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An investigation of stress-related factors and injury occurrence in Division III ice hockey athletes 2020.

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Christian Kiesel

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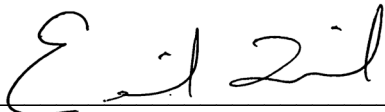Requirements for the Master of Science in Exercise Science Degree

Kinesiology Department

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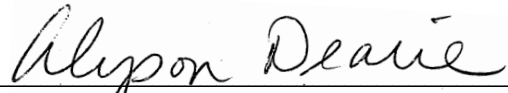
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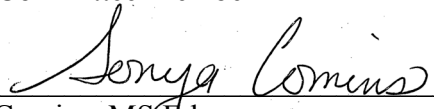
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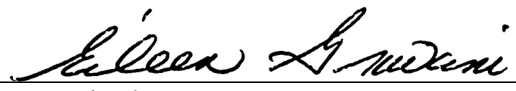   Thesis Committee Member

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ABSTRACT

Many variables can factor into a student athlete sustaining an injury, but one of the most interesting is stress. The Stress and Injury Model is excellent in explaining how exactly history of stressors, personality, and coping mechanisms play a pivotal role in the stress response. If these three factors cause a negative stress response, then that will lead to an athlete becoming more likely to become injured. This study used 40 ice hockey players from a Division III NCAA institution. Each participant completed the Inventory of College Students' Recent Life Experiences (ICSRLE) and Pittsburgh Sleep Quality Index (PSQI) every month throughout the athletic season. The total number of injuries were also calculated over the course of the season. The results showed that stress scores were significantly higher ($p < .001$) at the start of the season. Additionally, these higher stress scores were found to be significantly correlated with lower sleep quality. However, injury rates were not found to be significantly correlated with stress scores. Based off the past literature, an increase in stress at the beginning of the season could mean that there are more injuries sustained at this time. Future research should examine stress and injury rates over the duration of a full season, as well as incorporate baseline measurements to study further the effects of the start of a competitive season on stress.

iv

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I would like to personally thank my friends and family, as well as Dr. Erik Lind, Dr. Larissa True, Dr. Alyson Dearie, and Ms. Sonya Comins for their continued assistance and support. Another special thank you to SUNY Cortland, including both the Men's and Women's ice hockey teams for allowing me to conduct and complete this research.

TABLE OF CONTENTS

LIST OF TABLES & FIGURES

TABLES:

FIGURES:

CHAPTER 1

Introduction

Numerous amounts of college student-athletes compete every year. Unfortunately, many of them also become injured. Many factors can contribute to sustaining an injury, but one of the unique ones is stress. The stress and injury model theorizes three main factors that can contribute to negative stress response, and consequently, injury (Andersen & Williams, 1988; Williams & Andersen, 1998). If stress can correlate to injury, then there could be specific patterns throughout the year that can allow researchers to study more trends and help prevent even more injury occurrences.

Statement of the Problem

College athletics has become one of the most encompassing entities within the United States. Athletics had a record amount of 494,992 student-athletes competing during the 2017-2018 school year, which was a 3,000-fold increase from the year before (Schwarb, 2018). However, one constant in athletics are the injuries that occur to the student-athletes. More and more researchers are trying to determine the best ways to prevent injury. Yet, very little of this research is done on the sport of ice hockey. With so many factors that go into injuries, it is hard to pinpoint exactly how to prevent them from occurring. One factor that has been looked at that influences the onset of injuries is stress. However, many studies utilizing the model from Williams and Andersen (1998) just look at stress and injury at a single timepoint.

Few studies have looked at how stress can fluctuate over time, and even fewer have tried to find any correlations to athletic injuries. If researchers can study how a collegiate student-

athlete becomes stressed, and when in the school year that stress rises, then they can try to predict if that student-athlete will become more susceptible to injuries within that timeframe. If this is the case, simple stress-relief mechanisms can be implemented in order to not just lower perceived stress but injury rates.

Purpose

The purpose of this study was to identify if there were any differences between stress, sleep quality, and hardiness in ice hockey student-athletes that sustained an injury and student-athletes that did not get injured. This study also examined stress and sleep quality over a four-month timeline and investigated if there were any changes in values among student-athletes. Lastly, this study attempted to identify any increase in injury rates, and if they correlated with increased stress levels.

Hypotheses

H_0: There will not be significant changes in student experiences and sleep quality in ice hockey student-athletes over the course of a competitive season.

H_A: There will be significant changes in student experiences and sleep quality in ice hockey student-athletes over the course of a competitive season.

H_0: There will not be a significant, positive correlation between student-athletes' stress and injuries sustained throughout a collegiate ice hockey season.

H_A: There will be a significant, positive correlation between student-athletes' perceived stress and injuries sustained throughout a collegiate ice hockey season.

H_0: There will not be an increase in student-athlete stress that significantly correlates to a decline in ice hockey student-athlete sleep quality.

H$_A$: There will be an increase in student-athlete stress that significantly correlates to a decline in ice hockey student-athlete sleep quality.

Delimitations

The following were delimitations of this study:

1. Only members of the SUNY-Cortland NCAA Division III men's and women's ice hockey teams were assessed.

2. Sleep quality was measured using the Pittsburgh Sleep Quality Index (PSQI).

3. General stress was measured using the Inventory of College Students' Recent Life Experiences (ICSRLE) (Kohn, Lafreniere, & Gurevich, 1990).

4. The personality disposition hardiness was measured using the Hardiness Scale.

5. Injury was defined as any harm occurred to an athlete causing them to limit the amount of time or the way they participate, in practice or games, for at least three consecutive days.

6. Defining a four-week range to pinpoint injury data collection.

Limitations

The following were limitations of this study:

1. Possible injuries not reported to the certified athletic trainer (ATC).

2. How often and accurately the ATC diagnosed injuries to the best of their abilities.

3. How long the ATC kept the student-athletes out of play.

Assumptions

The following were assumptions of this study:

1. The student-athletes provided honest responses to the scales and questionnaires.

2. All injuries were accurately documented in the database by the ATC.

Significance of the Study

This study took a unique approach to help understand injuries within today's college student-athletes. It was designed to study the importance stress can have not only on a college individual but one that plays a competitive sport. This study was also significant since it looked at how stress can change over time in a collegiate student-athlete and if that significantly correlated to injury. Another interesting stance this article took was utilizing both a male and female ice hockey team. Using both teams provided more data for gender differences concerning to stress. Finally, since this study was utilizing a winter sport, their season encompasses both a final testing period in college as well as winter break. Of interest was to see how student-athlete stress differed between the two periods since final examinations were typically associated with more stress as winter break leads to relaxation and the holidays. This study could help determine how stress can lead to injuries and create insight to helping prevent further harm to student-athletes. This new insight could be utilized by the entire sports medicine team to implement time and cost-effective strategies to help minimize stress and, in return, injury.

Definition of Terms

Athletic Trainer – A health care provider that can diagnose, treat, and help prevent injuries to various athletic populations.

Hardiness – The ability to withstand challenging circumstances.

Ice Hockey – A physical, contact sport played on ice and uses a, "L" shaped stick to get a hard rubber puck into a net.

Injury - Specific harm done to an area or specific structure on the body that can cause pain and a decrease in functionality.

Stress - An imbalance between a specific demand and the response capability, where failure to meet the demand results in consequences.

CHAPTER 2

Review of Literature

College athletics has become one of the most encompassing entities within the United

States. It had a record amount of 494,992 student-athletes competing during the 2017-2018

school year, which was a 3,000-fold increase from the year before (Schwarb, 2018). However,

one thing that is inevitable with athletics ~~is~~ the injuries that occur to the student student-athletes.

Within a five year span between 2009 and 2014, there were over 1 million injuries documented

for collegiate student-athletes (Kerr et al., 2015). Even with all this research on collegiate

student-athletes, there remains little research on collegiate ice hockey student-athletes. This

limited literature is surprising because, according to Kerr and colleagues, men's ice hockey had a

higher average injury to student-athlete exposure rate than football within the five years (Kerr et

al., 2015). So many factors go into a student-athlete sustaining an injury, but one of the most

interesting one to factor in is from a psychological standpoint. The purpose of this literature

review is to outline the workload placed on a student-athlete both on and off the field, examine

stress as a contributing factor to athletic injury, and review beneficial scales that will help

determine a student-athlete's overall stress.

Student-Athlete Workload

Considerable time and energy is needed in order to become a collegiate student-athlete.

According to the NCAA, the average Division III student-athlete will spend just over 30 hours a

week on athletics, whereas a Division I student-athlete will have over 35 hours ("GOALS and

SCORE Studies," 2017). This time in athletics is just half of what is demanded from the student-

athlete. In order to be allowed to compete in college athletics, one must be a student at that university.

Academics and Athletics

According to Athnet, the NCAA requires their student-athletes to maintain a full-time student, this means that a student-athlete needs to be enrolled in at least 12 credit hours each semester for someone who is competing in Division III ("NCAA Academic Requirements for Freshman Eligibility," 2001-2019). The same is true for student-athletes at SUNY Cortland competing in Division III athletics. According to the SUNY Cortland frequently asked questions, the minimum to be full-time student is 12 credit hours (SUNY Cortland Registration FAQs). One credit hour is equal to 50 minutes of lecture in addition to at least two hours of work outside of the classroom per week (State University of New York Academic Affairs, 1976).

If a student takes a minimum of 12 credit hours, they will be averaging about 36 hours of course load every seven days. The 12 credit hours are just the minimum requirement. Most students will take more than 12 credit hours during certain semesters, and have other extracurricular activities. If a Division III collegiate student-athlete spends 30 hours a week on athletics and 36 hours a week on school, then 66 hours of the week are already factored out for them. If one includes seven hours of sleep every night, that is a total of 115 hours a week on school, sports, and sleep. There are only 168 hours in a week, which leaves 53 hours for the week or 7.5 hours a day, not factoring in any extracurricular or team travel to away games.

Injury Rates and Effects

Overall, sport participation is not the only concern for the student-athlete. Whenever there is a chance for an injury, one will most likely occur. As mentioned before, there were over one million injuries within a 5-year span (Kerr et al., 2015). Moreover, football had the highest

amounts of injures with over 47,000 while wrestling had the highest rate of 13.1 per 1000 student-athlete exposures (Kerr et al., 2015). One sport that does not receive much attention is ice hockey, even though it is a contact sport and can have higher injury rates than football (Kerr et al., 2015). Ice hockey is a physical, contact sport that can have several different injuries occur every year.

Injuries can become very detrimental depending on the student-athlete and type of damage that is done to the body. Some may last only a day, while other injuries may last months. According to Kerr and colleagues, almost a quarter of all injuries that occurred needed a minimum of seven days before the student-athlete could return to full playing status (Kerr et al., 2015). Another negative impact of injuries is the lasting effects. For example, some damaging effects that can come from concussions are chronic traumatic encephalopathy (CTE), Parkinson's, dementia, and amyotrophic lateral sclerosis (ALS) (Daneshvar, Riley, Nowinski, McKee, Stern, & Cantu, 2011). Therefore, it is imperative to not just properly treat injuries but to monitor, and try to prevent them from occurring. Many factors can help prevent injury, whether it be strengthening a core muscle group or ensuring the student-athlete is well conditioned. However, another factor that can lead to an injury is not physiological but psychological stress.

Stress as a Contributing Factor to Injury

Stress is defined as "'a substantial imbalance between demand and response capability, under conditions where failure to meet that demand has important consequences'" (Weinberg & Gould, 2015, p. 80). Stress comes from an inevitable progression of events that lead to a specific outcome; these events in order are environmental demand, perception of that demand, the stress response, and behavioral consequences (Weinberg & Gould, 2015). Numerous factors contribute to stress and many negative outcomes that can arise.

Negative Effects from Stress

Stress can have many detrimental effects. In 2014, there were at least $187 billion in work-related costs due to employee stress in the United States (Hassard, Teoh, Visockaite, Dewe, & Cox, 2018). Stress can be negative in other settings such as in college. According to a 2012 survey of the United States done by the American Psychological Association, the population that reported the highest average stress levels were millennials ("Stress by Generation," 2019). If stress is seen mostly in millennials, then that puts it within the current college population.

Another negative factor from stress is its impact on one's health. Using the Social Readjustment Rating Scale (Holmes & Rahe, 1967), researchers were able to find that the risk for illness increased in individuals with high, as opposed to low life-stress scores (Stuart, & Brown, 1981). Stress has many adverse outcomes and should be looked at more when dealing with one's health. Stress can cause illnesses within individuals; therefore, managing one's stress should be used in order to help maintain health. Not only will stress cause illness, but there is evidence that it can also lead to athletic injuries.

Stress and Injury Model

Researchers wanted to figure out a way in which stress and injuries related to athletics. Andersen and Williams (1988) created the stress and injury model to describe the different factors that went into stress-related injuries. The model described three factors that contributed to a student-athlete's response to the stress. The factors were history of stressors, personality characteristics, and coping mechanisms (Andersen & Williams, 1988). According to the authors, these three contributions will lead to a student-athlete sustaining an injury.

Once there is a demand or specific task placed on the student-athlete, they will go through what is called the stress response. The three factors that influence the stress response will be based on the individual, and therefore influence whether the student-athlete will have a negative or positive stress response to the external demands (Andersen & Williams, 1988). Ten years after developing the stress and injury model, the same researchers came up with a critique of their model. The original model suggested that a history of stressors was the primary contributor to the stress response, while personality and coping mechanisms only moderated the effects of stressor history (Andersen & Williams, 1988; Andersen & Williams, 1998).

The new model introduced bi-directional arrows between the history of stressors, personality, and coping mechanisms (Williams & Andersen, 1998). This new design suggests that all three play a pivotal role in the stress and injury model. Any one of the three can either contribute solely or together in the student-athlete's stress response (Williams & Andersen, 1998). There are two main parts to the stress response, cognitive appraisal of the situation, and physical effects on the student-athlete (Andersen & Williams, 1988; Williams & Anderson, 1998). If a student-athlete has an increase in history of stressors, a personality type that will worsen the stress response, and a low amount of coping mechanisms, then they will appraise the situation as more stressful and have an increase in physiological activation and attentional disruptions (Williams & Andersen, 1998).

History of Stressors

The history of stressors factor in the Stress and Injury Model can be broken down into three other separate groups. These groupings are life events, previous injuries, and daily hassles (Williams & Andersen, 1998). Life events are simply situations that cause the person to adapt

and consequently lead to stress (Andersen & Williams, 1998; Holmes & Rahe, 1967). An example of life events is divorce or moving to a new city.

According to Williams and Andersen (1998), Holmes (1970) gave the Social Readjustment Rating Scale (SRRS) to a football team to study time loss. The researcher found that that 50% of the student-athletes with a high rating of life stress missed at least one competition or three days due to injury, whereas only 9% and 25 % missed the same amount of time when rated with low and moderate levels of life stress, respectively (Holmes, 1970; Williams & Andersen, 1998). When the SRRS was modified to more of a collegiate student-athlete population, the results increase by 23% in the group with high life event stress (Bramwell, Masuda, Wagner, & Holmes, 1975; Williams & Andersen, 1998).

There were 30 studies conducted between 1970 and 1998 that examined the relationship between life stress and sports injuries; 27 of the 30 studies found some significant relationship between life stress and injury (Williams & Andersen, 1998). According to Andersen and Williams (1998), 18 of 20 studies found a positive correlation between life stress and injury. The student-athletes within the studies were shown to be 2-5 times more likely to be injured when shown to have high rather than low stress (Williams & Andersen, 1998).

Previous injury is also a contributing factor to a history of stressors. If a student-athlete had an injury occur to them, and they are not fully recovered from it before returning to play, they can sustain another injury (Williams & Andersen, 1998). When a body part becomes injured, it changes in physiology. If this change is not fully rehabilitated, then the functionality of the limb will decline. For example, with a strained hamstring, the muscle fibers become overstretched and result in a decrease in running ability. The hamstring will also become weak and will need to be strengthened to get back to the level it was before. If it does not become

strong enough, then another strain is very likely to occur from the fibers being unable to counteract the forces on the leg during a sprint.

The second aspect of the previous history is psychologically being unprepared to go back to a full return to play (Williams & Andersen, 1998). Even if a student-athlete if fully rehabilitated from an injury, they might be timid to go back because of fear of becoming injured again. If they are mentally timid, then their body movements will be timid as well. When a student-athlete does not fully commit himself or herself, especially in a contact sport, then most of the force will be put on them and cause another injury. Unfortunately, there is not a lot of research on previous history; however, some articles that were looked at showed differing results (Williams & Andersen, 1998).

Daily hassles are the final factor to history of stressors. Unlike life events, daily hassles are everyday occurrences that can cause minor irritation or annoyance to someone. However, if there are enough hassles they can accumulate and lead to increased stress within an individual (Williams & Andersen, 1998). According to Andersen and Williams (1998), an increase in hassles will lead to an increased likelihood of injuries. A study found this exact result when researching field hockey, volleyball, and triathlon student-athletes (Fawkner, McMurray, & Summers, 1999).

While daily hassles are unique to study, they can be very intricate and time-consuming. Since they are small hassles that can usually occur almost every day, the hassles need to be monitored as often as clinically possible. Fawkner, McMurray, and Summers (1999) monitored the daily hassles weekly and found very significant results. Another study looked at daily hassles as well, however, only gathered data every month, resulting in less significance in their study by only being able to predict injuries in one of the sports studied (Williams & Andersen, 1998).

Sleep

One of the most common type of hassle is lack of daily sleep. It is also one of the most beneficial remedies to stress. Sleep is vital in the health of not just a student-athlete but also any individual. It has been shown that too little sleep can lead to an increase in stress, anxiety, and lead to school burnout and depression (Cohen & Williamson, 1988; Lehto, Kortesoja, & Partonen, 2018; Neckelmann, Mykletun, & Dahl, 2007). It has also been linked to mood changes and an increase in anger if one does not have enough sleep every night (Dinges et al., 1997).

Most importantly, sleep is a vital tool to combat injury and illness. A study done on healthy individuals found that those with less than 92% sleep efficiency were 5.50 times more likely to develop a cold than those with 98% or more sleep efficiency; they also found participants with less than seven hours of sleep were 2.94 times more likely to develop a cold than those with eight or more hours (Janicki-deverts & Turner, 2019).

Another study looked at sleep being a factor in the stress-health model. The results showed that higher stress scores associated with a lower quality of health; they also found that the poorer quality of sleep and increased daytime sleepiness led to lower health scores (Benham, 2010). The researchers then wanted to see how the sleep measures affected the health scores when added to stress. They found that sleep causes a greater variance in health scores, up to 56% (Benham, 2010). This variance means that poor sleep added to stress can cause worse outcomes for one's health. Better sleep can also be looked at as a treatment to help lower stress and improve health.

Sleep has also been shown to have a direct relationship with a student-athlete obtaining an injury. Researchers wanted to study the effects of sleep on injuries and found those with less than 8 hours of sleep per night were 1.7 times more likely to sustain an injury (Milewski et al.,

2014). Another study found that subjects who had slept for more than 8 hours had reduced their risk of injury by 61%. Sleep is not only crucial in reducing stress levels but can help prevent injury and illness altogether.

Personality

Personality is an interesting factor in the stress and injury model because it is something that usually does not change within a person. Personality can be divided into three different elements within a person. The first is the psychological core; it is the deepest part of one's personality that is unchanging (Weinberg & Gould, 2015). The next element of personality is typical responses to the environment; this is slightly more dynamic than and not as constant as one's psychological core (Weinberg & Gould, 2015). An example to this is when someone is cheerful and social at a party; this can reflect their psychological core as being extroverted. The final element to personality is role-related behavior, or merely changing one's behavior as their perception of the environment change (Weinberg & Gould, 2015). Role-related behavior is the opposite of the psychological core as it is the most dynamic of the three elements.

One of the most prominent dynamics of personality is one's hardiness. Hardiness is how much someone can withstand strenuous situations. Even though there has not been much research on hardiness (Williams & Andersen, 1998), it has been linked to lower amounts of negative emotions (Ramanaiah & Sharpe, 1999). With increased hardiness, student-athletes can endure more stress and negative impacts within their life.

Two studies looked at the impacts of hardiness within the military. Bartone (1999) looked at the impacts of hardiness on American veterans from the Gulf War. His results found that hardiness helped to protect the veterans from the harmful effects of stress that came with the war (Bartone, 1999). A second study showed that candidates that were able to graduate from the

Army Special Forces had higher ratings of hardiness than those that did not graduate (Bartone, Roland, Picano, & Williams, 2008). Hardiness is a good predictor of success when faced with stress. Just as Bartone (1999) and Bartone, Roland, Picano, and Williams (2008) found, that greater hardiness was able to allow soldiers to withstand the harsh stressors of war and military training, respectively. If this setting is changed to athletics, those student-athletes who have more hardiness will theoretically be able to combat more stress within their respective sports.

Coping Mechanisms

The final factor that influences the stress and injury model is the availability of different coping mechanisms. Coping mechanisms can be used to combat the negative effects of stress and help prevent poor outcomes from stress (Weinberg & Gould, 2015). According to the stress and injury model, if a student-athlete has an adequate amount of resources to cope with stress, then injuries will be more likely to be prevented (Williams & Andersen, 1998).

In a study done by Hanson, McCullagh, and Tonymon (1992), a modified athletic questionnaire was used to assess coping resources in student-athletes. The results found that the student-athletes who had been injured had fewer coping mechanisms than the group that had not been injured. There are different ways for a student-athlete to cope with stress. For example, they can sustain positive focus and imagery, or become better with their time management (Weinberg & Gould, 2015). However, one of the most significant coping mechanism a student-athlete can have is social support. Two separate studies concluded that those with more social support had lower injury rates than those with less social support; these studies also found that the lower amount of social support led to an increase in injuries regardless of the student-athletes' life stressors (Byrd, 1993; Hardy, Richman, & Rosenfeld, 1990).

The Stress Response

History of stressors, personality, and coping mechanisms are the factors that can lead to athletic injuries in sports. How exactly does this happen? The stress response is how the student-athlete responds when a stressful situation is placed upon them. It is hypothesized that stress can lead to increased muscle tension, narrowing of the visual field, and an increase in distractibility (Andersen & Williams, 1998; Weinberg & Gould, 2015).

With an increase in muscle tension, a student-athlete will not be able to move as functionally as they could before. Increased tension can cause a decrease in range of motion as well as lower strength. Both effects can lead to injury when the student-athlete is not able to run, throw, or perform well enough to compete at their level of competition. This is similar to coming into preseason unconditioned. If one is not strong or flexible enough to produce what is demanded from them, then injury will ensure.

Many major life events have been shown to correlate with a narrowing peripheral vision when subjects were exposed to high stress conditions (Andersen & Williams, 1998). The visual field can narrow even more when peripheral targets move faster to the individual (Williams & Andersen, 1998). Faster moving peripheral targets relate more to the student-athlete since they are more likely to experience quicker objects during the competition such as a ball or another player. If peripheral vision was shown to narrow, and thus decrease the amount of visibility in the student-athlete, then this can lead to a higher susceptibility of injury.

Distractibility is the final factor that can come from a negative stress response. When a student-athlete is unable to concentrate at the task, then the athlete can sustain an injury by not being prepared for the external demand. It has been shown that greater central deficits can occur in individuals with high stress when compared to those with low stress (Williams & Andersen,

1998). Those with high negative life events were found to have an even less visual reaction time (Williams & Andersen, 1998).

Summary

Injuries will occur in college athletics. One factor that can lead to an injury is stress. Andersen and Williams' (1988) stress and injury model, accurately theorizes the main components that causes athletic injury. Their critiqued model 10 years later suggested that history of stressors, personality, and coping mechanisms all contribute either individually or collectively into the stress response (Williams & Andersen, 1998). If these factors meet a certain threshold, and the student-athlete undergoes a negative stress response, then injury can ensue.

During the stress response, a student-athlete will have increased muscular tension, narrowing of the visual field, and an increase in distractibility (Andersen & Williams, 1998; Weinberg & Gould, 2015). These could lead to injury and can be detrimental to the student-athlete. Injury rates in college are increasing, therefore, prevention is critical. Literature suggests that one way to prevent injuries is to help manage a student-athlete's stress.

CHAPTER 3

Methods

Participants

Participants in this study were recruited from both National Collegiate Athletic

Association (NCAA) Division III men's and women's ice hockey programs at SUNY-Cortland.

To be eligible, participants needed to compete during the 2019-2020 athletic season. No

participants were to be excluded if they have previously been injured, or if they had a current

injury going into the start of data collection. This is based on the notion that previous injuries can

play a significant role in sustaining a new one (Andersen & Williams, 1988; Williams &

Andersen, 1998). Participants were excluded if they left school, transferred in halfway through

the season, or did not finish the season with the team. If a participant did not finish the athletic

season due to injury, but was still a part of the team, then they were still included.

Scales and Questionnaires

The Pittsburgh Sleep Quality Index (PSQI; Buysse et al., 1988) was used to measure the

amount of quality sleep that each participant was getting. The seven components in this index

were determined to have a high degree of internal consistency and can remain stable over an 18-

month period (Buysse et al., 1988). This was a non-invasive, reliable, and validated measure that

assessed dimensions of sleep quality, namely (a) overall sleep quality, (b) time to fall asleep, (c)

sleep duration (d) daytime effects of sleep quality, and (e) sleep efficiency. This measure used 19

items, consisting of open-ended questions (e.g., When have you usually gone to bed?) as well as

pointed response options (e.g., During the last month, how often have you had trouble sleeping

because you cannot get to sleep within 30 minutes?) of "Not during the last month," "Less than once a week," "Once or twice a week," or "Three or more times a week" (Buysse et al., 1988).

The Inventory of College Students' Recent Life Experiences (ICSRLE; Kohn et al., 1990) was used to measure the amount of stressors each participant routinely endured. The ICSRLE contained 49 questions that addressed how someone had been affected by different situations occurring within the last month (e.g., Conflicts with boyfriend/girlfriend/spouse). The inventory was able to assign objective scores from subjective intensity responses of "not at all part of my life," "only slightly part of my life," "distinctly part of my life," or "very much part of my life" (Kohn et al., 1990). The ICSRLE had a high alpha reliability when correlated with the Perceived Stress Scale (Kohn et al., 1990).

The Hardiness Scale was used to determine different personality traits between participants. This scale was comprised of 30 descriptive statements (e.g., Changes in routine are interesting to me.) that can affect the subject (Bartone, 1991). The subjects gave a response ranking of "Not at all," "A little true," "Quite true," or "Completely true" to each of the statements (Bartone, 1991). The Hardiness scale has shown to be reliable, and contained an equal amount of questions to commitment, control, and challenge (Bartone, 1991).

A demographics questionnaire was given to determine the sex, age, and number of credit hours the student athletes were taking. It also asked how many injuries the participants sustained within the last 12 months that caused them to refrain from participating in athletics for three consecutive days.

Procedure

The current study was a prospective study design. Ice hockey student-athletes were recruited before the start of mandatory practices by gaining permission from each team's head

coach. The official start of the season was October 14. A month after the start of the season, all eligible participants filled out the Pittsburgh Sleep Quality Index (PSQI), the Inventory of College Students' Recent Life Experiences (ICSRLE), the Handiness Scale, a demographics questionnaire, and consent form allowing the researcher access to their potential injury documents. Since hardiness is considered an individual personality disposition, the participants only filled this out once. The demographics questionnaire was given again at the start of the second semester as some participant credit hours changed by taking different classes.

The same two scales (PSQI & ICSRLE) were given every month during the regular season. The second collection period was done before December 14. This was the start of winter break for students; therefore, none of the participants was on campus to complete the scales after that time. According to the SUNY Cortland Athletics Webpage, the regular season for both Ice Hockey teams ran from October 14 until February 22. Therefore, the scales were completed during the months of November, December, January, and February to measure the amount of stress and sleep quality from the past month.

The lead researcher conducted injury surveillance every two weeks. If a participant sustained an injury, they reported it to their respective athletic trainer. When an injury kept one of the participants out of practice or play for three consecutive days, the lead researcher documented it. The date the injury occurred on was documented into a log for the student-athlete and kept safe to sustain privacy. Injuries were plotted within a month-long period that ranges from the day after scales were given out; through the next day, the participants fill out the next set of scales.

Statistical Analysis

Descriptive statistics (M±SD) were computed for all dependent variables. One-way repeated measures ANOVA with a Bonferroni post-hoc analysis was used to determine any differences in ICSRLE among each of the four data collection intervals. Second one-way repeated measures ANOVA with a Bonferroni post-hoc analysis was used to determine any differences in PSQI scores among each of the four data collection intervals. Paired samples *t*-tests were used to identify differences in injury rates within each of the four collection intervals. A series of Pearson's bivariate correlations were run to determine the relationship between number of injuries and stress scores at each data collection interval. An additional series of Pearson's bivariate correlations were run to determine the relationship between stress and sleep scores at each data collection intervals. A partial correlation was used to determine the relationship between stress and sleep scores at each interval while controlling for hardiness and gender. Statistical significance set at $\alpha \leq 0.05$. All statistical analysis were conducted with SPSS version 24.

CHAPTER 4

Results

Data were collected on 40 participants (male [n =18]; female [n = 22]). Descriptive

statistics for participants' age, fall and spring credit hours, and hardiness scores are presented in

Table 1.

Table 1

Descriptive Statistics for DIII Hockey Players. Values are mean ± SD

Variable	Total (N = 40)	Males (n = 18)	Females (n = 22)
Age (years)	20.47 ± 1.600	21.78 ± 0.943	19.41 ± 1.180
Fall Credit Hours	14.55 ± 1.800	14.58 ± 1.801	14.52 ± 1.842
Spring Credit Hours	15.87 ± 1.265	15.83 ± 0.985	15.91 ± 1.477
Hardiness scores	3.33 ± 3.504	3.89 ± 3.234	2.86 ± 3.720

Note. N = number of participants.

Inventory of College Students' Recent Life Experiences

A one-way repeated measures ANOVA was performed to determine differences in

ICSRLE (stress) levels among the four data collection trials. ICSRLE scores were statistically

significantly different among the four data collection timepoints, $F(3, 117 = 25.093, p < .001$,

partial $\eta^2 = .392$. Post hoc analyses with a Bonferroni adjustment indicated that the ICSRLE

scores during the first collection period were statistically greater than the second collection

period (M = 11.58, 95% CI [4.824, 18.326], $p < .001$), third collection period (M = 20.43, 95%

CI [12.326, 28.524], *p* < .001), and fourth collection period (M = 16.18, 95% CI [8.822, 23.528], *p* < .001).

Estimated Marginal Means of ICSRLEScores
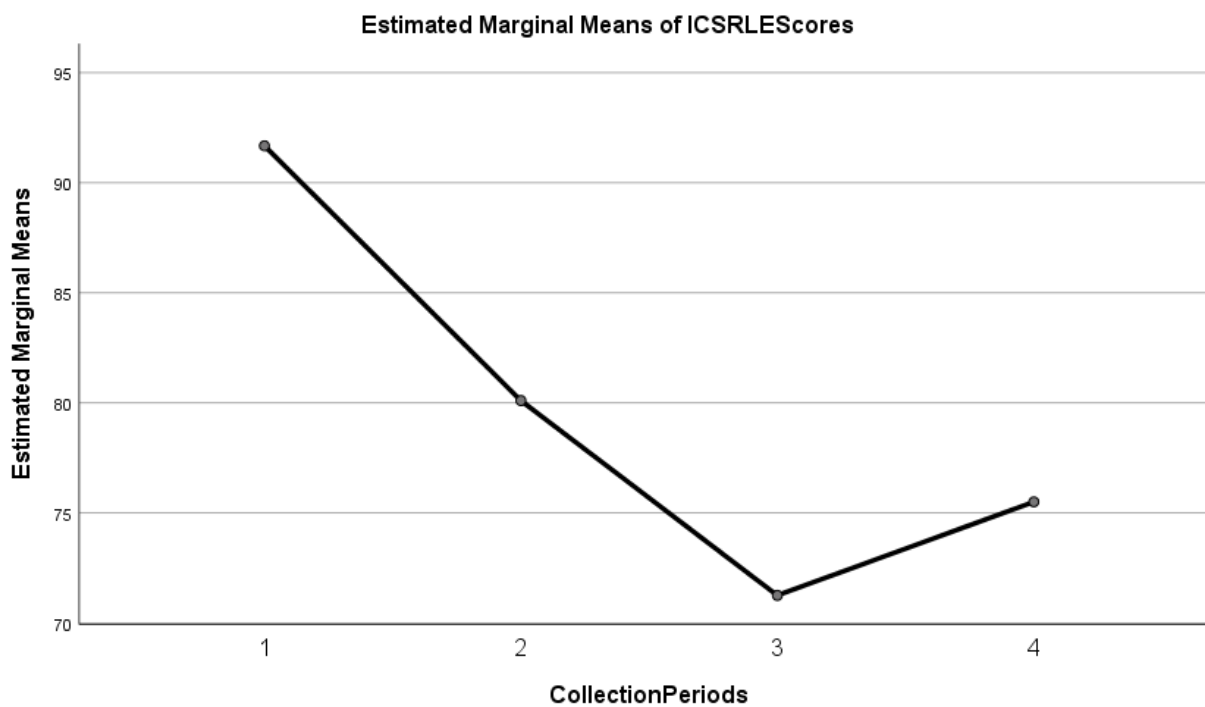
Figure 1. Line Graph of Changes in Inventory of College Students' Recent Life Experiences. Note. 1 = mid-October to mid-November. 2 = mid-November to mid-December. 3 = mid-December to mid-January. 4 = mid-January to late February.

Pittsburgh Sleep Quality Index

A second one-way repeated measures ANOVA was performed to differences in scores on the Pittsburgh Sleep Quality Index (PSQI) among the four collection periods. A Greenhouse and Geisser (1959) correction was applied to the one-way repeated measures ANOVA. Sleep quality was found to be statistically significantly different among the four time points, $F(2.281, 88.977) = 3.525$, $p = .028$, partial $\eta^2 = .083$. However, post hoc analyses with a Bonferroni adjustment indicated that the PSQI scores were not statistically significantly different between the first and second collection periods (M = .63, 95% CI [-.188, 1.438], $p = .233$), first and third collection

periods (M = .58, 95% CI [-.533, 1.683], *p* = .942), first and fourth collection periods (M = 1.15, 95% CI [-.095, 2.395], *p* = .085), second and third collection periods (M = -.05, 95% CI [-.917, .817], *p* = 1.000), second and fourth collection periods (M = .53, 95% CI [-.440, 1.490], *p* = .831), and the third and fourth collection periods (M = .58, 95% CI [-.257, 1.407], *p* = .372).

Injury Rate

Paired samples *t*-tests were used to determine injury rate differences at each of the four collection periods. There were no statistically significant differences in injury rates among any of the four collection periods. Paired samples *t*-tests were used again to determine injury rate differences in each of the four collection periods, but for males only. There was a statistically significant difference in male injury rates between the first and second collection periods, *t*(17) = 2.557, *p* = .020. Injury rates during the first collection period (m = .33) were significantly higher than injury rates from the second collection period (m = .06). There was also a statistically significant difference in male injury rates between the first and fourth collection periods, *t*(17) = 2.051, *p* = .056. Injury rates during the first collection period (m = .33) were significantly higher than injury rates from the fourth collection period (m = .06).

Correlations between ICSRLE and Injury Rate

A Pearson's correlation was run to assess the relationship between male ICSRLE scores and their injury rates during the first collection period. There was not a statistically significant relationship between male ICSRLE scores and injury rates, *r*(17) = .235, *p* = .348.

Correlations between ICSRLE and PSQI

A Pearson's correlation was run to assess the relationship between ICSRLE scores and PSQI scores during the first collection period. There was a statistically significant, moderately positive correlation between ICSRLE scores and PSQI scores, *r*(39) = .610, *p* < .001. Pearson's

partial correlation showed that the strength of this linear relationship was lessened when hardiness and gender were controlled for, $r_{partial}(36) = .515$, but still statistically significant, $p = .001$. A second Pearson's correlation was run to assess the relationship between ICSRLE scores and PSQI scores during the second collection period. There was a statistically significant, moderately positive correlation between ICSRLE scores and PSQI scores, $r(39) = .504$, $p = .001$. Pearson's partial correlation showed that the strength of this linear relationship was lessened when hardiness and gender were controlled for, $r_{partial}(36) = .416$, but still statistically significant, $p = .009$.

Table 2

Athlete Stress and Sleep Quality Scores. Values are mean ± SD

Variable	Total (N = 40)	Males (n = 18)	Females (n = 22)
ICSRLE Scores T1	91.68 ± 22.117	79.39 ± 20.985	101.73 ± 17.796
ICSRLE Scores T2	80.10 ± 20.145	68.83 ± 13.794	89.32 ± 20.046
ICSRLE Scores T3	71.25 ± 16.882	63.78 ± 16.275	77.36 ± 15.095
ICSRLE Scores T4	75.50 ± 19.421	68.61 ± 18.114	81.14 ± 18.997
PSQI Scores T1	7.12 ± 3.510	5.72 ± 3.409	8.27 ± 3.225
PSQI Scores T2	6.50 ± 3.063	5.50 ± 2.936	7.32 ± 2.982
PSQI Scores T3	6.55 ± 2.791	5.83 ± 2.550	7.14 ± 2.900
PSQI Scores T4	5.98 ±2.750	4.94 ± 2.508	6.82 ± 2.702

Note. N = number of participants. ICSRLE = Inventory of College Student Recent Life Experiences, measure of effects from stressors. PSQI = Pittsburgh Sleep Quality Index, measure of sleep quality. T1 = trial one, the first collection period. T2 = trial two, the second collection period. T3 = trial three, the third collection period. T4 = trial four, the fourth collection period.

CHAPTER 5

Discussion

The purpose of this study was to examine if student-athlete stress and sleep quality in hockey players could change in value throughout a season. Additionally, this report wanted to determine if any increased stress these athletes reported would lead to a rise in injury rates. The major finding of this study was that ICSRLE (stress) scores significantly decreased from the start of the season. Additionally, during the first and second collection intervals, PSQI (sleep quality) scores had moderately positive relationship with ICSRLE scores. However, stress scores were not significantly correlated to injury rates in this study.

After the second data collection, the overall ICSRLE scores of the athletes decreased from the first collection interval. This decrease indicates that overall, the hockey players in this study started their competitive season with stress levels at their highest. Stress levels then continued to decrease to their lowest at the third data collection. The last period of data collection showed a slight increase in stress levels; however, this was only significantly different from the first stress score at the beginning of the season. The ICSRLE looks at the amount specific stressors have affected an individual within the past month, rather than determining the specific amount of stress an individual is experiencing. However, since it significantly correlates to the Perceived Stress Scale, the ICSRLE is an adequate tool to quantify stress levels (Kohn, Lafreniere, & Gurevich, 1990).

Sleep was included since it has been linked to increased stress and anxiety, as well as influencing greater health variances when combined with an increase in stress (Benham, 2010;

Cohen & Williamson, 1988; Neckelmann, Mykletun, & Dahl, 2007). Sleep quality had a moderately positive relationship with stress scores during the first two collection intervals. This relationship implies that higher scores on the PSQI, which represents lower sleep quality, had a direct correlation with increased scores from the ICSRLE. The correlation between stress and sleep was ran again, but this time controlling for hardiness and gender.

Once again, sleep had a moderately positive relationship with stress during the first and second collection periods. This relationship is interesting because regardless of gender, or one's hardiness, sleep and stress were still significantly correlated. Hardiness is a personality trait that helps individuals withstand stressful situations. It has an inverse relationship with stress, so theoretically when hardiness increases in a person, stress levels should decrease. In this study, it did not matter how much hardiness an athlete had; stress was still significantly related to sleep. This means that sleep is just as important for stress management and in turn, one's health.

This study found that, unlike stress, sleep quality did not significantly change throughout the hockey season. This means that sleep was not the only factor making stress scores so much higher at the beginning of the season during the first collection interval. The other factor that could have contributed to the highest ICSRLE scores at the first collection interval could be the start of the season itself. Many factors can contribute to an increase in stress, including daily hassles (Fawkner, McMurrary, & Summers, 1999; Williams & Andersen, 1998). Once the season began, the athletes had to then squeeze in a minimum of two extra hours to their daily schedule. This new routine could have been enough to increase how much the participants became affected by the various stressors in their life, leading to their increased ICSRLE scores during the first collection period.

This study found that there was a significant difference in the number of male injury rates

between the first and second, as well as the first and fourth collection periods. However, the athletes' ICSRLE scores were not significantly related to the rate of injuries at any of the four collection periods. There were not many injuries throughout the season. The most amount of injuries that occurred during a single collection interval happened for the males with a total of six injuries. Females were not injured as much as the males, as they only had two injuries the entire season that required them to be out or limited for at least three days.

The small number of injuries could be the reason why there were only significant differences between the first and second collection intervals, as well as the first and fourth. A few of the male participants that were injured remained that way throughout the second collection interval. Therefore, there were fewer athletes available to sustain an injury and then have that injury reported. This can explain why there was a significant decrease in injuries, but that decrease did not have any significant correlation with a decrease in stress. This can be inferred for the fourth collection period as well. There was a slight increase in injury rates during the third collection period, which caused some that were injured not to have as much playing time during the last interval, and in turn, lead to lower amounts of reported injuries at that time.

A number of studies have linked an increase in stress to an increase in injury rates (Andersen & Williams, 1988; Fawkner et al., 1999; Hanson, McCullagh, & Tonymon, 1992; Hardy, Richman, & Rosenfeld, 1990; Williams & Andersen, 1998). Further studies may help to affirm the relationship between stress and injury, especially research that looks at changes in stress and injuries over time.

Conclusion

This study was one of the first to look at the relationship between stress and injury as well as how both stress and injury can change throughout an athletic season. ICSRLE scores

were significantly higher at the start of the season than at any other timepoint. According to the literature, this suggests that the athletes would have been more susceptible to injuries at that time. While this study was unable to significantly correlate injuries to stress, it did conclude that there were significantly more injuries at the same time there was the greatest stress.

This report also found that PSQI scores had a linear relationship with ICSRLE scores in the first half of the season, regardless of one's personality or gender. If an athlete had an increase in poor sleep, there was a good chance they had an increase in stress. This information reaffirms that sleep is still an essential contributor to the overall health of an athlete.

There is limited literature on collegiate hockey athletes, especially regarding the relationship between stress and injury. This report is one of very few to look at this specific population, as well as consider gender as an essential variable. This study warrants future research on the changes in stress, sleep, and injuries within an athletic population. More studies done throughout a season can help pinpoint specific areas of high stress. This new information can help not only athletic trainers, team physicians, physical therapists, and other members of the sports medicine team, but also coaches and the athletes. Determining when the most stress occurs in athletes can lead to the introduction of more preventative measures to injuries, contributing to higher team performance and success.

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APPENDIX A

Informed Consent
State University of New York College at Cortland

Christian Kiesel of the Kinesiology Department at SUNY Cortland is conducting research in which you are being asked to participate. We request your informed consent to be a participant in the project described below. *Please feel free to ask about the project, its procedures, or objectives*

Information and Procedures of this Research Study:
The purpose of this study is to examine the relationship between injury and certain factors related to the occurrence of an injury such as levels of stress experienced by college student-athletes, sleep quality, and personality. This will be done by completing questionnaires at various times throughout the season.

Before agreeing to participate, you should know that:
A. Freedom to withdraw
Participation in this research is voluntary, and there is no penalty for refusal or withdrawal. You are free to withdraw consent at any time without penalty. Even if you begin answering questions and realize for any reason that you do not want to continue, you are free to withdraw from the study. Additionally, you may ask the researcher to destroy any responses you may have given.

B. Risks Expected
The potential risk associated with the research is limited to confidentiality risk. To ensure confidentiality and minimize this risk, names will not be used and only the lead investigator and faculty committee will have access to the completed surveys. Surveys will be transported by the lead investigator immediately after data collection and will be stored in a locked office on the campus of SUNY Cortland.

C. Protection of Participants' Responses
Your responses are strictly confidential. Only the principle investigator and the faculty committee will have access to your responses. Your name will not be connected with your responses.

D. Length of Participation
The study should take approximately 15 minutes every time you fill out the set questionnaires. There will not be any extra follow-ups if you sustain an injury, everyone will complete the same number of questionnaires regardless of injury status.

E. Benefits expected
Participation in this study can help discover different areas leading to an athlete's stress and can contribute to aid in decreasing injury. In addition, it can allow for a better understanding of head coaches' satisfaction with athletic training services. This can lead to an improvement in the relationship between coaches and athletic trainers, and possibly an improvement in the perception of the field of athletic training.

F. Contact Information

If you have any questions concerning the purpose or results of this study, you may contact Christian Kiesel at christian.kiesel@cortland.edu or at (567) 230-4271. This study has been approved by the Institutional Review Board at SUNY-Cortland. For more information about research at SUNY-Cortland or information about the rights of research participants, please contact the Institutional Review Board at (607) 753-2511.

_____

I _____ have read the description of the project for which this consent is requested, understand my rights, and I hereby consent to participate in this study.

_____   _____
Signature of Participant   Date

_____   _____
Researcher's Signature   Date

APPENDIX B

MEMORANDUM

SUNY
Cortland
Institutional Review Board

To:	Christian Kiesel Erik Lind
From:	Mark Dodds, Reviewer *on behalf of* Institutional Review Board
Date:	November 6, 2019
RE:	Institutional Review Board Approval

In accordance with SUNY Cortland's procedures for human research participant protections, the protocol referenced below has been approved for a period of one year:

Title of the study:	An Investigation of Stress-related Factors and Injury Occurrence in Division III Ice Hockey Athletes		
Level of review:	Expedited	Protocol number:	192021
Project start date:	Upon IRB approval	Approval expiration date*:	November 5, 2020

* **Note:** *Please include the protocol expiration date to the bottom of your consent form and recruitment materials.* For more information about continuation policies and procedures, visit www.cortland.edu/irb/Applications/continuations.html

The federal Office for Research Protections (OHRP) emphasizes that investigators play a crucial role in protecting the rights and welfare of human subjects and are responsible for carrying out sound ethical research consistent with research plans approved by an IRB. Along with meeting the specific requirements of a particular research study, investigators are responsible for ongoing requirements in the conduct of approved research that include, in summary:

- obtaining and documenting informed consent from the participants and/or from a legally authorized representative prior to the individuals' participation in the research, unless these requirements have been waived by the IRB;
- obtaining prior approval from the IRB for any modifications of (or additions to) the previously approved research; this includes modifications to advertisements and other recruitment materials, changes to the informed consent or child assent, the study design and procedures, addition of research staff or student assistants, etc. (except those alterations necessary to eliminate apparent immediate hazards to subjects, which are then to be reported by email to irb@cortland.edu within three days);
- providing to the IRB prompt reports of any unanticipated problems involving risks to subjects or others;
- following the principles outlined in the Belmont Report, OHRP Policies and Procedures (Title 45, Part 46, Protection of Human Subjects), the SUNY Cortland College Handbook, and SUNY Cortland's IRB Policies and Procedures Manual;
- notifying the IRB of continued research under the approved protocol to keep the records active; and,
- maintaining records as required by the HHS regulations and NYS State law, for at least three years after completion of the study.

In the event that questions or concerns arise about research at SUNY Cortland, please contact the IRB by email irb@cortland.edu or by telephone at (607)753-2511. You may also contact a member of the IRB who possesses expertise in your discipline or methodology, visit http://www.cortland.edu/irb/members.html to obtain a current list of IRB members.

Sincerely,

Mark Dodds, Reviewer *on behalf of*
Institutional Review Board
SUNY Cortland

APPENDIX C

Demographics Questionnaire

Name:_____

Sex (circle):   Male   Female   Other

Age: _____

Number of Years as a College Athlete: _____

(Ex: if this is your 2nd season playing competitive hockey while taking college courses, put 2)

Number of Credit Hours for fall '19: _____

When was the last injury you sustained that caused at least three consecutive days of being out or limited in a game or practice? (circle):

        Less than a week   Less than a month   A month or more

How severe was your last injury/how long were you out or limited in a game or practice? (circle):

        Less than a week   Less than a month   A month or more

Please describe the injury above:

APPENDIX D

Simplified Personality Scale

This scale is used to assess different aspects to one's personality. There are no right or wrong answers. Please indicate how much you agree or disagree with each of the 12 statements.

Scale:

0 = strongly disagree   1 = mildly disagree

2 = mildly agree   3 = strongly agree

A. ____ Trying my best at work makes a difference.

B. ____ Trusting to fate is sometimes all I can do in a relationship

C. ____ I often wake up eager to start on the day's projects.

D. ____ Thinking of myself as a free person leads to great frustration and difficulty.

E. ____ I would be willing to sacrifice financial security in my work if something really challenging

     along.

F. ____ It bothers me when I have to deviate from the routine or schedule I've set for myself.

G. ____ An average citizen can have impact on politics.

H. ____ Without the right breaks, it is hard to be successful in my field.

I. ____ I know why I am doing what I am doing at work.

J. ____ Getting close to people puts me at risk of being obligated to them.

K. ____ Encountering new situations is an important priority in my life.

L. ____ I really don't mind when I have nothing to do.

APPENDIX E

<u>Inventory of College Students' Recent Life Experiences (ICSRLE)</u>

This survey is to assess how much you gave been affected by certain stressors within your life. Indicate how much each situation has affected your life *in the past month.* There is a total of 49 different experiences, please respond to each one.

Intensity Scale:

1 = **not at all** part of my life   2 = **only slightly** part of my life

3 = **distinctly** part of my life   4 = **very much** part of my life

1. Being let down or disappointed by friends   ____
2. Conflicts with boyfriend's/girlfriend's/spouse's family   ____
3. Social rejection   ____
4. Conflict with professor(s)   ____
5. Being taken for granted   ____
6. Too many things to do at once   ____
7. Having your trust betrayed by a friend   ____
8. Financial conflicts with family members   ____
9. Having your contributions overlooked   ____
10. Separation from people you care about   ____
11. Being taken advantage of   ____
12. Struggling to meet your own academic standards   ____
13. Struggling to meet the academic standards of others   ____
14. Not enough leisure time   ____
15. Dissatisfaction with school   ____
16. A lot of responsibilities   ____
17. Not enough time to meet the academic standards of others   ____
18. Decisions about intimate relationship(s)   ____
19. Important decisions about your future career   ____
20. Dissatisfaction with your mathematical ability   ____
21. Dissatisfaction with your reading ability   ____
22. Financial burdens   ____
23. Loneliness   ____
24. Important decisions about your education   ____
25. Conflict with teaching assistant(s)   ____
26. Lower grades than you hoped for   ____
27. Conflicts with your family   ____
28. Not enough time for sleep   ____
29. Finding courses too demanding   ____
30. Heavy demands from extracurricular activities   ____
31. Hard effort to get ahead   ____
32. Conflicts with friends   ____
33. Disliking your studies   ____
34. Poor health of a friend   ____
35. Social conflicts over smoking   ____
36. Getting "ripped off" or cheated in the purchases of services ____
37. Disliking fellow student(s)   ____

38. Difficulties with transportation   ____
39. Dissatisfaction with your ability at written extent   ____
40. Conflicts with boyfriend/girlfriend/spouse   ____
41. Social isolation   ____
42. Interruptions of your schoolwork   ____
43. Being ignored   ____
44. Long waits to get service (ex: at banks, stores, etc.)   ____
45. Finding course(s) uninteresting   ____
46. Dissatisfaction with your physical appearance   ____
47. Failing to get expected job   ____
48. Gossip concerning someone you care about   ____
49. Dissatisfaction with your athletic abilities   ____

APPENDIX F

Pittsburgh Sleep Quality Index

The following questions relate to your usual sleep habits during the past month *only*. Your answers should indicate the most accurate reply for the *majority* of days and nights in the past month. Please answer all questions.

1. During the past month, when have you usually gone to bed at night?
   USUAL BED TIME _____
2. During the past month, how long (in minutes) has it usually taken you to fall asleep each night?
   NUMBER OF MINUTES _____
3. During the past month, when have you usually gotten up in the morning?
   USUAL GETTING UP TIME _____
4. During the past month, how many hours of *actual sleep* did you get at night? (this may be different than the number of hours you spend in bed)
   HOURS OF SLEEP PER NIGHT _____

For each of the remaining questions, circle the one best response

5. During the past month, how often have you had trouble sleeping because you:
   a. Cannot get to sleep within 30 minutes

   Not during the past month   Less than once a week   Once or twice a week   Three or more times a week

   b. Wake up in the middle of the night or early morning

   Not during the past month   Less than once a week   Once or twice a week   Three or more times a week

   c. Have to get up to use the bathroom

   Not during the past month   Less than once a week   Once or twice a week   Three or more times a week

   d. Cannot breathe comfortably

   Not during the past month   Less than once a week   Once or twice a week   Three or more times a week

   e. Cough or snore loudly

   Not during the past month   Less than once a week   Once or twice a week   Three or more times a week

   f. Feel too cold

   Not during the past month   Less than once a week   Once or twice a week   Three or more times a week

   g. Feel too hot

   Not during the past month   Less than once a week   Once or twice a week   Three or more times a week

h. Had bad dreams

Not during the past month   Less than once a week   Once or twice a week   Three or more times a week

i. Have pain

Not during the past month   Less than once a week   Once or twice a week   Three or more times a week

j. Other reason(s), please explain _____
_____
How often during the past month have you had trouble sleeping because of this?

Not during the past month   Less than once a week   Once or twice a week   Three or more times a week

6. During the past month, how would you rate your sleep quality overall?

Very good   Fairly good   Fairly bad   Very bad

7. During the past month, how often have you taken medicine (prescribed or "over the counter") to help you sleep?

Not during the past month   Less than once a week   Once or twice a week   Three or more times a week

8. During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?

Not during the past month   Less than once a week   Once or twice a week   Three or more times a week

9. During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?

No problem at all   Only a very slight problem   Somewhat of a problem   A very big problem

10. Do you have a bed partner or roommate?

No bed partner or roommate   Partner/roommate in other room

Partner in same room, but different bed   Partner in same bed

If you have a roommate or bed partner, ask him/her how often in the past month you have had:

    a. Loud snoring

Not during the past month   Less than once a week   Once or twice a week   Three or more times a week

    b. Long pauses between breaths while asleep

Not during the past month   Less than once a week   Once or twice a week   Three or more times a week

    c. Legs twitching or jerking while you sleep

Not during the past month   Less than once a week   Once or twice a week   Three or more times a week

    d. Episodes of disorientation or confusion during sleep

Not during the past month   Less than once a week   Once or twice a week   Three or more times a week

    e. Other restlessness while you sleep; please describe: _____
_____

Not during the past month   Less than once a week   Once or twice a week   Three or more times a week
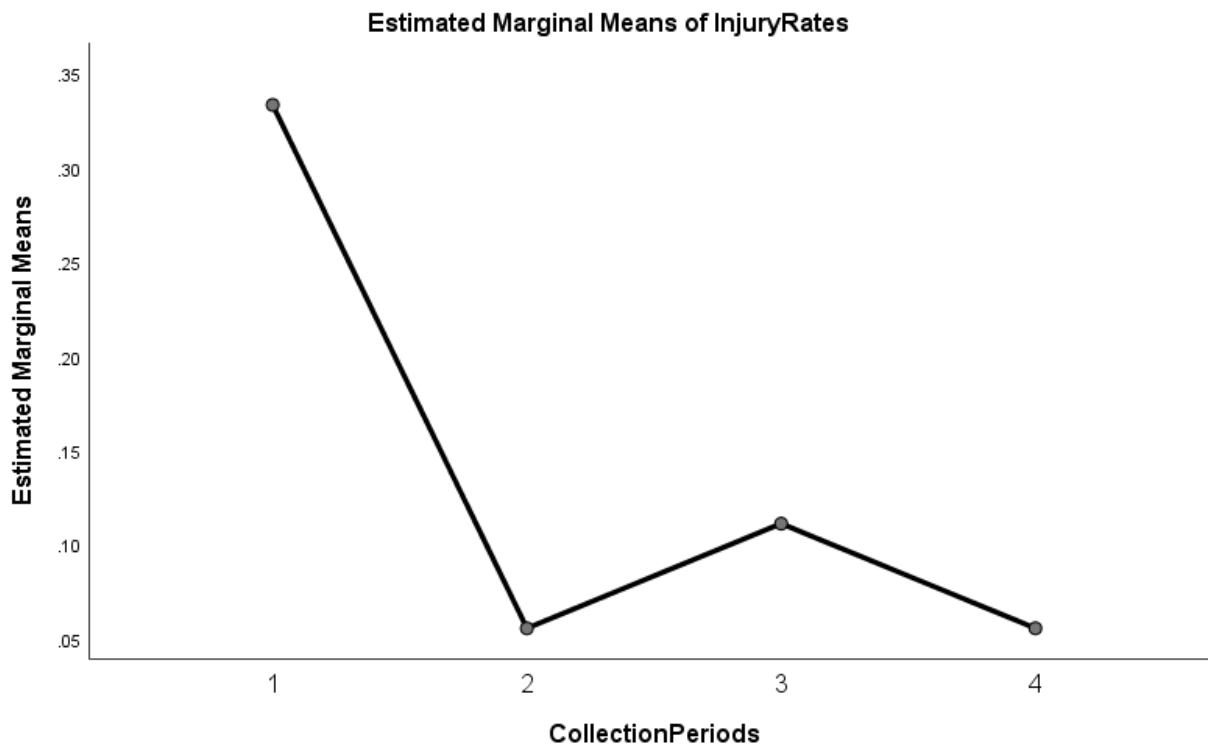
APPENDIX G

Figure 2. Line Graph of Changes in Injury Rates
Note. 1 = mid-October to mid-November. 2 = mid-November to mid-December. 3 = mid-December to mid-January. 4 = mid-January to late February.