Type D Personality and Injury Relationship in Collegiate Track Athletes

The Honors Program
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ABSTRACT

The purpose of this study was to examine Type D personality as an internal factor for injury risk in collegiate track athletes. A survey was administered to 275 track athletes across each of the three NCAA divisions. The survey included general questions about injury history, which included demographic type questions. A Type D Personality Inventory assessment was administered which measured negative affectivity and social inhibition (Blum, 2009). Additionally, the survey included a version of the Perceived Stress Scale (PSS), measuring an athlete's evaluation of situations that invokes a stress response (Cohen et al, 1983). Lastly, the survey included the Athletic Coping Skills Inventory (ACSI) ((Smith et al, 1994), which measures an athlete's psychological skills. Skills measured in this section included; coping under adversity, coach ability, concentration, confidence, goal setting, peaking under pressure, and freedom from worry. Logistic Regression results revealed that Type D personality is a significant factor for predicting athletic injury in collegiate track athletes. However, a discriminate analysis with the two factors of Type D personality, negative affectivity and social inhibition, revealed that only negative affectivity significantly predicted injury. Coping skills and perceived stress both had significant impacts on negative affectivity. Due to social inhibitions insignificant effect on predicting injury, it was not further looked into. Findings from this study provide essential information to athletic programs, coaches and athletes aiming to reduce injury risk among collegiate track athletes.

INTRODUCTION

Numerous studies have found that athletic injuries can be caused by not only external factors, such as environmental conditions, sport surfaces, equipment, temperature and intense play, but also internal factors. Internal factors include physiological and psychological variables. Research on psychological factors has been focused on the question of whether there is a personality type that makes an athlete more susceptible to sport injuries (Olmedilla et al, 2009). Research today is in agreement that sports injuries are multifactorial in origin, with some factors having greater or lesser influence on the injury, depending on the context of how it happened. Stress has been the main factor related to the increase in the probability of injury.

After 12 seasons of virtually injury free running throughout high school, I had been recruited to continue my running at the collegiate level. Throughout my nine seasons as a collegiate athlete, I missed 15 competitions and 32 weeks of training. College and high school are vastly different. In college the training demand, pressure to perform and level of competition is greater. In addition there is increased social and academic demands, all of which equal higher stress. I have often wondered how it is that some athletes thrive in collegiate athletics, while others, who had never previously struggled with injury, spend their entire collegiate career plagued with injury. I pondered whether personality is a risk factor, and if there is a personality that may place an athlete at a higher risk of injury due to their stress response.

LITATURE REVIEW

Type A and B Personality

Type A and B Personality theory was created by Meyer Friedman and RH Rosenman in the 1950's. Friedman and Rosenman were both cardiologists researching the possible causes of coronary heart disease. After a nine-year study of over 3,000 healthy men aged 35-59, Friedman and Rosenman speculated that certain patterns of behavior carried a higher risk. They identified what we know today as Type A and Type B personalities (Caripovic-Veselica et al, 1995).Friedman and Rosenman characterized Type A individuals as being aggressive, ambitious, hostile, impatient, and competitive, and thus more prone to coronary heart disease (CHD).

Type A personality is measured by high Achievement Strivings (AS) and Impatience Irritability (II) (Day et al, 2005). Individuals who are high in AS tend to be hard-working, active, and serious, whereas people who are high in II tend to be impatient, irritable, and angry. High Impatient irritability individuals tend to demonstrate low impulse control. The Impatience Irritability (II) factor of Type A Behavior has been linked to increased reporting of negative health symptoms, such as coronary heart disease, increased perceptions of stress, decreased life satisfaction, and increased depression. With regard to the achievement striving factor of Type A Behavior, individuals who are high in achievement striving report higher levels of job and life satisfaction (Caripovic-Veselica et al, 1995).Research has indicated that Achievement Striving is positively associated with academic and occupational performance, but not related to health problems. Impatience Irritability is positively associated with health problems, but unrelated to performance (Day et al, 2005).

Type B personality behavior is very much the opposite of type A and therefore on the scale that measures achievement strivings and impatience irritability would score low on both of these measures. Type B individuals experience less stress from the obstacles in daily life and feel less pressured by too many things to do (Ray, 1980).

Type C Personality

A 1984 study measured the physiological responses to stressful stimuli of three groups; patients with malignant melanoma (a potentially fatal form of skin cancer), people with heart disease, and a control cohort with no medical illness (Mate, 2005). The melanoma group proved most likely to deny any awareness of a stressful stimuli. This study demonstrated that people can experience emotional stresses with measurable physical effects on their system – "while managing to sequester their feelings in a place completely beyond conscious awareness" (Mate, 2005). It was in relationship to melanoma that the notion of a "Type C" personality was first proposed, a combination of emotional traits more likely to be found in those who develop cancer than in people who remain free of it. In the early 1990's results of research were interpreted in favor of a type-C cancer prone personality. However, the current view is in disfavor of the C-type personality, due to the lack of consistency in the research and a specific links between cancer and certain personality traits (Melville, 2016).

Type D Personality

Type D personality was described originally in cardiovascular patients and was a predictor of poor health status and an increased risk of mortality. It is also known as the "distressed personality" (Nyklíček et al, 2012, 362). Type D personality is characterized as the combination of high levels of both negative affectivity (NA) and social inhibition (SI) (Polman et al, 2010, 681). In order to be classified as having Type D personality one needs to score high on both the NA and SI scale. The combination of negative emotions and the inability to cope with these emotions is what defines Type D personality (Polman et al, 2010, 682). "Social inhibition (SI) is the tendency to inhibit the expression of emotions and behaviors in social interactions, which is related to the construct of introversion" (Geuens et al, 2015). It is associated with individuals being tense, having fewer personal ties, and being uncomfortable when socializing with other people (Nyklíček et al, 2012, 362). Negative affectivity (NA) is the tendency to experience negative emotions across time and situations, and is related to neuroticism. People with high levels of NA are likely to experience distress, anxiety, irritability, pessimism and worry as well as to have a negative view of oneself, the world, the future and others (Polman et al, 2010, 691). As a result, personality type is closely related to health and wellbeing, "Type D personality has been found to be positively

correlated with perceived stress as well as negatively correlated with social support from family and friends". Those with type D personality have been found to experience higher levels of chronic stress, emotional and social difficulties (Polman et al, 2010, 691).

There have been several studies concerning Type D personality. Research by Ogińska-Bulik investigated the role of Type D personality in perceiving stress at work and the development of adverse effects of experienced stress, such as mental health disorders and burnout syndrome (Ogińska-Bulik, 2006). The study was in agreement with the assumption that Type D personality plays an important role in the perception of job stress and the occurrence of negative health outcomes. Type D subjects in this study where found to be more likely to perceive their work environment as stressful due to a lack of rewards and a lack of control and responsibility. They also showed more symptoms of professional burnout, such as emotional exhaustion and lack of personal accomplishment, as well as mental health disorders (Ogińska-Bulik, 2006). Research by Polman in 2010 was in agreement with Ogińska-Bulik. Polman's research examined whether Type D personality contributed to the relationship between perceived stress and symptoms of burnout. Similar to Ogińska-Bulik the results from this study found Type D personalities displayed increased symptoms of burnout. In Polman's research type D personality was also found to be associated with lower levels of perceived social support from family and friends. In addition, perceptions of social support were associated with reduced stress and individuals who experience more stress were more likely to report higher burnout symptoms (Polman et al, 2010). Lynn Williams and Amanda Wingate also found that that Type D was associated with lower levels of perceived social support (Williams et al, 2012). However, Williams and Wingate also looked at the coping skills commonly used by type D personalities and found that Type D was associated with the use of avoidant coping and it was negatively associated with problem and emotion-focused coping. In addition, they found that social support and emotion-focused coping partially mediated the relationship between Type D and perceived stress, suggesting that social support and coping style can, in part, explain the relationship between Type D and perceived stress (Williams et al, 2012).

Stress Injury Relationship

There has been substantial research done on stress and it's relation to injury. This is due to the effect stress can have on the body. Anderson (Anderson et al, 1999, 736) notes that stress results in "generalized muscle tension, distractibility in the central field of vision, peripheral narrowing, and an increased state of anxiety. This makes it more difficult to detect peripheral cues that one is in harm's way or due to muscle tension, not being able to generate the motor pattern necessary to remove oneself from danger quickly, and, in a contact sport not being sufficiently relaxed to absorb the blow". For these reasons Injuries tend to occur 2 to 5 times more frequently in athletes with high, compared to low, life stress (Anderson et al, 1999, 736). It is not stress alone that can lead to an increase risk of injury, a study by Mark B. Anderson and Jean M. Williams looked at two NCAA Division 1 schools and injuries across ten sports at these schools. In this study they found that history of many negative life events, together with low social support, may leave athletes with less than optimal resources to handle stress (Anderson et al, 1999, 740). In addition Dr. Richard D. Gould, a professor at North Carolina Greensboro stated, "It is not the most aggressive, risk-seeking athlete who is most likely to be injured, but stressors such as family arguments, disagreement with teachers, difficult relationships with friends and inability to adequately cope with stressors (Gould et al, 2000, 40)." However, it is important to note that not all people respond negatively to potential situations and there are other factors to consider besides stress, as being a risk factor for injury. Such factors include being "tired" at practice or prior to a performance which can cause an athlete's mind to wander, causing him or her to perform poorly and merely "go through the motions" (Vernaccia, n.d., 4394). This is especially true in athletes at the collegiate level as the long training hours combined with travel, competition, academic and social demands, make it more difficult to satisfy sleep requirements.

Stress has been linked to a higher risk of injuries and negative physical effects in multiple research dealing with athletes and non-athletes. Petrie looked at the effects of life stress, psychological coping skills, competitive trait anxiety and playing status on injury in NCAA Division 1 football players. In his work he found that the potentially stressful situation of being a starter, in combination with higher levels of positive life stress and competitive trait anxiety, may negatively influence athletes' appraisals such that they either viewed practices

and competitions as threatening/uncontrollable or believed they did not have the resources to cope. Starters and nonstarters did not differ in the number of days missed due to injury, but the study suggested that being a starter, "in conjunction with high levels of the psychosocial variables places them at greater risk for injury and that there is a stress/injury relationship" (Petrie et al, 1993). Anderson found a similar conclusion in his work in which he measured changes in state anxiety, visual perception and reaction time during stress among 196 collegiate athletes participating in 10 sports. In Anderson's study, he found that those individuals who were low in a variable that buffers stress responsively (e.g. social support), found their negative life events and peripheral narrowing under stress were substantially related to their number of injuries. Bood conducted research on non-athletes and the affect stress has on them. He looked at the relationship between personality and experience of stress in regard to four types of affective personality; self-destructive, low affective, high affective and self-actualizing (Bood et al, 2004). The study found that the most stressed individuals tended to be placed in the self-destructive group and the least stressed placed in the self-actualizing group. This is similar to Petrie's and Anderson's findings as it supports the idea that high stress levels have a negative impact on health and wellbeing (Anderson et al, 1999).

There are numerous models that try to establish a connection between psychological factors and the occurrence of sport injuries. Due to the large volume of previous research based on it, this study will focus on Williams and Andersen's (1998) "stress injury model".

The stress injury model has three core factors; personality, history of stressors, and coping resources. It is hypothesized that one's stress history contributes directly to the stress response, while personality factors and coping resources may act on the stress response either directly or through the effects of the history of stressors. The model relies on the assumption that the two basic mechanisms behind the stress-injury relationship are increases in general muscle tension and deficits in attention during stress. The hypothesis behind the model is that "individuals with a lot of stress in their lives who have personality traits that tend to exacerbate the stress response and few coping resources will, in a stressful situation, be more likely to appraise the situation as stressful, exhibit greater muscle tension and attentional

changes, and thus be at greater risk of injury compared to individuals who have the opposite profile".

An individual's history of stressors (i.e., major life events, chronic daily problems, and previous injuries) should have a substantial impact on the stress response, and thus on injury risk. A thorough assessment of the stressors in an athlete's life may give the coach, trainer, or sport psychologist a good estimate of how much at risk of injury that athlete is, at least from a history-of-stressors. Although the stress-athletic injury literature is not as substantial as the stress-illness research, there is support for a life event/stress-injury relationship. This relationship has been particularly well established for football but, attempts to test the effects of life stress outside of football have been some-what unclear. An assessment of previous injuries (and their severity), incurred by an individual, should be included in looking at an athlete's injury history. If the athlete has not recovered enough to return to the sport but does anyway, the probability of re-injury is high. Also, if the athlete is physically but not psychologically prepared to return to sport participation, problems may arise due to negative cognitive appraisals. Fear of re-injury may lead to a considerable stress response and may actually increase the probability of re-injury. The history of previous injuries, and the psychological and physical rehabilitation of the athlete, are extremely important as their role in re-injury may outweigh other contributing factors in the stress injury relationship (Anderson et al, 1999).

Personality role in the stress injury relationship is strongly related to cognitive appraisal. Certain personality traits make some individuals less likely to perceive situations and events as stressful or may predispose one to be less susceptible to the effects of the stressors (Petrie, 1993). Two such personality traits are trait anxiety (Petrie, 1993) and low self-confidence (Kolt & Roberts, 1998; Johnson, 2006). Lavallee and Flint (1996) found that there were positive relationships between high competitive anxiety and injury. Additional personality factors that have been found to link to injury susceptibility are hardiness, locus of control, sense of coherence, competitive trait anxiety, achievement motivation and sensation seeking (Williams & Andersen, 1998). Locus of control is related to an athlete's perceived control over the outcome of any given situation. There are two different loci of control, internal locus

and external locus. Someone with high internal locus of control would recognize that the outcome is within their control. Pargman and Lunt (1989) found in their study that the risk of being injured had a positive relationship with external locus of control. In another study Kolt and Kirkby (1996) discovered that a high internal locus of control was correlated with a high number of injuries among elite gymnasts. There are also studies that claim that mood states could be related to injury occurrence. Williams, Hogan and Andersen (1993) stressed that athletes with positive states of mind early in the season experienced less injuries during the season.

Coping resources comprise a wide variety of behaviors and social networks that help the individual deal with the problems, joys, disappointments, and stresses of life. General coping behavior is comprised of several diverse behaviors that may influence an athlete's overall stress level. This includes sleep patterns, nutritional habits, time management, and general self-esteem. Additionally, if the athlete is a student, study skills are a factor. Lack of good general coping behaviors in this category may easily lead to higher stress and thus greater risk of injury. In the area of athletic injury, Williams, Tonymon, and Wadsworth (1986) found that general coping resources—measured by the Miller and Smith (1982) Vulnerability to Stress subscale of their Stress Audit Questionnaire—were directly related to injury.

Athletes who had low coping resources were more likely to be injured than those with better coping resources. One major source of coping resources is the extent and kind of social support system an athlete has. Agreement on what constitutes social support and how to measure it has been lacking in the stress literature. Social support from significant others such as coaches, parents, partners, and sport psychologists are factors in obtaining control over stress. “When an individual feels in control of an individual’s experiences and over a particular stressor, stress reactivity will be reduced. Since stressors are usually random and inevitable, perceptions of available support provide some degree of control and in turn influence stress reactivity” (Polman et al, 2010, 683). Social support is even more important in an athlete who has sustained a minor injury that requires rest and treatment. Without social support the athlete may feel worthless for not being able to contribute to the team and if the coach reinforces this mindset, the player may try to play through an injury to remain part of

the team. A sense of 'worthlessness' is not the only damaging mindset a coach can instill in an athlete, attitudes such as 'no pain, no gain', and a 'give 110%' attitude might lead athletes to take undue risks and therefore sustain injury(Crust, n.d.,2).

Stress is unavoidable, as every person comes across stress throughout a single day. However, athletes experience stress even more than the average individual with training every day and frequent competitions. Since Type D personality is related to how one copes with stress, it is important to look at the effect coping strategies can have on an individual. Roth and Cohen (1986, 813) defined coping as the "cognitive and emotional activity that is oriented towards or away from a threat". Every individual has their own strategies to cope with life stressors. Some are more productive and helpful than others. Two types of coping strategies for dealing with stressful situations are avoidance coping and approach oriented coping. Approach-oriented coping is concerned with behaviors that attempt to reduce stress by alleviating the problem directly, whereas avoidance-oriented coping is concerned with activity or cognitive changes to avoid confrontation with stressors using distractions or social diversion (Polman et al, 2010, 691). Avoidance coping is the most relevant form of coping among those with type D personalities due to the passive and limited confrontation nature of it. However, avoidance is not a productive coping method. Most avoidance coping strategies provide a temporary removal from the stressful situation, however, disengagement from goals can only last for so long. If a person initially disengages from a situation that eventually cannot be avoided, then increased levels of stress will be expected (Polman et al, 2010, 691). A study conducted by Andreas Ivarsson and Urban Johnson performed on senior soccer players examining psychological factors as predictors of injuries, found that psychological factors such as high stress levels and ineffective coping could increase the injury risk among athletes (Johnson, 2011, 136). This is not the only study to highlight the effect coping strategies has on injury risk, as Crust had said that "learning to cope with stress can avoid negative symptoms such as attentional disruptions and muscular tension as well as act as a buffer to reduce likelihood of injury"(Crust, n.d.,2) .

Stress and Injury Reduction and Prevention

Research has been done on the reduction of stress as well as identifying Type D characteristics. By adopting some of these tactics for their team, coaches may help reduce the risk of injury. In a study performed on normal, but distressed individuals, mindfulness based stress reduction intervention was found to reduce negative affectivity and social inhibition. Both of these are characteristics of Type D personality (Nyklíček et al, 2012, 362). Nyklíček defines mindfulness as the "state of being attentive to and aware of, what is taking place in the present in an open, accepting and nonjudgmental way". The purpose of this study was to increase one's degree of mindfulness. This was done through exercises that taught breathing and observing sensations in the body, moving mindfully (yoga), and various forms of sitting meditation. In this study, mindfulness was found to have a larger effect on negative affectivity rather than social inhibition and had no effect on Type D classification. However, it did illustrate that the degree of Type D personality characteristics can be reduced (Nyklíček et al, 2012, 362).

In addition to daily life stress, athletics adds a large degree of stress, especially to an already overwhelmed individual. There has been substantial research done on how to reduce sport related stress. Across research there is a consensus of the importance of recovery and sleep to reduce stress and prevent athletic injury. Vernaccia (1997) outlined a four phased recovery process to relieve post competitive stress, provide adequate rest and relaxation opportunities for athletes, and to relieve post-competitive stress. The four phases are:

1) Satisfy nutritional and hydration needs
2) Get adequate sleep and rest
3) Have relaxation time and a social support system
4) Include daily stretching and active rest

Vernaccia also stressed the importance of the role coaches play in an athlete's performance, stress levels, and injury risk. According to Vernaccia the coach-athlete relationship is the primary mechanism which coaches and athletes can assess, monitor and recover from imposing stress. Coaches should be attuned to their athletes and develop an observational and conversational relationship with their athletes that results in the design and implementation of

flexible and developmentally appropriate training programs and racing schedules. Coaches should monitor stress levels of athletes to recognize physical behavioral and emotional symptoms of stress that interfere with recovery and restoration phases of training (Vernaccia, 1997 4394).

Gould agreed with Vernaccia on the importance of the role a coach plays on an athlete. He mentioned that there is a reduced risk of injury with open communication between coaches, parents, trainers and athletes. But in addition to mindfulness, rest, and coaching, he mentioned goals as a way to reduce sport related stress and athletic injury and to perform at one's best. Goal setting provides direction, an opportunity to reflect improvement in performance/ recovery (short term goals), and help identify areas of strength and areas that need improvement (Gould, 2000, 40). Gould suggested using SMARTER goals:

SMARTER GOALS

- Specific
- Measurable
- Acceptable
- Realistic
- Time-phased
- Exciting
- Recorded

A specific goal means the goal is well defined and is clear and unambiguous, one knows exactly what they want to accomplish with all the details. A goal that is measurable has specific criteria for measuring progress toward the accomplishment of the goal you set. Also, goals need to be acceptable and realistic. A good goal is important to you, you believe you can control the outcome, and you must realize that you can only control your own performance. For example, winning a championship is a difficult goal to accept if you practice hard but get little or no playing time in the games. In addition, goals must be time-phased. This means that there are intermediate goals that are realistic to achieve and there are target dates for the achievement of your goals. Exciting goals allow you to feel good about your accomplishments and pleased about performance rather than worried about the outcome. Lastly, goals should be recorded. It is a good idea to keep a journal to help monitor your

progress and evaluate practices and competitions for improvements in performance. By recording progress one can adjust goals if situations change, for example, you get injured or your role on the team changes (Gould, 2000, 42).

Why Type D

Type D Personality is characterized by high negative affectivity which is related to higher levels of self-reported stress and poor coping skills. In addition people who express high negative affectivity, on average have higher levels of distress and anxiety. The other component of Type D Personality, social inhibition, is characterized by anxiety in social interaction. College life and athletics, involve a high level of social interaction. Being around your peers every day, not only during practice, but during class time and living arrangements as well. Therefore, those with a high level of social inhibition would be under a considerable amount of perceived stress.

Few personality traits have been found to be associated with the onset of athletic injuries. Psychological stress, however, has been shown to predict increases in injury. Therefore, stresses resulting from major life events, (e.g., moving to a new city or school or losing a loved one), as well as minor daily hassles, such as having a hectic schedule, have been associated with an increased risk of injury. Psychological factors do not typically cause injury by themselves. Rather, they increase the risk of being injured when other physical factors such as muscle imbalances, exist or when athletes are placed in injury-threatening situations (e.g., when physical contact is made in an awkward position). Stress is thought to increase the risk of injury because of the unwanted disruption in concentration or attention and increased muscle tension associated with heightened stress. Athletes especially prone to injury seem to be those who experience considerable life stress, who have little social support from others, and who possess few psychological coping skills. According to the Stress Injury Model, Type D Personalities response to stress and high level of perceived stress, could be at a higher risk of athletic injury.

Prior to examining Type D Personality relationship to athletic injury in collegiate track athletes the following hypotheses were formed.

- H1: Type D personality is a significant predictor of athletic injury in collegiate track and field athletes and those with Type D personality are at a higher risk of injury
- H2: Both negative affectivity and social inhibition are significant contributors to predicting athletic injury due to the increase stress response of having high levels of negative affectivity and social inhibition.
- H3: Lower scores on the athletic coping skills and higher perceived stress would indicate a higher negative affectivity and social inhibition.

METHODOLOGY

Participants

One hundred forty five NCAA athletes encompassing schools from the three NCAA divisions volunteered to participate (70 females and 75 males). The athletes represented freshman-5th year graduate students (37 freshman, 33 sophomore's, 30 juniors, 33 seniors and 12 graduate students). Five different event groups were represented in addition to those who compete in cross country: short sprints, long sprints, hurdles, mid-distance, and long distance. The sample included both those who had encountered an injury in the past year and those who have not (37 had not had any injury, 43 missed 1-7 days, 15 missed 1-2 weeks, 9 missed 3-4 weeks and 47 missed over a month).

Measures

A survey was distributed to NCAA athletes in all three divisions by a combination of direct emails to athletes, coaches and social media. The survey consisted of four parts. The first part consisted of general questions about injury history in the past year and training level. The next part of the survey measured negative affectivity and social inhibition. These questions where measured on a 4-point likert scale (false, less false, neutral, less true, true). False equaled 0 points and true equaled 4. A score of 10 and higher on both negative affectivity and social inhibition indicated type D personality. The next part of the survey was the Perceived Stress Scale (PSS). This part of the survey consisted of ten questions about an individual's evaluation of situations. The questions are based off an individual's evaluation of a situation because it is the evaluation of a situation that invokes the stress response rather than the event itself. This survey was measured on a 4- point likert scale (0 = Never 1 = Almost Never 2 = Sometimes 3 = Fairly Often 4 = Very Often). Scores ranging from 0-13 are considered low stress, 14-26 are considerate moderate stress and lastly scores ranging from 27-40 are considered high stress (Cohen et al, 1983). The last section of the survey was the Athletic Coping Skills Inventory (ACSI) which measures an athlete's psychological skills (Smith et al, 1994). Statements that athletes have used to describe their experiences were listed and participants had to rate the frequency with which they happen (almost never, sometimes, often, almost always).

Procedure

The survey was created on kwiksurveys.com and was submitted to the university's Institution Review Board (IRB) and after approval the survey was launched on October 15, 2016. The survey was distributed to collegiate athletes competing in Division I, II, and III through email directly to collegiate coaches and athletes, as well as through social media. Prior to starting the survey, participants received an informed consent form that explained the purpose of the study and the voluntary and anonymous nature of the survey. The survey was closed on 2/1/2016.

Ethical Concerns

In doing my research there were several issues and limitations that I had to be aware of. One issue included participant dropout rate in the surveys. Not every participant may answer every question or finish the survey. In doing my analysis I will need to be sensitive and aware of this. 175 athletes accepted the informed consent form to move on but only 145 finished the survey. Another potential issue is the particularly small sample of athletes I got, a total of 145 students, while they encompass all divisions, and male and female this sample may not be representative of all NCAA Track and Field Athletes. It may just represent a specific type of student athlete that would take the time to fill out the survey. This would make it difficult to come to a solid conclusion or analysis. In addition in conducting the survey I have to present the participants with full disclosure about the nature of the study, and have them consent to participate before they take the survey. Another ethical concern is privacy, in conducting the survey I kept all answers anonymous.

RESULTS

Logistic Regression: Type D Personality and Injury

The first regression attempted to answer the following question: What are the leading contributing factors of injury in collegiate track and field athletes? Data from the Type D Measurement, Perceived Stress Scale and Athletic Coping Skills Inventory portions of the survey were used to answer this question. The dependent variable was injury, while the explanatory variables included Type D Personality, coping adversity, coachability, concentration, confidence, peaking under pressure, freedom from worry, goal setting, and athletic stress. Type D personality was defined as those who scored 10 or higher on both Negative Affectivity and Social Inhibition. Prior to running the model, it was hypothesized that Type D personality is a significant predictor of athletic injury in collegiate track athletes. (Refer to H1). There has not been a previous study that has looked at Type D Personality as a predictor for athletic injury. However, the American College of Sports Medicine has published an article on the psychological issues related in Athletes. This article discussed medical issues related to athletic injuries. Medical issues discussed included the effects that stressful life events may contribute to the risk of athletic injuries beyond just the physical and environmental factors. The article objects to any "injury prone" personality type, but supports the idea of a relationship between stress and athletic injury. The prediction that Type D personality may predispose an athlete to a higher injury risk stems from the fact that those with type D personality have been found to experience higher levels of chronic stress, emotional difficulties and social difficulties. They therefore have a high negative response to life stress (Polman et al, 2010, 691). Results that were statistically significant at the five percent level of significance were reported. This model predicted that overall, Type D Personality was the only significant internal factor in predicting athletic injury in track and field athletes (Table1). This concluded that the initial hypothesis was correct, that there is a relationship between Type D personality and Athletic Injury in Collegiate Track and Field Athletes. While this model did find that Type D personality impacted athletic injury, it did not distinguish which aspect of this personality, negative affectivity or social inhibition, had the greater impact on injury.

Table 1. Injury Contributing Factors

	DF	Odds ratio	St. β	St. Error	Wald Chi-Squared	Sig.
Type D Personality(0)	1	.327	-.5588	.2250	6.1700	.0130
Intercept	1		-.4850	.2250	4.6471	.0311

Using the model to analyze the effect Type D Personality had on Injury, revealed that the odds of being injured, if you have Type D personality, is 32.7% higher. This can be attributed to the fact that those who are high on the Type D scale have high negative affectivity which makes one likely to experience a high level of extreme distress, anxiety, irritability, pessimism and worry, as well as to have a negative view of oneself, the world, the future and others (Nyklíček et al, 2012, 362) (Polman et al, 2010, 691). These feelings create a high level of perceived stress. Those with Type D personality often lack the coping mechanisms to properly manage this stress. Since stress causes attentional changes that interfere with an athlete's performance it would be expected that those with Type D personality would have a higher risk of injury.

Discriminate Analysis: Negative Affectivity and Social Inhibition

The second regression attempted to answer the following question: What aspect of Type D personality is related to injury? Data from the Type D classification portion of the survey were used to answer this question along with responses to the amount of time missed due to injury. A month or more consecutive days missed due to injury was classified as severely injured and anything less than a month injured was considered not injured/ not severe. For this model, injury was the classification variable and negative affectivity and social inhibition were the analysis variables. Prior to running this model, it was hypothesized that both social inhibition and negative affectivity would be significant internal factors in increasing ones risk of injury. Negative affectivity has been defined as the tendency to experience negative emotions across time and situations and has been linked to people who experience a high level of distress, anxiety, irritability and worry (Polman et al, 2010, 691). Social inhibition on the other hand is the tendency to inhibit the expression of emotions and behaviors in social

interactions, which is related to the construct of introversion. It is associated with individuals being tense, having fewer personal ties and being uncomfortable when socializing with other people (Nyklíček et al, 2012, 362). In order to be Type D personality one has to score high on both negative affectivity and social inhibition and it was thought that both traits would contribute a high level of stress and therefore put an athlete at a greater risk of injury. Discriminate analysis results revealed that social inhibition was not a significant predictor of athletic injury, however negative affectivity was (Table 2).

Univariate Test Statistics DF(1,134)					
	Total Standard Deviation	Pooled Standard Deviation	R-Square	F Value	Pr>F
Negative Affectivity	6.2325	6.1316	0.0393	5.48	0.0207
Social Inhibition			0.0103	1.40	.2390

Looking at the table of correctly classified results, it is evident that a model containing negative affectivity and social inhibition does not do a good job at predicting injury in collegiate track and field athletes. Of the 45 injured athletes modeled, only 5 are correctly classified as injured.

Percent Classified into Injury			
	Injured	**Not Injured**	**Total**
Injured	5	40	45
Injured percentage	11.11	88.89	100.00
Not Injured	4	87	91
Not Injured Percentage	4.4	95.60	100.00
Total	9	127	136
Total Percentage	6.62	93.38	100.00

The same model without social inhibition was run producing very different results. Negative affectivity as the lone analysis variable correctly predicted 26 of the 45 injured athletes which is 46.67% more. However, more athletes were classified as injured when they weren't. 36.26% of non-injured athletes were classified as injured as opposed to only 4.40% with social inhibition in the model. The model with social inhibition had a 36% misclassification rate compared to the model with just negative affectivity which had a 38% misclassification rate. However, despite the slightly higher misclassification rate, the model with just negative affectivity produced more false positive results (predicting injury when there is not) than a false negative result (predicting no injury when there is). One may argue that this is a preferable result in that athletes with the potential for an impending injury can be readily identified. The model without social inhibition better predicts injury.

	Injured	**Not Injured**	**Total**
Injured	26	19	45
Injured percentage	57.78	42.22	100.00
Not Injured	33	58	91
Not Injured Percentage	36.26	63.74	100.00
Total	59	77	136
Total Percentage	43.38	56.62	100.00

These results can be attributed to the fact that negative affectivity is more closely related to how one appraises a situation and perceived stress. The higher ones negative affectivity the higher their perceived stressed and the lower their confidence in the means to cope with the stress. Whereas with high social inhibition, stress would only be heightened in social situations and those with high social inhibition usually try to avoid those stressful social situations. An athletic event or practice at the collegiate level requires a high level of attentional focus. Therefore it might be viewed less as a social situation and would not be constituted as a stressful situation for one with high social inhibition.

Regression:

The third model attempted to answer the following question: What factors are leading predictors of negative affectivity in collegiate track athletes? Data from the Athletic Coping Skills Inventory (ACSI) and Perceived Stress Scale (PSS) portions of the survey were used to answer this question. The dependent variable was negative affectivity, while the explanatory variables included athletic stress, coping under adversity, coach ability, concentration, confidence, goal setting, peaking under pressure, and freedom from worry. Prior to running the model, it was hypothesized that lower scores on the athletic coping skills and higher perceived stress would indicate a higher negative affectivity. This prediction stemmed from

previous research that determined that those with Type D personalities perceived their work environment as stressful because of lack of rewards, lack of control and responsibility (Ogińska-Bulik, 2006). In addition Type D has been negatively associated with problem and emotion-focused coping (Williams et al, 2012). Athletics at the collegiate level is the equivalent of a part time job and it would be expected that those with Type D personality would view it similarly as a non-athlete Type D personality would with work. Since high negative affectivity is a key aspect as being characterized as Type D personality, it would be expected that they would also have a high perceived stress level and a lack of coping skills. Results that were statistically significant at the five percent level of significance were reported. This model predicted that freedom from worry was the leading predictor of high negative affectivity. However, athletic stress, coping under adversity, coachability, concentration, confidence, goal setting, peaking under pressure all contributed significantly to negative affectivity. This concluded that the initial hypothesis was correct. Coping skills and perceived stress contribute significantly to ones negative affectivity. The negative coefficients on coping under adversity, coach ability, concentration, confidence, goal setting, peaking under pressure and freedom from worry indicate that low coping skills result in high negative affectivity and the positive coefficient of perceived stress indicates that the higher the perceived stress one has the higher negative affectivity one would have.

Analysis of Variance					
	DF	Sum of Squares	Mean Square	F Value	Pr>F
Model	8	4684.4437	585.5546	2070.20	<.0001
Error	108	30.54774	0.28285		
Corrected Total	116	4714.9914			

Root MSE	**0.53184**	**R-Square**	**0.9935**
Dependent Mean	8.45299	Adj R-Sq	0.9930
Coeff Var	6.29169		

Parameter Estimates						
Variable	**DF**	**Parameter Estimate**	**Standard Error**	**t Value**	**Pr > |t|**	**Standardized Estimate**
Intercept	1	0.19520	0.17885	1.09	0.2775	0
16_coping_adversity	1	-2.07598	0.04441	-46.74	<.0001	-0.87792
16_coachability	1	-2.00196	0.03482	-57.50	<.0001	-1.13680
16_concentration	1	-1.94851	0.03451	-56.46	<.0001	-0.91556
16_confidence	1	-1.89906	0.03542	-53.62	<.0001	-1.02689
16_goal_setting	1	-1.95192	0.02966	-65.82	<.0001	-0.59670
16_peaking_pressure	1	-1.99469	0.03432	-58.12	<.0001	-1.06870
16_freedom_from_worry	1	-2.14515	0.03352	-63.99	<.0001	-1.06843
15_Athletic_Stress	1	0.98323	0.00849	115.77	<.0001	5.54059

Comparing the Means:

While the above models revealed many interesting trends between injury and components of Type D Personality, there are additional factors that where predicted to be important to collegiate track Type D and Injury relationship that have not been covered. These factors included gender, year, division, scholarship, hours spent training each week and when one started the sport. One-Way ANOVAs were performed in order to compare the means of different groups to determine whether there were significant differences in the levels and the components of Type D Personality. Since negative affectivity was concluded as the only significant variable, the analysis of means in this discussion was limited to negative affectivity as the dependent variable. Results were only reported at the five percent level of significance.

- Gender: There were no statistically significant differences in negative affectivity across gender. Whether you were a female or a male had no significant impact on your levels of negative affectivity.
- Year: There were no statistically significant differences in negative affectivity across year one is in college. Whether you were a freshmen, sophomore, junior, senior or graduate student had no significant impact on your levels of negative affectivity.

- Division: There were no statistically significant differences in negative affectivity across division. Whether you competed at Division 1, Division 2 or Division 3 had no significant impact on your levels of negative affectivity.
- Scholarship: There were no statistically significant differences in negative affectivity across those with scholarship versus those without. Whether you were a received money or not had no significant impact on your levels of negative affectivity.
- Hours Spent Training: There were no statistically significant differences in negative affectivity across those who spent less training compared to those who spent more hours training. Whether you trained less than 10 hours a week, over 20, or somewhere in the middle, had no significant impact on your levels of negative affectivity.
- Age Introduced to Track: There were no statistically significant differences in negative affectivity across the age one began in the sport. Whether you started track in elementary school or college had no significant impact on your levels of negative affectivity.

DISCUSSION

This study provides an overview of how Type D Personality relates to the stress injury model in collegiate track and field athletes. This study used previously used scales to measure Type D personality, coping resources and daily athletic stress.

Key Findings:

- Type D Personality proved to be a significant predictor of athletic injury. However, when the components of Type D Personality were broken down, negative affectivity significantly predicted athletic injury while social inhibition did not.
- While coping adversity, coachability, concentration, confidence, goal setting, peaking under pressure, freedom from worry and athletic stress did not significantly impact ones risk of athletic injury they did significantly impact an athlete's negative affectivity score which in turn significantly predicted athletic injury in collegiate track athletes.
- Coping adversity, coachability, concentration, confidence, goal setting, peaking under pressure, freedom from worry all had a negative relationship to negative affectivity implying the lower coping skills an athlete has, the higher their negative affectivity will be.
- Gender, year, division, scholarship, hours spent training, age introduced to track all were not significant indicators of negative affectivity.

Implications of the Study

Research on Type D Personality relationship to injury is lacking compared to other personality measures that have been around longer such as Type A and B. Identifying the relationship between Type D Personality and athletic injury in collegiate track athletes, can be useful to coaches, athletic programs in reducing the risk of injury. By putting in place methods to reduce negative affectivity we can, in turn, reduce injury risk. This information is also helpful to athletes as it addresses athletic related stressors and athletic related coping skills that can be strengthened to decrease athletic injury risk. Staying healthy is the primary goal of every collegiate athlete, as one cannot compete while sidelined.

Study Limitations & Future Directions

Limitations of this study are identified below. Additionally, recommendations are offered concerning how future research of personality of collegiate track athletes can avoid such limitations.

1. *Expanding Sport Coverage*:

This study concentrated specifically on running athletes in track and field. It did not address those who participate in the field events. In expanding coverage to all track and field events, differences in the relationship between Type D personality and injury may be revealed. Additionally, future research should look into coverage of individually based sports such as track and field, gymnastics and swimming, and compare the results to team based sports such as soccer, baseball and basketball, to see if social inhibition becomes an important factor in athletic injury there.

2. *Shorten Survey and Increased Sample Size:* The survey contained three separate surveys used in different research, while tailored to athletes, participants did not know how much longer of the survey they had left potentially contributing to the 27% drop out rate. In future research limiting the survey to a demographic page and then the actual survey may reduce the dropout rate. In addition having a larger sample of athletes would increase the reliability of the results and allow for a training and validation data set when running statistical results. Without a validation data set, the results are valid toward the sample but are not a reliable result for the whole collegiate track community.
3. *Measure other Personality Types and Factors:* This study focused on specifically Type D Personality. Future studies incorporating Type A, B and C Personality traits in addition, would allow for comparison of different personality types to see if there is a significant difference among personality factors, or if the incidence of injury is similar across all personalities.
4. *Expand the Scope:* This study looked specifically at the collegiate level. Future research should incorporate the high school and post collegiate level to determine if there are similar trends or unique difference across the different levels of competition.

It would also be interesting to incorporate first hand experiences of injured athletes and learn more about their injury history, in addition to where they measured on the Type D Personality Scale.

APPENDICES

Appendix A – Sample Letters and Survey

A.1 Sample Letters to Athletes

Dear Track &Field Athlete,

My name is Annmarie Tuxbury and I am a Senior at Bryant University. I am conducting a research study for my honors capstone project on athletic injury in collegiate track and field athletes. I am asking, as a fellow member of the track community, for you all to take my quick 5 minute survey. If you have friends that run track at different universities, please feel free to forward this email along to them as well. Thank you in advance for your help, it is truly appreciated.

SURVEY:

https://kwiksurveys.com/app#/598221/analyze/-1

Sincerley,

Annmarie Tuxbury

A.2 Sample Letters to Coaches

Dear Track & Field Coaches,

My name is Annmarie Tuxbury and I am a senior at Bryant University in RI. I am writing to request the participation of your athletes in a study I am conducting as part of my graduation requirements. The study I am conducting involves investigating injury risk factors of college track athletes across all divisions. I spent a good portion of my time as a collegiate track athlete injured and also witnessed many of my fellow athletes on my team and other teams sidelined and hampered by injury. I also had teammates and had friends of whom never missed a day due to injury. I often wondered if there was a common trait or factor that the commonly injured athletes shared that made us more susceptible to injury than others.

If you would like to help out, please send the following survey link to your athletes:

https://kwiksurveys.com/app#/598221/analyze/-1

If you are interested in the conclusions and findings of this study, please do not hesitate to contact me, as I would be more than happy to share my final report. Thank you in advance for your time and any effort you may extend on my behalf. Best luck with the end of the cross country season and the upcoming track and field seasons.

Sincerely,

Annmarie Tuxbury

A.3 Survey

Introduction And Informed Consent

Hi,
I am a Senior Honors student at Bryant University completing my capstone research project. You are invited to play an important part of an independent, significant research project about athletic injurie in collegiate track and field athletes. The purpose of this research is to better understand what factors increase one's risk of injury. If you agree to participate in this study, you will completely the following survey which consist of demographics and then three short surveys. It should take 5-10 minutes to complete. Be assured that your responses will be treated with confidentiality. Participation is voluntary and if you decide to participate you are also free to discontinue your participation at any time. By marking yes you are stating that you have decided to participate and that you have read the information above.

If you have any addition questions please contact Annmarie Tuxbury (atuxbury@bryant.edu), a student at Bryant University.

Thank you for your participation in this study.

Annmarie Tuxbury

1) I agree to participate in this study...	
Yes	
No	

2) What is your gender?	
Male	
Female	

3) What year are you?	
Freshman	
Sophmore	
Junior	
Senior	
Graduate Student	

4) In what events do you participate in? Choose all that apply.	
Short Sprints	
Long Sprints	
Hurdles	
Middle Distance	
Long Distance	
Cross Country	

5) In a typical week how many hours do you spend training?	
Less than 10 hours	
10-15 hours	
15-20 hours	
25+ hours	

6) How much time in the past year have you missed training due to injury?	
None	
1-7 days (sporadic)	
1-2 weeks	
3-4 weeks	
1 month +	

7) At which division do you compete in college Track & Field?	
Division I	
Division II	
Division III	

8) When did you first begin participating in Track and Field?	
Elementary School	
Middle School	
High School	
College	

9) Do you have an athletic scholarship?	
Yes	
No	

10) Number of days of modified practice (taping, unable to do certain activities, etc.)

11) List any athletic injuries you have had in the past year.

12) Number of days of missed practice do to athletic injury

INSTRUCTIONS: Below are a number of statements. Simply indicate TRUE or FALSE with each statement by marking the corresponding button. Try not to take too much time on individual questions. Be assured, there are no 'right' or 'wrong' answers or trick questions; the first response that comes to mind is probably the right one for you. If you find some of the questions difficult, please give the answer that is true for you in general or for most of the time.

13) Please rate these statements by how much they relate to you.					
	False	Less False	Neutral	Less True	True
I often make a fuss about unimportant things					
I often feel unhappy					
I am often irritated					
I take a gloomy view of things					
I am often in a bad mood					
I often find myself worrying about something					
I am often down I the dumps					

14) Please rate these statements by how much they relate to you.					
	False	Less False	Neutral	Less True	True
I often feel inhibited in social interactions					

I find it hard to start a conversation					
I am a closed kind of person					
I would rather keep people at a distance					
I find it difficult to talk to people I am not well acquainted with					
I find it difficult to make contact easily when I meet people					
When socializing I don't find the right things to talk about					

15) During the last month....					
	Never	Almost Never	Sometimes	Fairly often	Very Often
....how often have you been upset because of something that happened unexpectedly?					
…how often have you felt nervous and "stressed"?					
...how often have you felt that you were unable to control the important things in your life?					
....how often have you felt confident about your ability to handle your personal problems?					
...how often have you felt that things were going your way?					
....how often have you found that you could not cope with all the things you had to do?					
...how often have you been able to control irritations in your life?					
...how often have you felt that you were on top of things?					
...how often have you been angered because of things that were outside of your control?					
...how often have you felt difficulties were piling so high that you could not overcome them?					

16) 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 to much time on any one statement.

	Almost Never	Sometimes	Often	Almost Always
On a daily or weekly basis, I set very specific goals for myself that guide what I do				
I get the most out of my talent and skills				
When a coach tells me how to correct a mistake I've made, I tend to take it personally and get upset				
When I'm playing sports, I can focus my attention and block out distractions				
I remain positive and enthusiastic during competition, no matter how badly things are going				
I tend to play better under pressure because I think more clearly				
I worry quite a bit about what others think of my performance				
I tend to do lots of planning about how to reach my goals				
I feel confident that I will play well				
When a coach or manager criticizes me, I become upset rather than helped				
It is easy for me to keep distracting thoughts from interfering with something I am watching or listening to				
I put a lot of pressure on myself by worrying about how I will perform				
I set my own performance goals for each practice				
I is easy for me to; keep distracting thoughts from interfering with something I am watching or listening to				
I put a lot of pressure on myself by worrying about how I will perform				

I set my own performance goals for each practice				
I don't have to be pushed to practice or play hard; I give %100				
If a coach criticizes or yells at me, I correct the mistake without getting upset about it				
I handle unexpected situations in my sport very well				
When things are going badly, I tell myself to keep calm, and this works for me				
The more pressure there is during a game, the more I enjoy it				
While competing, I worry about making mistakes or failing to come through				
I have my game plan worked out in my head long before the game begins				
When I feel myself getting too tense, I can quickly relax my body and clam myself				
To me, pressure situations are challenges that I welcome				
I think about and imagine what will happen if I fail or screw up				
I maintain emotional control regardless of how things are going for me				
It is easy for me to direct my attention and focus on a single object or person				
When I fail to reach my goals, it makes me try even harder				
I improve my skills by listening carefully to advice and instruction from coaches				
I make fewer mistakes when the pressure is on because I concentrate better				

Appendix B – Survey Summary

I AGREE TO PARTICIPATE IN THIS STUDY...

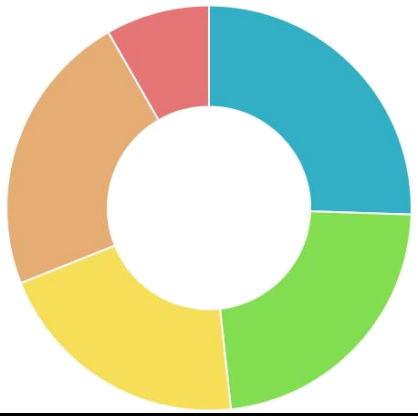
	Yes	No	Responses
All Data	173 (99%)	1 (1%)	174

WHAT IS YOUR GENDER?

	Male	Female	Standard Deviation	Responses
All Data	76 (52%)	71 (48%)	2.5	147

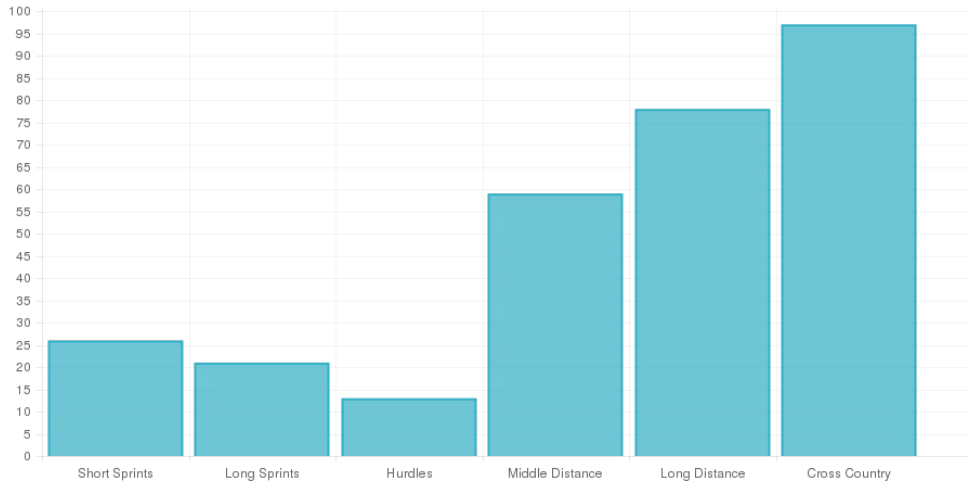
WHAT YEAR ARE YOU?

	Freshman	Sophmore	Junior	Senior	Graduate Student	Standard Deviation	Responses
All Data	37 (26%)	33 (23%)	30 (21%)	33 (23%)	12 (8%)	8.79	145



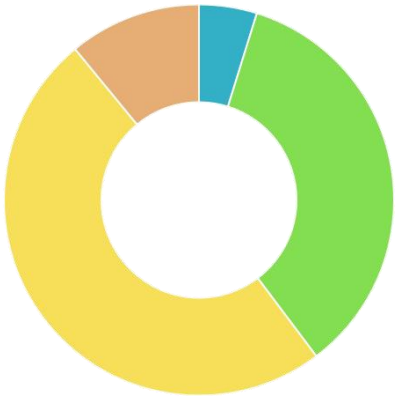
IN WHAT EVENTS DO YOU PARTICIPATE IN? CHOOSE ALL THAT APPLY.

	Short Sprints	Long Sprints	Hurdles	Middle Distance	Long Distance	Cross Country	Responses
All Data	26 (18%)	21 (15%)	13 (9%)	59 (42%)	78 (55%)	97 (69%)	141



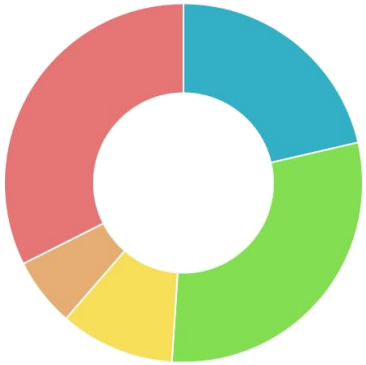
In a typical week how many hours do you spend training?

	Less than 10 hours	10-15 hours	15-20 hours	25+ hours	Standard Deviation	Responses
All Data	7 (5%)	51 (35%)	72 (49%)	16 (11%)	26.27	146



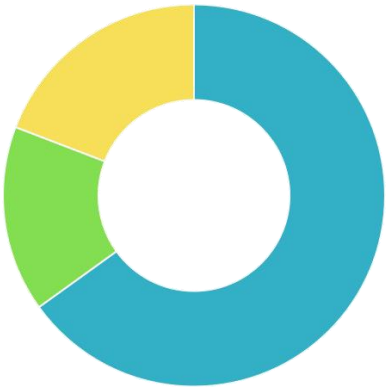
HOW MUCH TIME IN THE PAST YEAR HAVE YOU MISSED TRAINING DUE TO INJURY?

	None	1-7 days (sporadic)	1-2 weeks	3-4 weeks	1 month +	Standard Deviation	Responses
All Data	31 (21%)	43 (30%)	15 (10%)	9 (6%)	47 (32%)	14.97	145



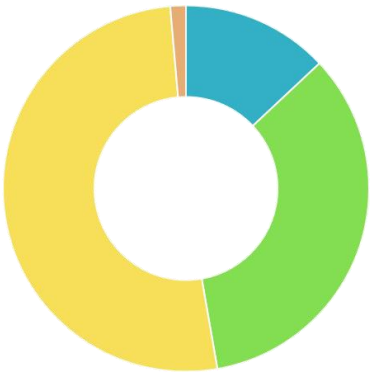
AT WHICH DIVISION DO YOU COMPETE IN COLLEGE TRACK & FIELD?

	Division I	Division II	Division III	Standard Deviation	Responses
All Data	95 (65%)	23 (16%)	28 (19%)	32.83	146



WHEN DID YOU FIRST BEGIN PARTICIPATING IN TRACK AND FIELD?

	Elementary School	Middle School	High School	College	Standard Deviation	Responses
All Data	19 (13%)	50 (34%)	75 (51%)	2 (1%)	28.11	146



DO YOU HAVE AN ATHLETIC SCHOLARSHIP?

	Yes	No	Standard Deviation	Responses
All Data	57 (40%)	87 (60%)	15	144

REFERENCES

Andersen, M. B., & Williams, J. M. (1999). Athletic injury, psychosocial factors and perceptual changes during stress. *Journal Of Sports Sciences*, *17*(9), 735-741.

Andersen, M. B., & Williams, J. M. (1988. *Journal Of Sport & Exercise Psychology*, *10*(3), 294-306.

Blum, (2009, January 14). PSY310 Handouts. Retrieved March 18, 2016, from http://www.csun.edu/~drnancyb/PSY310 handouts.html

Bood, S., Archer, T., & Norlander, T. (2004). Affective Personality in Relation to General Personality, Self-Reported Stress, Coping, and Optimism. *Individual Differences Research*, *2*(1), 26-37.

Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. Journal of Health and Social Behavior, 24(4), 385-396.

Crust, L. (n.d.). How much do psychological factors such as stress and personality contribute to the risk sports injuries? Retrieved April 8, 2015, from http://www.sportsinjurybulletin.com/arcive/stress-sports-injuries.html

Deutsh, R.E. (1985). The psychological implications of sports related injuries. *The International ournal of Sports Psuchology, 16, 232-237*

Day, A. L., Therrien, D. L., & Carroll, S. A. (2005). Predicting psychological health: Assessing the incremental validity of emotional intelligence beyond personality, Type A behavior, and daily hassles. Eur. J. Pers. European Journal of Personality, 19(6), 519-536.

Denollet, J. (2005). DS14: Standard Assessment of Negative Affectivity, Social Inhibition, and Type D Personality. Psychosomatic Medicine, 67(1), 89-97. doi:10.1097/01.psy.0000149256.81953.49

Ebbets, Russ, ed. "Sport Psychology Roundtable" Track Coach Vol. 197 Fall 2011 pp. 6271-6283

Ebbets, Russ, ed. Vernacchia, R. A. "Psychological Restoration: Assessing Under Recovery and Underperforming in Track and Field Athletes" Track Coach Vol. 179 Spring 2007 pp.5705-5712

Ebbets, Russ, ed. Zackowitz, Kathryn "Arousal Regulation Techniques in Track and Field" Track Coach Vol. 183 Spring 2008 pp.5856-5861

Eysenck, H. (1970). The Two Faces of Psychology. In The biological basis of personality, American Lecture Series (Vol. 689). Springfield, Ill., New Jersey: Transaction.

Friedman, M. (1977). TYPE A BEHAVIOR PATTERN: SOME OF ITS PATHOPHYSIOLOGICAL COMPONENTS. BULLETIN OF THE NEW YORK ACADEMY OF MEDICINE, 53(7), 594-604.

Mate, G. (2005). The Cancer Personality | alive. Retrieved March 18, 2016, from http://www.alive.com/health/the-cancer-personality/

Geuens, N., Braspenning, M., Bogaert, P. V., & Franck, E. (2015). Individual vulnerability to burnout in nurses: The role of Type D personality within different nursing specialty areas. *Burnout Research, 2*(2-3), 80-86.

Gould, D. & Petlichkoff & Prentice & Tedeschi, (2000). Psychology of Sports Injuries. *Sports Science Exchange Roundtable*, 11(2), 40-44. Retrieved from http://www.gssiweb.com.

Johnson, U. (1997, December). *Coping strategies among long-term injured competitive athletes. A study of 81 men and women in team and individual sprts.* Abstract retrieved on Febuary 20, 2006

Johnson, U., & Ivarsson, A. (2011). Psychological predictors of sport injuries among junior soccer players. Scandinavian Journal of Medicine & Science in Sports, 129-136.

Keller, B., Braga, A., & Coelho, R. (2013). Relationship between personality trait and muscle injuries in tennis players. Revista Brasileira De Medicina Do Esporte, 19(2). doi:10.1590/S1517-86922013000200010

Kimbrough, S., DeBolt, L., and Balkin, R.S. (2007). Use of the athletic coping skills Inventory for prediction of performance in collegiate baseball. The Sport Journal, 10(1), Winter 2007.

Lynn Williams & Amanda Wingate (2012): Type D personality, physical symptoms and subjective stress: The mediating effects of coping and social support, Psychology & Health, DOI. 10. 108/08870446.2012.667098, From http://dx.doi.org/10.1090/08870446.2012.667098

Mccrae, R., & Costa, P. (1989). Reinterpreting the Myers-Briggs Type Indicator From the Perspective of the Five-Factor Model of Personality. Journal of Personality, 57, 17-40. Retrieved April 9, 2015, from http://www.researchgate.net/profile/Paul_Costa3/publication/20447534_Reinterpretin

g_the_Myers-Briggs_Type_Indicator_from_the_perspective_of_the_five-factor_model_of_personality/links/00b49515b9ad847e86000000.pdf

Melville, M. J. (2016, January 12). Cancer's ABC's. Retrieved March 18, 2016, from https://dreamcoat.wordpress.com/2016/01/12/cancers-abcs/

Merenda, P. (1987). Toward a Four-Factor Theory of Temperament and/or Personality. Journal of Personality Assessment, 51(3), 367-374. doi:10.1207/s15327752jpa5103_4

Nideffer, Robert M. Athletes'Guide to Mental Training Human Kinetics Champaign, IL 1985

Nyklíček, I., Beugen, S., & Denollet, J. (2013). Effects of mindfulness-based stress reduction on distressed (Type D) personality traits: a randomized controlled trial. *Journal Of Behavioral Medicine*, *36*(4), 361-370. doi:10.1007/s10865-012-9431-3

Ogińska-Bulik, N. (2006). OCCUPATIONAL STRESS AND ITS CONSEQUENCES IN HEALTHCARE PROFESSIONALS: THE ROLE OF TYPE D PERSONALITY. *International Journal Of Occupational Medicine & Environmental Health*,*19*(2), 113-122. doi:10.2478/v10001-006-0016-7

Orlick, Terry In Pursuit of Excellence: How to win in sport and life through mental training Human Kinetics Champaign, IL 1990

Petrie, T. A. (1993). Coping skills, competitive trait anxiety, and playing status: Moderating effects on the life.. *Journal Of Sport & Exercise Psychology*, *15*(3), 261-274.

Polman, R., Borkoles, E., & Nicholls, A. R. (2010). Type D personality, stress, and symptoms of burnout: The influence of avoidance coping and social support. *British Journal Of Health Psychology*, *15*(3), 681-696. doi:10.1348/135910709X479069

Roth, S., & Cohen, L. J. (1986). Approach, avoidance, and coping with stress. American Psychologist, 41, 813-819.

Selye, H. (1976). Forty years of stress research: Principal remaining problems and misconceptions. CMA Journal, 115, 53-56. Retrieved September 9, 2015, from file:///C:/Users/student/Downloads/canmedaj01483-0055 (1).pdf

Vernaccia, R. (1997). Psychological perspectives on overtraining. Track Coach, 38, 4393-4399.

Vernacchia, R. A. and Statler, T. A. ed. The Psychology of High Performance Track and Field Tafnews Press Mountain View, CA 2005

Verner, Conzelmann, Lehnert, Seiler and Rammsayer "Subjective Stress in Female Elite Athletes and Non-Athletes: Evidence From Cortisol Studies" Europe's Journal of Psychology 6 (4) pp.56-70