Relationships Among Academic and Athletic Motivation and Mental, Physical, and Academic Outcomes in Collegiate Athletes

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As of 2015, there were approximately 480,000 collegiate athletes in the United States. Among these students, a scant few are drafted as a professional within their respective sports. For example, only 1.6% of students are drafted into the NFL, and 1.1% and 0.9% of male and female students enter the NBA and WNBA, respectively (NCAA.org, 2016). As there is a very negligible likelihood of becoming and making one's living as a professional athlete, it is critically important that students who attend university as athletes earn a degree to have a career that will serve them for the rest of life after school. Organizations such as the NCAA make it clear and evident that most collegiate athletes will not become professionals, so athletes know that in order to get the most out of their college experience they will need to excel academically and not just athletically. Entering college is a stressful time for all students, which can lead to declines in physical and mental health as well as increased substance use (Pritchard & Yamnitz, 2007). College athletes have more demands to manage than the general college population, as there are the demands of being a full time college student as well as a full time athlete.

College athletes have been found to spend 40 or even 50+ hours per week on their sport, which often leaves them too fatigued to study effectively. Indeed, a lack of free time and their ability to do well academically are two big concerns for student athletes (Penn, Schoenn, & Berland, 2015). While the majority of students base their school choice on athletics (Miller, 2011), they also feel that academics are important. Most students endorse highly identifying as both a student and athlete (NCAA, 2014),

meaning they have all of the pressures, responsibilities, goals, and requirements of both. It is this dual role, with the motivations for both, that may be detrimental to psychological health, academic success, and physical health. Given these implications, there is a need for examination of the impact of students' athletic and academic motivation on mental health and academic outcomes, as well as physical health outcomes. Therefore, the current study examined the effect of athletic and academic motivations upon these domains. Further, the proposed study will examine the interrelationships among mental health, academic, and physical health outcomes. Lastly, it will explore the potential role of resiliency factors as moderators of the relationship between academic and athletic motivation and the mental, academic, and physical health outcomes.

Academic and Athletic Roles

Most people engage in multiple, differing roles and motivations in everyday life. For each role an individual is motivated to perform there are differing demands, goals, and priorities that accompany the role. Further, roles may or may not facilitate each other, as there can be a competition for individuals' resources. Previous research has examined the ways in which individuals are affected by having different roles (Brook, Garcia, & Fleming, 2008). For example, women building careers in addition to parental responsibilities and men taking on more parental responsibilities while still being highly involved in career life are both affected by having role changes (Greenhaus & Beutel, 1985; Hall, 1992). There has been an emphasis on possible negative outcomes when there is a conflict of roles, specifically if and when the resources and needs of one role make it challenging for an individual to fulfill the needs of another role. Indeed, some

research suggests that having multiple roles can lower well-being (Rafaeli-Mor & Steinberg, 2002). A proposed reason for this is that having multiple identities creates a disparity in resources, whereby individuals have less time and energy to spread across conflicting roles, which can decrease well-being. Some literature supports this notion, whereby those with more identities and conflicting roles are more overloaded than those without such conflicts, leading to lower overall psychological well-being (Barnett & Hyde, 2001; O'Driscoll, Ilgen, & Hildreth, 1992). The stress from one area can cause stress in another area, such as from work to home life and vice versa. This phenomenon is referred to as stress spillover (Neff & Karney, 2004). While the impact of multiple roles in regard to family dynamics has been the topic of much study, the impact of being both a student and athlete, and the potential negative effects of these two roles, has not been well developed.

Stress is a common part of life for the population at large, and has been found to be particularly high for college students, who have been found to have higher levels than the general population (Adlaf, Gliksman, Demers, Newton, &Taylor, 2001; Stewart-Brown et al., 2000). Indeed, stress among college students has been rising over time, with more students than ever reporting psychological distress (Kitzrow, 2003; Pryor, Hurtado, DeAngelo, Palucki Blake, & Tran, 2010). Abouserie (1994) found that 80% of college students felt at least moderately stressed, and the number of college freshman feeling distressed is particularly high (Pryor et al., 2010). These stressors come from a number of domains, such as personal, academic, health-related, and financial, (Ross, Niebling, & Heckert, 1999; Joo, Durband, & Grable, 2008; Stilger, Etzel, & Lantz, 2001).

College student athletes must face these same stressors while also having the role of athlete.

College athletes have many demands and pressures in regard to their sport performance as well as their academic performance and personal lives. While some research suggests that sport participation (formal and recreational) can act as a buffer to stress (Hudd et al., 2000; Kudlacek, 1997; Shirka, 1997; Caltabiano, 1994), it has been found that the act of athletic participation can act as a stressor in addition to those the general college population already experiences (Kimball & Freysinger, 2003; Papanikolaou, Nikolaidis, Patsiaouras, & Alexopoulos, 2003). Being a collegiate athlete has its own unique stressors and impediments, such as time commitments, injuries, and social strains with coaches & teammates (Humphrey, Yow, & Bowden, 2000; NCAA, 2014). Indeed, while the NCAA stipulates that athletes spend no more than 20 hours per week engaged in their respective sport, athletes have reported that sport related endeavors take up to 40 or more hours per week, the equivalent of a full time job (Penn, Schoen, Berland, 2015). As such, it is no surprise that athletes have reported distress related to sport participation, such as pressure to win and high anxiety, suggesting that this role can be a unique and significant factor driving increases in stress. Further, previous literature suggests that athletes who endorse elevated stress levels have an increased likelihood of engaging in poor health habits and alcohol use (Hudd et al., 2000; Wilson, Pritchard, & Schaffer, 2004).

As noted previously, having multiple roles and motivations can cause stress and strain on an individual's resources. This dichotomy is present for student athletes, who indicate being highly motivated by both athletics and academics (NCAA, 2011). While

some previous research has indicated that athletes can have lower academic performance (Stansbury, 2003), this is seen at schools where athletes have the potential for being drafted as a professional. However, the majority of Division I and II schools' athletes are very unlikely to be drafted, and athletes know the importance of performing well in classes and not just in their sport. This has been found to cause a push-pull dynamic for student athletes (Mahoney, 2011), which can in fact cause stress due to these dual roles competing for resources. Given the dual roles that athletes have, it is imperative that these roles be examined as possible determinants in academic performance as well as psychological and physical health.

Mental Health and Academic Outcomes

As touched on above, being a college student athlete can bring about the increased probability of mental distress, which can in turn affect academic outcomes and goals of students. Stress can be experienced both generally and in regard to a specific domain, with student athletes having the potential for both. That is, general stress refers to a state of psychological arousal where external demands tax one's ability to adapt (Lazarus, 1966). On the other hand, stress can be felt in regard to a more specific situation, such as the stress caused by school (Misra & McKean, 2000). Academic stress can be defined as when a student becomes overwhelmed emotionally as a result of academic specific stressors (Richardson, Abraham, & Bond, 2012). Indeed, college has been found to be a time of increased stress a result of increased demands, such as academic, financial, health, or time constraints (Goodman, 1993; LeRoy, 1988).

In addition to psychological distress, the demands of college life and athletic competition can negatively affect academic performance (Felsten & Wilcox, 1992; Pritchard & Wilson, 2003), thus diminishing the point of being in school. However, motivation has been found to be able to improve academic performance, if stress is not too high (Struthers, Perry, & Menec, 2000). As one would expect, academic motivation has been found to be associated with academic achievement (Fortier, Vallerand, & Guay, 1995). Indeed, academic motivation is a main factor in driving academic performance and outcomes. For example, longitudinal assessments of high school students have found that academic motivation was associated with academic achievement (Baker, 2003; Guay, Ratelle, Roy, & Litalien, 2010). Motivation tends to be associated with stress and academic achievement, whereby higher motivation leads to both better academic outcomes as well as greater academic stress (Rucker, 2012). Thus, it would seem that academic motivation can lead to stress, while also leading to higher academic performance. It is the drive and motivation to perform academically that leads to both, as a certain amount of stress is generally needed to perform well. This concept was captured in the Yerkes-Dodson theory, whereby there is an inverted u relationship between arousal and performance (Teigen, 1994). For an individual to perform well, one needs an adequate amount of arousal, or stress, to perform, while not having so much as to overwhelm the person and negatively affect performance. Given this, athletes who are motivated by both sports and academics may have higher general and academic stress levels, but may still be able to perform well academically due to high academic motivation. Indeed, student athletes have been found to have the same levels of academic motivation as non-athletes (Miles, 2015). However, the aggregated

stress may manifest itself in negative means of coping, such as substance use or poor sleep (Perkins, 1999; Orzech, Salafsky, & Hamilton, 2011). Thus, while the influence of stress on academic performance caused by the dual roles of student athletes may be ameliorated by academic motivation, there is still the potential for negative effects on physical health.

Physical Health Outcomes

Physical health is of great importance to the general population at large; however, physical health and performance are of utmost importance to athletes. If an athlete is not healthy, he or she is unable to participate and compete in7 respective sport. For college athletes, not being able to play due to poor health or injury is a very real concern ("Mind, Body, & Sport," NCAA, 2016). Being able to play is of course of great importance to athletes, so staying healthy and performing the activities for staying healthy and in prime shape is a way to increase one's odds of play. Further, play time is of importance for student athletes as it is also associated with athletes' sense of achievement and enjoyment (Klenosky, Templin, & Troutman, 2001). The desire for play time seems to be associated with greater physical performance, as seen in a group of Division I basketball players, where physical fitness was found to be related to the amount of playing time for athletes (Hoffman et al., 1996). Given this, it is possible that the more motivated at one's sport an athlete is, the more effort and time he or she will put into conditioning for their sport.

That motivation for one's sport may be related to physical health and performance is relevant to the physical health of athletes as well. That is, the more motivated an athlete is toward their sport, the more likely they are to put in effort to play

at a high level, which often requires high amounts of strength and conditioning. Athletes' lives involve many hours of activities which improve physical health and conditioning, including practice time, time spent on strength and conditioning, and rehabilitation (Penn, Schoenn, Berland, 2015). Due to this, athletes tend to have high aerobic and strength conditioning. This physical fitness may have multiple health-related benefits, notably improved body composition and bone mineral density.

Body composition, or the amount of one's body that is fat versus fat-free mass, is a good indicator of overall health. Having desirable body composition has been associated with a number of important health facets, such as inflammation (Festa et al., 2001), longevity (Lorenzini, 2014), cardiovascular risk (Rosito et al., 2008), and stroke (Kernan et al., 2013). Further, the positive and negative health behaviors that one develops during their young adult years can remain though adulthood (Poobalan & Aucott, 2016). Given this, it is important to examine the impact of sport motivation on body composition, particularly since diet, the major influence on body composition, is often less than ideal in college athletes (Webber et al., 2015). In addition to body composition, the high levels of strength training that most athletes engage in can be of additional benefit in regard to bone mineral density. Bone mineral density, the amount of bone mineral within bones, is important throughout the lifespan, and particularly as one ages. In later adulthood bone density tends to decrease, particularly for females, increasing the chances of fractures and breaks (McLung, 2005). However, regular strength training is a behavior which has been shown to improve bone mineral density (Layne & Nelson, 1999). This is of particular importance for the physically-disabled players, as having a spinal-cord injury or physical disability greatly increases the

likelihood of poor bone density (Smeltzer, Zimmerman, & Capriotti, 2005; Kocina, 1997). Thus, another potential health benefit for collegiate participation is the increase in bone mineral density resulting from prescribed resistance training protocols, which is of particular benefit to females (Kerr et al., 2001).

In short, while athletes may have additional stressors and priorities over traditional college students, there is the potential for health benefits resulting from their frequent exercise regimen. Further, these benefits may be increased due to athletic motivation, as the more motivated an athlete is the more frequently and harder they will train, which then results in improvements in physical health. In addition to the potential benefits of being athletically motivated, there is the potential for engagement in health-compromising behaviors in order to meet athletic demands.

Health Compromising Behaviors

While there are potential benefits to athletic and academic motivation for student athletes, namely increased aerobic conditioning, body composition and bone mineral density, and academic performance, the role of student athlete may also bring with it an increased likelihood of health-compromising behaviors. Namely, being a student athlete may be associated with poorer sleep habits and substance use (Fullager et al., 2015; NCAA, 2014).

Adequate sleep is highly important for individuals in the general population, likely more so for those who are at university, and still more so for student athletes. Sleep is a fundamental health behavior which can positively or negatively affect one on many levels, including cognitive (Pilcher & Walters, 1997), psychological, and physiological functioning (Lund, Reider, Whiting, & Pritchard, 2010). Sleep is of great importance to

students, as it is vital to memory and proper cognitive functioning (Walker & Stickgold, 2006). During sleep, memory consolidation takes place and new memories, encoded while awake, are made more stable and integrated into long-term memory. In short, this is when new, fresh information is able to be made into more long-lasting memories (McClelland, McNaughton, & O'Reilly, 1995). While naps can be of benefit to memory (Lahl, Wispel, Willigens, & Pietrowsky, 2008), getting a proper night's sleep provides the most benefit. Long-term memory can be divided into declarative, where memories such as facts and dates can be declared, and procedural, which is the unconscious memory of how to do things. Declarative is, of course, important for students, but athletes also utilize declarative for memories of situations in previous games as well as procedural memory when learning skills for their respective sport. Again, a full night of sleep is optimal for procedural memory, with the first night after practicing a motor skill providing the best learning (Walker et al., 2003). In addition to impact of sleep on memory, adequate sleep is needed for optimal athletic performance. Inadequate sleep has been found to decrease strength (Reilly & Piercy, 1994), accuracy (Edwards & Waterhouse, 2009) and overall physical performance (Mougin et al., 1991). In addition to cognitive function and athletic performance, inadequate sleep has been associated with poorer health outcomes. Indeed, having a sleep debt has been found to be associated with weight gain and increased risk of obesity (Stranges et al., 2008). Inadequate sleep has been found to be associated with altered hunger and satiation hormones, leading to increased appetite, particularly for unhealthy, calorically dense food items (Spiegel, Tasali, Penev, & Cauter, 2004). Further, chronic inadequate sleep has been associated with an increase in the stress hormone cortisol, leading to compromised glucose

utilization (Gangwisch, 2009). Thus, adequate sleep is highly important for performance in both academics and athletics, however inadequate sleep can be caused by too many time commitments (Penn, Schoen, Berland, 2015). Given this, it is quite possible that the student athletes in the currently studied population are not getting adequate sleep, which is then associated with detriments in academic performance, stress levels, and health behaviors. In addition to the potential compromising effects of inadequate sleep is the possibility of substance use among athletes.

While tending to decrease over the past decade, 44% of male and 33% of female athletes reported drinking excessively (5 or more drinks for males and 4 or more drinks for females in a sitting). Further, 22% reported using marijuana, 6% reported taking pain medications without a prescription, with basketball athletes having the lowest rates of amphetamines and steroids (NCAA, 2014). Athletes do seem to engage in heavy drinking at a higher frequency than non-athletes (Yusko, Buckman, White, & Pandina, 2008), and within the general college population, stress has been related to drinking (Colder, 2001). Stress is a known risk factor for substance use as a means of coping (Sinha, 2008). Given that college athletes have to deal with the stresses of being both an athlete and student, it is possible that substance use will be associated with the life stress or the stresses of academic life, which can, in turn, negatively impact health outcomes such as body composition. Given this, it is important to examine the possible associations among these stressors and outcomes. In addition to the influence of health-compromising behaviors on these relationships, it is also pertinent to examine the moderating effects of dispositional and learned factors related to how people cope with stress.

Exploratory Moderators

Factors that can influence one's hardiness, and ability to handle various demands, may play a role in the relationship between academic motivation, athletic motivation, and emotional, health, and academic outcomes. Specifically, individuals with higher optimism, self-control, and resilience may be less likely to experience negative effects and more likely to experience the benefits of these dual roles. Dispositional optimism describes a general belief that good things, not bad things, will happen (Scheier & Carver,1992). This disposition has been found to be associated with better health outcomes, such as less physical symptoms during the stressful time at the end of a college semester (Scheier & Carver, 1992), improved recovery rate after bypass surgery (Scheier et al., 1989), and better health outcomes and behaviors in the elderly (Steptoe, Wright, Kunz-Ebrecht, & Iliffe, 2006). Further, it has been linked to better overall psychological well-being (Scheier & Carver, 1992).

Similar to the benefits seen in dispositional optimism are those associated with self-control, which describes how one "initiates, alters, or maintains behavior in response to environmental demands," (Maloney, Grawitch, & Barber, 2012). Compared to those low in self-control, those higher in self-control had better academic performance, better self-esteem, less psychopathology, less harmful health behaviors, (binge eating, alcohol abuse), and handle stress better (Tangney, Baumeister, & Boone, 2004; Bowlin & Baer, 2011). Thus, those higher in trait self-control may experience less negative effects of excessive stress.

A third construct that has been shown to make individuals more hardy to stress is resilience. Connor and Davidson (2003) define resilience as the "personal qualities that

enable one to thrive in the face of adversity." Those who rank higher in resiliency have been found to have lower levels of psychiatric disorder (Scali et al., 2012). Further, higher resiliency has been found to be protective against stress and mental health issues. Nursing students higher in resiliency had less emotional exhaustion and burnout along with better psychological health (Rios-Risquez et al., 2016), and resilient Navy personnel had less attrition and less mental illness (Bezdjian et al., 2016). Thus, factors associated with hardiness to stressors should be explored, as they may moderate the relationship between athletic and academic motivation and academic, physical, and psychological outcomes.

In addition to academic and athletic motivation, their influence on academic, physical and mental health outcomes, and the association of these outcomes with health-negating behaviors, some factors to take into consideration in the way of covariates are gender, whether one is able-bodied or a wheelchair athlete, and trauma history. The current study sought to examine the associations and influences of the above described factors above and beyond these covariate factors. Gender was taken into account due to possible differences in stress, substance use, body composition, and academic performance (Matud, 2006; Brady & Randall, 1999; Jackson et al., 2006; Buchmann & DiPrete, 2006). "Able-bodiedness" was taken into account as this is associated with bone mineral density and body composition (Frey-Rindova, De Bruin, Stussi, & Dietz, 2000; Jones, Legge, & Goulding, 2003). Last, trauma history needs to be taken into account as traumatic events can affect how one experiences stress after a traumatic event (Wessa et al., 2006), and some of the wheelchair athletes sustained traumatic injuries which led to their physical disability.

Overview

College is a stressful time for many students, who can find challenges stemming from classes and social, financial, familial, and other factors. Being an athlete also brings its own challenges, such as time for other endeavors, possible conflicts with teammates and coaches, and pressure to succeed, while providing potential benefits such as improved physical health. Student athletes have to contend with the needs of each, with motivation being a likely determinant of beneficial outcomes. The way in which the student athlete navigates these can be influenced by how hardy to the stresses and adversity he or she is as well as the practice of health behaviors, such as sleep and substance use. It was the purpose of this study to examine how athletic and academic motivations were associated with mental health and academic outcomes, as well as physical health among male and female student athletes from both the running and adaptive competitive teams. Further, it sought to examine the associations between physical and mental health and academic performance, as well as the relationships with these and the detrimental health behaviors of inadequate sleep and substance use. Lastly, the study explored the possible influence of hardiness characteristics and perceptions of academic and general stress in moderating the relationships between academic and athletic motivation with the health and academic outcomes.

Methods

Participants

The study participants included 48 UT Arlington student athletes who were either on the Movin' Mavs wheelchair basketball team (n = 19) or the able-bodied men's and women's basketball teams (n = 29; Table 1). Players were recruited by talking first with

their respective coaches, and then meeting with players to describe the purpose and process of the study. Players who elected to participate were contacted by study personnel to arrange the time to come in to the lab setting for participation.

Procedure

Prior to participation the study was described in detail to participants, and consent was obtained before participation in the protocol. Participation was counterbalanced such that two participants were scheduled and one would complete the pen and paper questionnaires while the other went through the maximal aerobic capacity test protocol, then they would switch to complete the study. The study was completed in the University's Kinesiology laboratories, where treadmills and equipment for measuring maximal oxygen consumption ($V0_{2max}$) testing were housed. Sessions took approximately 60-90 minutes to complete.

Measures

Academic and athletic motivation were measured though the Student Athletes' Motivation toward Sports and Academics Questionnaire (SAMSAQ; Gaston-Gayles, 2005). This measure assesses student athletes' motivations for both academics and athletics, allowing researchers to determine how invested in each role participants are. It consists of 23 items, and had acceptable reliability (alphas = .44 - .84).

General stress was measured with the perceived stress scale (Cohen, Kamarck, & Mermelstein, 1983). It is the most widely used assessment of general stress. It consists of 10 items, and had good reliability (alpha = .89).

Academic stress was assessed via the Academic Stress Questionnaire (Zajacova, Lynch, & Espenshade, 2005). This measured stress associated with a

number of school-related tasks, such as homework, course readings, and exams (alpha = .84).

Academic achievement was measured by participants' UT Arlington cumulative GPA. In order to obtain GPA, each participant gave explicit consent to have their UTA GPA retrieved from the records department. Prior academic performance, in the form of high school GPA, was also requested, after obtaining consent, in order to be controlled as a covariate.

Body Composition and bone mineral density were measured via Dual-energy X-ray absorptiometry, or DXA. This is a gold standard in assessing body composition and bone mineral density. It uses two X-ray beams to assess body composition while an individual lays supine on the machine table. Feedback is provided in the form of a t-score, indicating within how many standard deviations one's bone density is compared to a healthy 30-year-old. Feedback provided for body composition provides the overall percent of one's body is fat mass, or body fat percentage ("Bone Density Testing," Osteoporosis Foundation).

Maximal aerobic capacity was assessed via a VO_{2max} test, whereby participants had their oxygen consumption and carbon dioxide production measured while engaging in exercise on a treadmill until volitional exhaustion. This is the gold standard for assessing maximal aerobic capacity. The able-bodied athletes started out walking on a treadmill at 1.7 miles per hour and 10% incline, and the incline and speed were increased every two minutes until athletes indicated they needed to stop. Wheelchair-athletes followed a similar protocol on a treadmill built for wheelchair use, again

beginning at a slow pace for three minutes, and then increasing in speed and incline every three minutes until volitional exhaustion.

Prior trauma was assessed by the Life Events Checklist for DSM-5, or LEC-5 (Weathers, Blake, Schnurr, Kaloupek, Marx, & Keane, 2013). This allows for the screening of potentially traumatic events that may have happened to a participant within their lifetime. It consists of 17 items, screens for a number of events known to be possibly traumatic that one may encounter in his or her lifetime, and was scored to indicate whether or not an individual had a traumatic experience directly happen to them.

Sleep quality was assessed via the Pittsburgh Sleep Quality Index, or PSQI (Buysse, Reynolds, Monk, Berman, & Kupher, 1989). This is used to assess the quality and patterns of sleep in adults, consists of 9 items, and provides a score indicating sleep quality (alpha = .78). Having a higher score corresponds to more issues with sleep, and it assesses seven areas of sleep (e.g. subjective sleep quality, sleep disturbances, daytime dysfunction).

Optimism was measured via the Revised Life Orientation Test, or LOT-R (Scheier, Carver, & Bridges, 1994). This consists of 10 items and detects individuals' general levels of optimism and pessimism (alpha = .74).

Resilience was measured by the Connor-Davidson resilience scale (Connor & Davidson, 2003). This has 25 items, and assessed how resilient and able to handle stress participants are (alpha = .92).

Substance use was measured by a number of items on a health scale, asking participants whether they currently used alcohol, cigarettes or other tobacco products,

or other illicit drugs (cocaine/crack, marijuana/pot, stimulants/uppers, LSD/mescaline, tranquilizers, pain killers, heroin/opiates, PCP, sniff gases or fumes).

Self-control was measured by the Brief Self-Control Scale (Tangney, Baumeister, & Boone, 2004). This assesses one's ability to inhibit impulses and whether they can amend their behavior as needed to adapt to changing demands (Maloney, Grawitch, & Barber, 2012; alpha = .84.)

Analyses

Data Screening

The raw data were examined via frequencies and descriptive statistics in order to assess distributions. Skewness, kurtosis, and histograms with normality plots were used to assess normality. It was found that variables had acceptable normality, thus no transformations were performed.

Analyses

The first aim, examining the influence of academic and athletic motivation on academic and mental and physical health outcomes, is shown in Figure 1, and was examined via sequential regression analysis. To examine the influence of academic motivation on mental health and academic achievement, athletic motivation was entered as a predictor first, with academic motivation entered second. Models examined academic stress, academic achievement, and general stress. This was reversed to examine the influence of sport motivation on physical health, whereby academic motivation was entered into each model first, followed by sport motivation. Potential covariates included gender, whether one was able-bodied or not, and trauma history, and were included in each model as a covariate if correlated with the outcome.

The second aim, shown in Figure 2, was exploratory due to the small sample size and examined the possible moderating influence of optimism, self-control, and resilience as well as general and academic stress. The interactions between these variables and the predictors of interest (academic or sport motivation) were sequentially entered into the models described under Aim 1 in order to examine for possible moderating influences.

The third aim, shown in Figure 3, characterized the relationships among the outcome variables and the behavioral health variables of substance use and sleep. It was examined by generating partial correlations among the mental health, academic, and physical health factors, as well as the health-compromising behaviors of sleep and substance use. Factors that were controlled for included gender, whether a participant was able-bodied or not, and trauma history.

Statistical Results

Analysis of Hypothesis 1 was conducted via sequential regression analysis. Hypothesis 1 proposed that higher academic motivation would more strongly predict lower general stress, lower academic stress, and higher academic performance than would levels of sport motivation. Further, that sport motivation would be related to positive physical outcomes, namely lower body fat percentage, higher bone mineral density, and higher VO_{2max}. The covariates used were based on the literature and variables related to the outcomes. In order to increase power, the potential covariates were examined via a correlation matrix (Table 2.) to determine if they had a relationship with the outcomes, and thus if needed to be included as a covariate. As a result, covariates were able to be dropped from a number of models to increase degrees of

freedom. Gender was kept as a covariate for academic stress and body fat percentage, adaptive status was kept as a covariate for academic performance, body fat percentage, bone mineral density, and VO_{2max}, while prior trauma was not used as a covariate. The covariates were also examined for association with the predictors, but were not associated with either athletic or academic motivation.

The assessment of academic motivation on the mental health and academic outcomes began with entering the relevant covariates (gender and/or adaptive/non-adaptive sport) into the model, followed by sport motivation, and finally academic motivation in the last block. The university did not have records of high school grade point average for a majority of participants, so in order to keep sample size high this was not used as a covariate. First the effects of total stress were examined. As seen in Table 2, none of the potential covariates were related to the outcome of general stress, so no covariates were used so as to improve power. Full results are seen in Table 3, and it was found that student motivation did not significantly predict any significant variance in general stress, $R^2 = .05$, $F(2, 45) = 1.18$, $p = .32$. Neither athletic motivation nor academic motivation predicted total general stress. Academic stress was examined next. As seen in Figure 1, gender was related to academic stress, and as such was the only covariate included. Full results are seen in in Table 4, and it was found that student motivation was not a significant predictor of academic stress, $R^2 = .181$, $F(3,44) = 3.23$, $p = .03$ (however, being female was associated with higher academic stress). Academic achievement (college GPA) was then examined as an outcome with adaptive status used as a covariate. Full results are in Table 5. Academic motivation did not

significantly predict academic achievement, R^2 = .183, F(3, 39) = 2.92, p = .05 (however, wheelchair students had higher academic achievement).

The second portion of Hypothesis 1 proposed that sport motivation would be related to positive physical outcomes, above that of the influence of academic motivation. To examine this, relevant covariates were first entered into the model, followed by academic motivation, and then sport motivation. Body fat percentage was examined first, with adaptive status and gender used as covariates (Table 2). Full model results are in Table 6. Sport motivation did not influence predict body fat percentage, R^2 = .761, F(4, 36) = 28.7, p < .001 (however, males and able-bodiedness were associated with lower body fat percentage). Bone mineral density was examined next, with adaptive status as a covariate (Figure 1). Full results are reported in Table 7. Athletic motivation trended toward predicting an increase in bone density, R^2 = .679, F(3, 35) = 24.7, p <.001(wheelchair athletes were found to have lower bone density levels). Last, VO_2 Max was examined for possible influence from athletic motivation. Adaptive status was used as a covariate as it was associated with the outcome VO_2 Max (Table 2). The full model results are in Table 8, and it was found that athletic motivation did not significantly predict aerobic capacity, R^2 = .768, F(3, 40) = 44.17, p < .001 (however, able-bodied athletes had higher aerobic capacity). Thus, there was partial support for Hypothesis one, as athletic motivation led to an increase in bone mineral density.

Hypothesis 2, as visualized in Figures 2a and 2b, was conducted via exploratory moderation analysis. Hypothesis 2 proposed that higher levels of resilience moderators would lead to a lowered relationship between academic motivation and general and

academic stress, while improving academic achievement. Further, it was expected that a greater persistence of resilience moderators would strengthen the relationship between sport motivation and the physical health outcomes of body composition, bone mineral density and VO_{2max}. Also, perceptions of stress were thought to possibly be modifiers of academic and sport motivation such that optimal academic and physical health benefits could be achieved when motivation was high and stress was moderate. The moderators of optimism, resilience, self-control, general stress, and academic stress were examined, with each being added as a potential moderator to the models examined in Hypothesis 1. First, the effect of academic motivation influencing general stress was examined with the moderators. Full results for the exploratory moderation effects of optimism, resilience, self-control, and academic stress are in Table 9. It was found that optimism did not moderate the relationship between academic motivation and general stress, nor did resilience, self-control, or academic stress. Further, none of the exploratory moderators individually predicted general stress.

Next, the effect of academic motivation influencing academic stress was examined with each of the exploratory moderators. Full results are in Table 10. It was found that optimism did not moderate the relationship between academic motivation and academic stress, nor did resilience, self-control, or general stress. It was also found that the moderators did not independently predict academic stress.

Academic performance (UTA GPA) was examined next with each of the exploratory moderators. Full results are in Table 11. It was found that optimism did not moderate the relationship between academic motivation and academic performance, nor did resilience, self-control, academic stress, or general stress.

The exploratory moderators were then used to examine athletic motivation's influence on outcomes. The influence of academic motivation on body composition was examined first. Full results are in Table 12, and it was found that optimism did not moderate the relationship between academic motivation and body composition, nor did resilience, self-control, general stress, or academic stress.

The prediction of bone mineral density by athletic motivation with the exploratory moderators was performed next, with results in Table 13. It was found that optimism did not moderate the relationship between athletic motivation and bone mineral density, nor did resilience, self-control, general stress, or academic stress.

Last, the prediction of aerobic capacity by athletic motivation with the exploratory moderators was performed, with results in Table 14. It was found that optimism did not moderate the relationship between academic motivation and aerobic capacity, nor did resilience, self-control, general stress, or academic stress. However, in the associations among the predictors, moderators, and outcomes, it was found that optimism was related to aerobic performance (Table 16). Thus, optimism was then examined via sequential regression as a predictor of aerobic performance, with adaptive status and academic motivation as covariates, and positively predicted aerobic performance, $R^2 = .72$, $F(3,39) = 83.96$, $p < .001$ (Table 15). There was partial support found for Hypothesis 2, as the moderator of optimism was found to positively influence aerobic capacity.

Hypothesis 3, as visualized in Figure 3, was conducted via partial correlations among the mental health, academic, physical health, and health compromising behaviors (poor sleep, substance use) with gender and adaptive status as covariates.

Hypothesis 3 proposed that greater general and academic stress would be associated with poorer body composition, bone mineral density, and VO_{2max}. Further, these outcomes were expected to be associated with health-compromising behaviors, specifically poor sleep and substance use. Full results are in Tables 16 and 17, with four associations being found (drug use and tobacco use were not included in the table, as no student endorsed these within the last six months). Specifically, there was a moderate positive relationship between academic stress and general stress, $r = .49$, $p < .05$, and a moderate positive relationship between bone mineral density and VO_{2max} Max, $r = .47$, $p < .05$ (Table 16). Further, poorer sleep quality was related to higher general stress, $r = .33$, $p < .05$, and an association between better sleep quality and better grades trended towards significance, $r = -.29$, $p = .06$ (Table 17). In order to better examine and characterize the experience of being a student athlete and these significantly related variables, sleep, general stress, and academic performance were examined for associations with academic and athletic motivation. It was found that academic motivation was not associated with sleep quality ($r = -.19$, $p = .23$), general stress ($r = .06$ $p = .71$), or academic performance ($r = -.03$ $p = .87$). Further, athletic motivation was also not significantly associated with sleep quality ($r = -.14$, $p = .39$), general stress ($r = .24$, $p = .13$), or academic performance ($r = -.13$, $p = .43$).

Discussion

The purpose of the current study was threefold. First, it sought to examine the influence of academic and athletic motivation on academic, mental health, and physical health outcomes among collegiate basketball players. Second, it sought to explore potential moderators of the relationship between academic and sport motivation and the

mental, academic, and physical health outcomes, specifically resilience factors, such as dispositional optimism, self-control, and resilience, and perceptions of academic and general stress as moderators. Third, it sought to characterize the interrelationships among the mental health, academic, and physical health outcomes.

Under the first purpose, it was hypothesized that higher academic motivation would more strongly predict lower general stress, lower academic stress, and higher academic performance than would higher levels of sport motivation. Further, it was proposed that higher sport motivation would more strongly predict lower body fat percentage, higher bone mineral density, and higher VO_{2max}. The first hypothesis had partial support. It was found that academic motivation did not influence the mental health or academic outcomes. Further, it was found that athletic motivation did not influence body composition or VO_{2max}. However, athletic motivation was found to have a marginally significant influence on bone mineral density, causing a small increase in R^2 of .04. While this is a small effect, it is still an important one, especially given health implications. Bone mineral density is important throughout the lifespan, particularly for females, as it begins declining in young adulthood and continues to do so linearly with age (Riggs et al., 1981). Further, while it is indeed of importance to able-bodied individuals, it is of particular importance to physically handicapped individuals, as they have higher rates of osteoporosis (Smeltzer, Zimmerman, & Capriotti, 2005). This suggests that those who are motivated by their sport are engaging in rigorous amounts of resistance training, which has been shown to positively influence bone density. Further, while the effect is small, this is to be expected, as changes in bone density due to resistance exercise are not large, but are clinically important (Layne & Nelson, 1999).

Additionally, the positive health behaviors one develops as a young adult tend to remain through to adulthood (Poobalan & Aucott, 2016), so these improvements in bone density resulting from weight training spurred by athletic motivation will likely have benefits throughout the lifespan.

The second aim sought to explore the influence of potential moderators of the models examined in the first aim, that is, the influence of athletic motivation on physical health outcomes and academic motivation on mental health and academic outcomes. While it was found that none of the exploratory moderators moderated the above described relationships, one of the moderators did independently influence an outcome.

It was found that dispositional optimism predicted higher maximal aerobic capacity. While at first dispositional optimism may not seem a likely predictor of a physical ability, it has been linked to better outcomes post-surgery (Scheier et al., 1989) and better physical health (Scheier & Carver, 1992). Further, individuals who are higher in dispositional optimism tend to cope and approach goals in an active manner. This is opposed to those who are higher in pessimism, who tend to disengage and employ avoidance coping techniques when faced with a challenge (Nes & Segerstrom, 2006; Segerstrom,2007). Thus, individuals who are higher in dispositional optimism may approach their sport, and the physical training they engage in for their sport, more often and more rigorously. That is, they may be more likely to engage fully in their training in order to reach their goal, both in the way they play their sport, and when they physically prepare via strength training and conditioning. Someone higher in dispositional optimism may be more likely to do more than what is asked, which would influence physical exertion while training and thus result in higher aerobic capacity.

Under the third aim, it was hypothesized that greater general and academic stress would be associated with poorer body composition, bone mineral density, and $V0_{2max}$. Further, that those outcomes would be associated with health-compromising behaviors, specifically poor sleep and greater substance use. There was partial support for the third hypothesis, with four associations found while controlling for gender and adaptive status. First, as was predicted, there was a positive, moderate association between academic stress and general stress. Thus, this suggests that stress experienced at school interacts with and feeds into one's level of general life stress. It makes sense that as students experience more stress associated with schoolwork, their overall level of stress increases. However, one positive note is that neither of these were related to academic performance. Thus, even if students are experiencing higher levels of stress, it does not appear to be affecting the main reason they are in school. While some previous research suggested that college life and athletics could negatively impact academic performance (Felsten & Wilcox, 1992; Pritchard & Wilson, 2003), these results indicate that stress levels are not associated with academic performance, which is good for the student athletes.

It was also found that bone mineral density and aerobic performance (VO_2 Max) were moderately positively correlated. This was expected, as basketball athletes need and thus train both strength and endurance capabilities. As mentioned above, since health habits developed in young adulthood can stay with an individual throughout the lifespan (Poobalan & Aucott, 2016) these student athletes will likely keep up these positive health habits. While it is likely that they may not engage in as rigorous training once they have graduated and no longer compete at a collegiate level, retention of even

some level of their current training, and the benefits that go along with them, will improve their health as older adults.

The health behavior of sleep was also found to be related to both general stress and academic performance. Specifically, there was an inverse relationship between sleep quality and stress, whereby higher general stress levels were associated with poorer sleep. Further, poorer sleep was associated with academic performance, with poorer sleep quality being associated with poorer grade point averages. Additionally, neither academic nor athletic motivation were associated with sleep, stress, or academic performance, indicating that the associations with sleep are independent of our measures of academic and athletic motivation. That sleep was negatively impacted by stress levels is in line with previous research, which found that as stress increases sleep quality declines, and that interventions targeting stress can improve sleep (Hicks & Garcia, 1987; Winbush, Gross, & Kreitzer, 2007). Sleep is very important for a number of functions, with cognitive function being one (Pilcher & Walters, 1997). Indeed, sleep is needed for adequate memory and proper cognitive functioning (Walter & Stickgold, 2006), which makes it very important to a student athlete population. Because adequate sleep is needed for proper memory consolidation (Stickgold, 2005) as well as creative thinking and decision making (Harrison & Horne, 1997), it is not just an important health behavior, but one that impacts student outcomes. Given that poorer sleep is associated with poorer academic performance in these student athletes, it would be of benefit to examine ways to increase sleep if possible. While the schedule of a student athlete is full of demands for athletics and academics, improving sleep is an activity that can help academic, and possibly athletic performance. Since athletes have

athletic endeavors scheduled by trainers and coaches, perhaps schedules could be arranged to included brief naps in the afternoon. Sleep, or lack thereof, has become so prevalent that napping “classes” are even being offered at commercial gyms (Blair, 2017) and college campuses (Student Involvement, Texas State University). If commercial gym owners, personal trainers and other college campuses recognize the importance of sleep on one’s health and academic performance, then perhaps student athletes’ trainers, who oversee physical development, could help athletes improve their sleep in an effort to improve physical and academic performance.

Conclusions and Future Directions

The present study sought to examine the influence of academic and athletic motivation on mental and physical health and academic performance. Further, it sought to characterize the relationships among the academic, physical and mental health variables as well as health-related variables while determining the influence of potential moderating personality traits. It was found that athletic motivation leads to improved bone density, an important health outcome, particularly for females and physically-disabled athletes. Further, that academic and general stress are indeed related, and that sleep quality is related to both stress and academic performance. Taken together, this suggests that fostering athletic motivation can have health benefits, as evidenced by increases in the “hard to improve” marker of bone density. Fostering athletic motivation participation in the general population may have health benefits via increased physical activity and caloric output (Haskell, Lee, Pate, Powell & Blair, 2007), however it is likely that athletes have even greater benefits, as they engage in strength training to improve performance, which improves bone mineral density. Also, it was

found that sleep is a very important activity for collegiate athletes, as it is associated both with stress and academic performance. And that certain traits, namely optimism, should be fostered, in order to provide better health and academic outcomes.

Future research could build upon this study by incorporating multiple sites, so as to provide a larger sample size and examine effects across a more diverse geography. Further, benefits could be had by athletes if they are given the opportunity to sleep adequately on a regular basis, so as to improve mental health and academic performance. Lastly, coaches and leaders can help foster motivation for athletics, as well as an optimistic attitude, in order to again improve health and academic outcomes.

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Table 1. Participant Characteristics

Characteristic		Wheelchair Team		Running Team	
		M	*SD*	*M*	*SD*
Age		20.7	2.9	19.7	1.4
		n	%	*n*	%
Gender					
	Male	9.0	43.3	13.0	40.0
	Female	10.0	56.7	17.0	60.0
Race					
	American Indian/Alaska Native	1.0	6.3	1.0	3.3
	African American	1.0	6.3	15.0	50.0
	White	11.0	68.8	10.0	30.0
	Native Hawaiian	0.0	0.0	1.0	3.3
	Other	3.0	18.8	3.0	10.0

Table 2. Summary of Correlations Between Potential Covariates and Outcomes

Variable	Gender[a]	Adaptive Status[b]	Previous Trauma[c]
General Stress	.23	-.15	-.09
Academic Stress	.43*	-.15	-.07
GPA	.08	.41*	.24
Body Fat %	.69**	.37*	-.26
BMD	-.17	-.80**	-.15
Max VO2	-.37*	-.83**	-.03

Note: * = $p < .05$, **= $p < .01$.
Note: [a] 0= male, 1 = female
Note: [b] 0 = able-bodied, 1 = physically disabled
Note: [c] 0 = not experienced, 1 = experienced

Table 3. Sequential Regression for Academic Motivation Predicting General Stress

Variable	B	SE	β	
Step 1				$\Delta R^2 = .05$, F (1,46) = 2.37, $p = .13$
Athletic Motivation	2.65	1.72	.22	$t(46) = 1.54$, $p = .13$
Step 2				$R^2 = .05$, F (2,45) = 1.18, $p = .32$
Athletic Motivation	2.95	2.29	.25	$t(45) = 1.29$, $p = .21$
Academic Motivation	-.23	1.19	-.04	$t(45) = -.20$, $p = .84$

Table 4. Sequential Regression for Academic Motivation Predicting Academic Stress

Variable	B	SE	β	
Step 1				ΔR^2 = .18, $F(1,46)$ = 9.93, p = .003
Gender[a]	19.15	6.08	.42	t(46) = 3.15, p = .003
Step 2				ΔR^2 = .001, $F(2,45)$ = 4.89, p = .012
Gender[a]	19.11	6.14	.42	t(45) = 3.11, p = .003
Athletic Motivation	1.14	5.20	.03	t(45) = .22, p = .83
Step 3				ΔR^2 = .002, $F(3,44)$ = 3.23, p = .031
Gender[a]	19.51	6.32	.43	t(44) = .43, p = .003
Athletic Motivation	2.68	6.95	.07	t(44) = .07, p = .39
Academic Motivation	-1.24	3.66	-.06	t(44) = -.06, p = -.34

Note: [a] 0= male, 1 = female

Table 5. Sequential Regression for Academic Motivation Predicting Academic Performance

Variable	B	SE	β	
Step 1				$\Delta R^2 = .18$, $F(1,41) = 8.89$, $p = .01$
Adaptive Y/N[a]	.42	.15	.41	$t(41) = 2.98$, $p = .01$
Step 2				$\Delta R^2 = .01$, $F(2,40) = 4.67$, $p = .02$
Adaptive Y/N[a]	.42	.15	.41	$t(40) = 2.97$, $p = .01$
Athletic Motivation	-.09	.12	-.11	$t(40) = -.73$, $p = .47$
Step 3				$\Delta R^2 = .01$, $F(3,39) = 3.21$, $p = .03$
Adaptive Y/N[a]	.40	.15	.39	$t(39) = 2.76$, $p = .01$
Athletic Motivation	-.16	.16	-.19	$t(39) = -.97$, $p = .34$
Academic Motivation	.06	.09	.13	$t(39) = .65$, $p = .52$

Note: [a] 0 = able-bodied, 1 = physically disabled

Table 6. Sequential Regression for Athletic Motivation Predicting Body Fat Percentage

Variable	B	SE	β	
Step 1				$\Delta R^2 = .74$, $F(2,38) =$, $p < .001$
Gender[a]	18.27	2.02	.75	$t(38) = 9.03$, $p < .001$
Adaptive Y/N[b]	12.09	1.99	.45	$t(38) = 6.08$, $p < .001$
Step 2				$\Delta R^2 = .02$, $F(3,37) =$, $p < .001$
Gender[a]	19.12	2.07	.78	$t(37) = 9.23$, $p < .001$
Adaptive Y/N[b]	13.10	2.07	.78	$t(37) = 6.32$, $p < .001$
Student Motivation	-1.46	.98	-.13	$t(37) = -1.49$, $p = .15$
Step 3				$\Delta R^2 = .01$, $F(4,36) =$, $p < .001$
Gender[a]	19.32	2.08	.79	$t(36) = 9.26$, $p < .001$
Adaptive Y/N[b]	13.44	2.11	.56	$t(36) = 6.37$, $p < .001$
Student Motivation	-2.08	1.19	-.19	$t(36) = -1.75$, $p = .09$
Athletic Motivation	2.19	2.35	.09	$t(36) = .93$, $p = .36$

Note: [a] 0= male, 1 = female

Note: [b] 0 = able-bodied, 1 = physically disabled

Table 7. Sequential Regression for Athletic Motivation Predicting Bone Mineral Density

Variable	B	SE	β	
Step 1				$\Delta R^2 = .64$, $F(1,37) = 66.50$, $p < .001$
Adaptive Y/N[a]	-.26	.03	-.80	$t(37) = -8.16$, $p < .001$
Step 2				$\Delta R^2 < .001$, $F(2,36) = 32.35$, $p < .001$
Adaptive Y/N[a]	-.26	.03	-.80	$t(36) = -7.60$, $p < .001$
Student Motivation	.001	.02	.004	$t(36) = .04$, $p = .97$
Step 3				$\Delta R^2 = .04$, $F(3,35) = 24.7$, $p < .001$
Adaptive Y/N[a]*	-.25	.03	-.78	$t(35) = -7.58$, $p < .001$
Student Motivation	-.02	.02	-.13	$t(35) = -1.05$, $p = .30$
Athletic Motivation	.07	.04	.23	$t(35) = 2.00$, $p = .05$

* $p < .001$.

Note: [a] 0 = able-bodied, 1 = physically disabled

Table 8. Sequential Regression for Athletic Motivation Predicting Aerobic Capacity

Variable	B	SE	B	
Step 1				$\Delta R^2 = .80$, $F(1,42) = 166.06$, $p < .001$
Adaptive Y/N[a]	-21.73	1.90	-.87	$t(42) = -12.89$, $p < .001$
Step 2				$\Delta R^2 < .001$, $F(2,41) = 81.16$, $p < .001$
Adaptive Y/N[a]	-21.88	1.93	-.88	$t(41) = -12.45$, $p < .001$
Student Motivation	.25	.80	.03	$t(41) = .21$, $p = .84$
Step 3				$\Delta R^2 = .001$, $F(3,40) = 53.12$, $p < .001$
Adaptive Y/N[a]	-21.98	1.96	-.89	$t(40) = -12.29$, $p < .001$
Student Motivation	.57	1.1	.06	$t(40) = .45$, $p = .66$
Athletic Motivation	-.87	2.08	-.04	$t(40) = -.44$, $p = .66$

Note: [a] 0 = able-bodied, 1 = physically disabled

Table 9. General Stress Predicted by Academic Motivation with Exploratory Moderators.

Moderator	β	*p*	95% CI	
Optimism x Academic Motivation	-.10	.60	-.48	.28
Self-Control x Academic Motivation	-.07	.59	-.33	.19
Resilience x Academic Motivation	-.003	.97	-.15	.14
Academic Stress x Academic Motiv.	.005	.14	-.96	6.73

Table 10. Academic Stress Predicted by Academic Motivation with Exploratory Moderators.

Moderator	β	*p*	95% CI	
Optimism x Academic Motivation	-.79	.17	-1.96	.36
Self-Control x Academic Motivation	-.36	.41	-1.20	.49
Resilience x Academic Motivation	-.41	.06	-.84	.01
General Stress x Academic Motiv.	.50	.16	-.21	1.20

Table 11. Academic Achievement Predicted by Academic Motivation with Exploratory Moderators

Moderator	β	*p*	95% CI	
Optimism x Academic Motivation	-.003	.86	-.04	.03
Self-Control x Academic Motivation	-.002	.83	-.03	.02
Resilience x Academic Motivation	.0001	.99	-.01	.01
General Stress x Academic Motiv.	-.0008	.94	-.02	.02
Academic Stress x Academic Motiv.	.0002	.94	-.005	.006

Table 12 Body Composition Predicted by Sport Motivation with Exploratory Moderators.

Moderator	β	*p*	95% CI	
Optimism x Sport Motivation	-.70	.19	1.76	.36
Self-Control x Sport Motivation	-.47	.14	-1.09	.16
Resilience x Sport Motivation	-.22	.24	-.61	.16
General Stress x Sport Motivation	.12	.68	-.49	.74
Academic Stress x Sport Motivation	.07	.43	-.11	.26

Table 13. Bone Density Predicted by Sport Motivation with Exploratory Moderators

Moderator	β	*p*	95% CI	
Optimism x Sport Motivation	-.007	.36	-.02	.009
Self-Control x Sport Motivation	.01	.15	-.002	.02
Resilience x Sport Motivation	.005	.09	-.009	.01
General Stress x Sport Motivation	-.002	.70	-.01	.007
Academic Stress x Sport Motivation	-.001	.87	-.003	.002

Table 14. Maximal Aerobic Capacity Predicted by Sport Motivation with Exploratory Moderators.

Moderator	β	*p*	95% CI	
Optimism x Sport Motivation	-.06	.16	-.14	.03
Self-Control x Sport Motivation	-.05	.02	-.09	-.01
Resilience x Sport Motivation	-.009	.59	-.04	.02
General Stress x Sport Motivation	.03	.02	-.006	.08
Academic Stress x Sport Motivation	-.002	.97	-.01	.01

Table 15. Sequential Regression for Optimism Predicting Aerobic Performance

Variable	B	SE	β	
Step 1				R^2 = .83, F(2,40) = 100.09, p <.001
Gender	-.82	.16	-.34	t(40) = -5.29, p <.001
Adaptive Status	-2.08	.16	-.84	t(40) = -12.97, p <.001
Step 2				R^2 = .72, F(3,39) = 83.96, p < .001
Gender	-.84	.14	-.35	t(39) = -5.96, p <.001
Adaptive Status	-2.16	.15	-.87	t(39) = -14.59, p <.001
Optimism	.06	.02	.18	t(39) = 3.07, p = .004

Table 16. Associations Among Predictors, Exploratory Moderators, & Outcomes Controlling for Gender & Adaptive Status

Variables	Athletic Motivation	Student Motivation	Optimism	Self-Control	Resilience	General Stress	Academic Stress	GPA	Body Composition	BMD	VO^2 Max
Athletic Motivation	1										
Student Motivation	.68*	1									
Optimism	-.10	.16	1								
Self-Control	-.37	-.05	.52*	1							
Resilience	-.15	-.03	.45*	.44	1						
General Stress	.23	.05	-.51*	-.51*	-.42	1					
Academic Stress	.004	-.12	-.45	-.36	-.30	.49*	1				
GPA	-.12	-.02	.25	.25	.04	-.20	-.23	1			
Body Composition	-.04	-.25	.15	-.19	-.07	.12	.16	.18	1		
BMD	.31	.28	.22	.17	-.11	-.04	-.08	.16	.25	1	
VO^2 Max	.06	.08	.44*	-.08	.11	.05	-.10	.30	.29		1

* $p < .05$

Table 17. Associations Among Health, Academic, and Physical Outcomes

Variables	PSQI	Alcohol Use	General Stress	Academic Stress	GPA	Body Composition	BMD	VO^2 Max
PSQI	1							
Alcohol Use	.02	1						
General Stress	.33*	.21	1					
Academic Stress	.26	-.09	.49*	1				
GPA	-.29**	.26	-.20	-.23	1			
Body Composition	.01	-.19	.12	.16	.18	1		
BMD	.004	.25	-.04	-.08	.16	.25	1	
VO^2 Max	.20	.19	.05	-.10	.30	.29	.50*	1

* $p < .05$, ** $p = .06$.

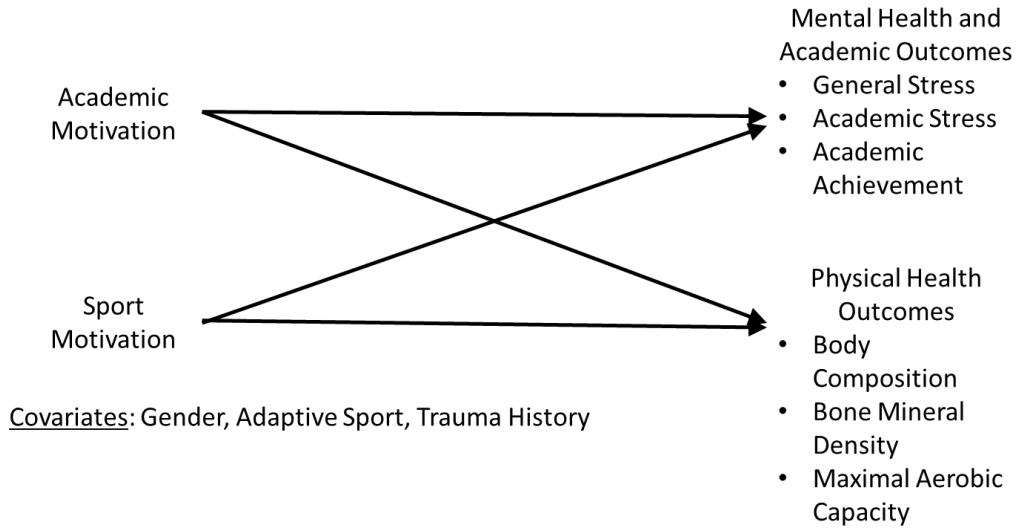

Figure 1. Conceptual Model for Aim 1

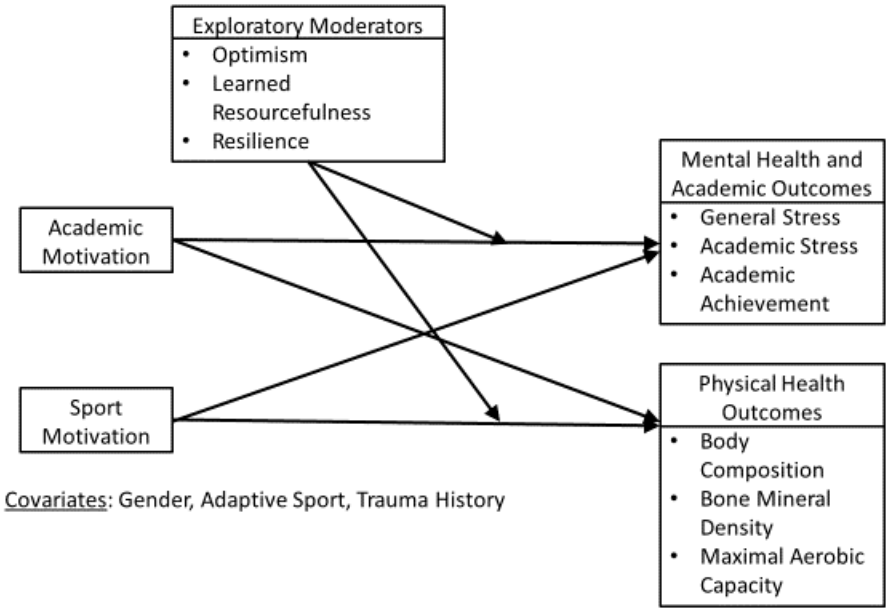

Figure 2a. Conceptual model for Exploratory Moderator Effects in Aim 2

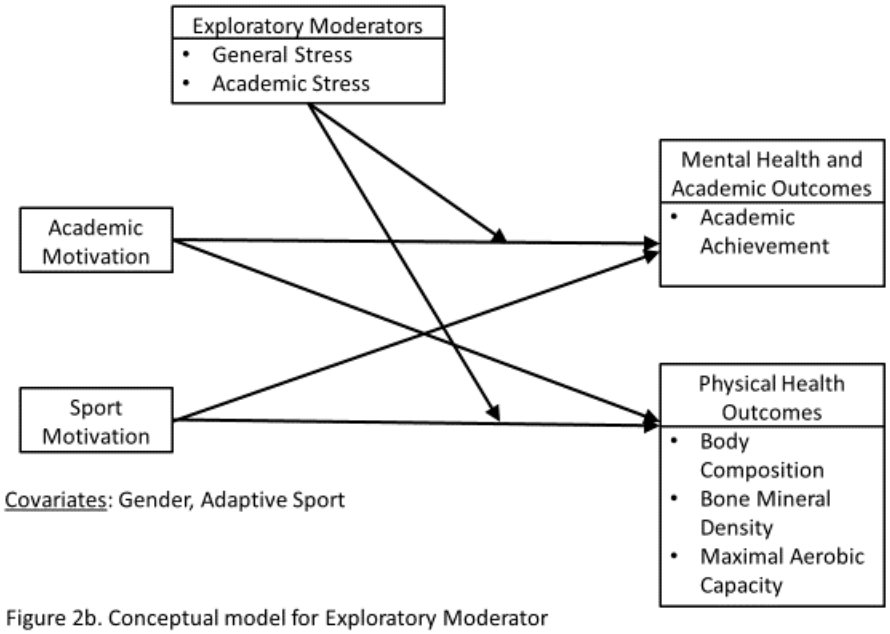

Figure 2b. Conceptual model for Exploratory Moderator Effects of Stress in Aim 2

Figure 2b. Conceptual Model for Exploratory Moderator Effects of Stress in Aim 2

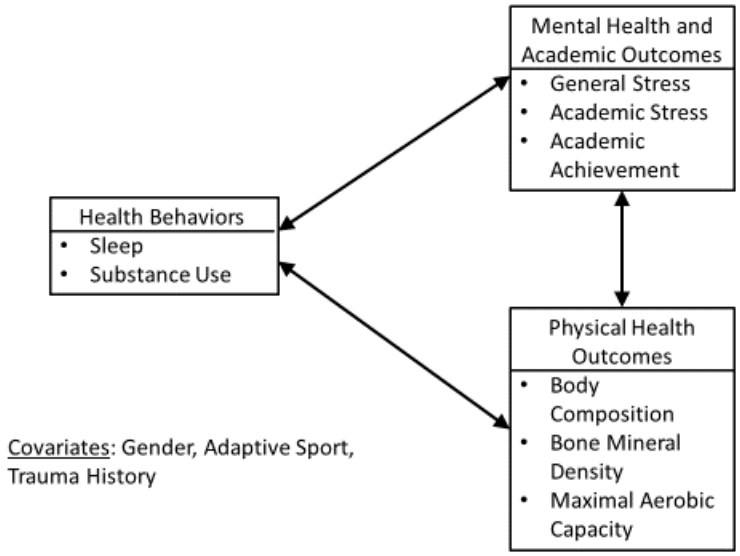

Figure 3. Conceptual Model for Aim 3

Appendix A. Measures

Pittsburgh Sleep Quality Index

INSTRUCTIONS:

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. You may skip any questions you do not wish to answer.

1.During the past month, what time have you usually gone to bed at night?

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, what time have you usually gotten up in the morning?

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 spent in bed)

HOURS OF SLEEP PER NIGHT_____

For each of the remaining questions, check the one best response. Please answer all questions.

5. During the past month, how often have you had trouble sleeping because you…
(You may skip any questions you do not wish to answer)

	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
a) Cannot get to sleep within 30 minutes	☐ 1.	☐ 2.	☐ 3.	☐ 4.
b) Wake up in the middle of the night or early morning	☐ 1.	☐ 2.	☐ 3.	☐ 4.

c) Have to get up to use the bathroom	☐ 1.	☐ 2.	☐ 3.	☐ 4.
d) Cannot breathe comfortably	☐ 1.	☐ 2.	☐ 3.	☐ 4.
e) Cough or snore loudly	☐ 1.	☐ 2.	☐ 3.	☐ 4.
f) Feel too cold	☐ 1.	☐ 2.	☐ 3.	☐ 4.
g) Feel too hot	☐ 1.	☐ 2.	☐ 3.	☐ 4.
h) Had bad dreams	☐ 1.	☐ 2.	☐ 3.	☐ 4.
i) Have pain	☐ 1.	☐ 2.	☐ 3.	☐ 4.

j) other reason(s), please describe:_____

	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
k) How often during the past month have you had trouble sleeping because of this?	☐ 1.	☐ 2.	☐ 3.	☐ 4.

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

Very good	Fairly good	Fairly bad	Very bad
☐ 1.	☐ 2.	☐ 3.	☐ 4.

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

Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
☐ 1.	☐ 2.	☐ 3.	☐ 4.

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

Academic Stress Scale

Directions: On the first scale, please answer how stressful are these tasks for you, **from 0=not at all stressful to 10=extremely stressful.**
You may skip any questions you do not wish to answer.

Task	Not Stressful										Very Stressful
Studying	0	1	2	3	4	5	6	7	8	9	10
Asking questions in class	0	1	2	3	4	5	6	7	8	9	10
Keeping up with the required readings	0	1	2	3	4	5	6	7	8	9	10
Understanding my professors	0	1	2	3	4	5	6	7	8	9	10
Writing term papers	0	1	2	3	4	5	6	7	8	9	10
My parents' expectations of my grades	0	1	2	3	4	5	6	7	8	9	10
Making friends at school	0	1	2	3	4	5	6	7	8	9	10
Doing well on exams	0	1	2	3	4	5	6	7	8	9	10
Talking to college staff	0	1	2	3	4	5	6	7	8	9	10
Finding time to study	0	1	2	3	4	5	6	7	8	9	10
Understanding my textbooks	0	1	2	3	4	5	6	7	8	9	10
Participating in class discussions	0	1	2	3	4	5	6	7	8	9	10
Understanding college regulations	0	1	2	3	4	5	6	7	8	9	10

Student Athletes' Motivation Toward Sports & Academics Questionnaire

Please indicate your level of agreement with each of the following statements. You may skip any questions you do not wish to answer.

		Very Strongly Agree					Very Strongly Disagree
1.	I am confident that I can achieve a high grade point average this year (3.0 or above).	1	2	3	4	5	6
2.	Achieving a high level of performance in my sport is an important goal for me this year.	1	2	3	4	5	6
3.	It is important for me to learn what is taught in my courses.	1	2	3	4	5	6
4.	I am willing to put in the time to earn excellent grades in my courses.	1	2	3	4	5	6
5.	The most important reason why I am in school is to play my sport.	1	2	3	4	5	6
6.	The amount of work required in my courses interferes with my athletic goals.	1	2	3	4	5	6
7.	I will be able to use what is taught in my courses in different aspects of my life outside of school.	1	2	3	4	5	6
8.	Earning a high grade point average (3.0 or above) is not an important goal for me this year.	1	2	3	4	5	6
9.	It is important to me to learn the skills and strategies taught by my coaches.	1	2	3	4	5	6
10.	It is important for me to do better than other athletes in my sport.	1	2	3	4	5	6
11.	The time I spend engaged in my sport is enjoyable to me.	1	2	3	4	5	6
12.	It is worth the effort to be an exceptional athlete in my sport.	1	2	3	4	5	6
13.	Participation in my sport interferes with my progress towards earning a college degree.	1	2	3	4	5	6

		Very Strongly Agree					Very Strongly Disagree
14.	I get more satisfaction from earning an "A" in a course toward my major than winning a game in my sport.	1	2	3	4	5	6
15.	During the years I compete in my sport, completing a college degree is not a goal for me.	1	2	3	4	5	6
	I have some doubt about my ability to earn high grades in some of my courses.	1	2	3	4	5	6
16.	I am confident that I can earn a college degree.	1	2	3	4	5	6
17.	I will be able to use the skills I learn in my sport in other areas of my life outside of sports.	1	2	3	4	5	6
18.	I get more satisfaction from winning a game in my sport than from getting an "A" in a course toward my major.	1	2	3	4	5	6
19.	It is not important for me to perform better than other students in my courses.	1	2	3	4	5	6
20.	I am willing to put in the time to be outstanding in my sport.	1	2	3	4	5	6
21.	The content of most of my courses is interesting to me.	1	2	3	4	5	6
22.	The most important reason why I am in school is to earn a degree.	1	2	3	4	5	6
23.	It is not worth the effort to earn excellent grades in my courses.	1	2	3	4	5	6

Substance Use

Do you currently drink alcohol, or has there ever been a time in your life when you did drink alcohol on a fairly regular basis?

☐ 1. Yes ☐ 0. No If NO, please skip.

1a. ***When did you start using alcohol regularly?*** _____

1b. ***If you no longer drink alcohol regularly, when did you quit?*** _____

1c. ***During the time of your regular alcohol use, how many days in an average month are there when you have at least one drink?*** _____

1d. ***On days that you drink, how many drinks (on average) do you (or did you) have?*** _____

Do you currently or have you ever used any of the following drugs on a regular basis: cocaine/crack, marijuana/pot, stimulants/uppers, LSD/mescaline, tranquilizers, pain killers, heroin/opiates, PCP, sniff gases or fumes?

☐ 1. Yes ☐ 0. No

2a. ***When did you start using drugs?*** _____

2b. ***If you no longer use drugs regularly, when did you quit?*** _____

Do you currently smoke cigarettes?

☐ 1. Yes ☐ 0. No

Do you currently use other tobacco products, such as cigars, pipes or chewing tobacco?

☐ 1. Yes ☐ 0. No

Perceived Stress Scale

The questions in this scale ask you about your feelings and thoughts **during the last month**. In each case, you will be asked to indicate by circling *how often* you felt or thought a certain way. You may skip any questions you do not wish to answer.

		Never	Almost Never	Sometimes	Fairly Often	Very Often
1.	In the last month, how often have you been upset because of something that happened unexpectedly?	0	1	2	3	4
2.	In the last month, how often have you felt that you were unable to control the important things in your life?	0	1	2	3	4
3.	In the last month, how often have you felt nervous and “stressed”?	0	1	2	3	4
4.	In the last month, how often have you felt confident about your ability to handle your personal problems?	0	1	2	3	4
5.	In the last month, how often have you felt that things were going your way?	0	1	2	3	4
6.	In the last month, how often have you found that you could not cope with all the things that you had to do?	0	1	2	3	4
7.	In the last month, how often have you been able to control irritations in your life?	0	1	2	3	4
8.	In the last month, how often have you felt that you were on top of things?	0	1	2	3	4
9.	In the last month, how often have you been angered because of things that were outside of your control?	0	1	2	3	4
10.	In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?	0	1	2	3	4

Self-Control Scale

Using the scale provided, please indicate how much each of the following statements reflects how you typically are. **You may skip any questions you do not wish to answer.**

	Not at all				Very much
1. I am good at resisting temptation.	**1**	**2**	**3**	**4**	**5**
R2. I have a hard time breaking bad habits.	**1**	**2**	**3**	**4**	**5**
R3. I am lazy.	**1**	**2**	**3**	**4**	**5**
R4. I say inappropriate things.	**1**	**2**	**3**	**4**	**5**
R5. I do certain things that are bad for me, if they are fun.	**1**	**2**	**3**	**4**	**5**
6. I refuse things that are bad for me.	**1**	**2**	**3**	**4**	**5**
R7. I wish I had more self-discipline.	**1**	**2**	**3**	**4**	**5**
8. People would say that I have iron self-discipline.	**1**	**2**	**3**	**4**	**5**
R9. Pleasure and fun sometimes keep me from getting work done.	**1**	**2**	**3**	**4**	**5**
R10. I have trouble concentrating.	**1**	**2**	**3**	**4**	**5**
11. I am able to work effectively toward long-term goals.	**1**	**2**	**3**	**4**	**5**
R12. Sometimes I can't stop myself from doing something, even if I know it is wrong.	**1**	**2**	**3**	**4**	**5**
R13. I often act without thinking through the alternatives.	**1**	**2**	**3**	**4**	**5**

Connor Davidson Resilience Scale

Choose the answer that you most identify with in the given statement.

	Not True At All	Rarely True	Sometimes True	Often True	True Nearly All of The Time
1. I feel that I am able to adapt to change	0	1	2	3	4
2. I have close and secure relationships	0	1	2	3	4
3. Sometimes fate or God can help	0	1	2	3	4
4. I can deal with whatever comes	0	1	2	3	4
5. Past success gives confidence for new challenge	0	1	2	3	4
6. I can see the humorous side of things	0	1	2	3	4
7. Coping with stress can strengthen me	0	1	2	3	4
8. I tend to bounce back after illness or hardship	0	1	2	3	4
9. Things happen for a reason	0	1	2	3	4
I put forth my best effort no matter what	0	1	2	3	4
10. I can achieve my goals	0	1	2	3	4
11. When things look hopeless, I don't give up	0	1	2	3	4
12. I know where to turn for help	0	1	2	3	4
13. When under pressure, I focus and think clearly	0	1	2	3	4
14. I prefer to take the lead in problem solving	0	1	2	3	4
15. I am not easily discouraged by failure	0	1	2	3	4
16. I think of myself as a strong person	0	1	2	3	4
17. I am able to make unpopular or difficult decisions	0	1	2	3	4
18. I can handle unpleasant feelings	0	1	2	3	4
19. I have to act on a hunch	0	1	2	3	4
20. I have a strong sense of purpose	0	1	2	3	4
21. I feel in control of my life	0	1	2	3	4
22. I like challenges	0	1	2	3	4

23. I work to attain my goals	0	1	2	3	4
24. I take pride in my achievements	0	1	2	3	4

Revised Life Orientation Test

Please answer the following questions about yourself by indicating the extent of your agreement using the following scale:

Be as honest as you can throughout, and try not to let your responses to one question influence your response to other questions. There are no right or wrong answers. You may skip any questions you do not wish to answer.

		strongly DISagree	DISagree	neutral	agree	strongly agree
1.	In uncertain times, I usually expect the best.	0	1	2	3	4
2.	It's easy for me to relax.	0	1	2	3	4
3.	If something can go wrong for me, it will.	0	1	2	3	4
4.	I'm always optimistic about my future.	0	1	2	3	4
5.	I enjoy my friends a lot.	0	1	2	3	4
6.	It's important for me to keep busy.	0	1	2	3	4
7.	I hardly ever expect things to go my way.	0	1	2	3	4
8.	I don't get upset too easily.	0	1	2	3	4
9.	I rarely count on good things happening to me.	0	1	2	3	4
10.	Overall, I expect more good things to happen to me than bad.	0	1	2	3	4

Posttraumatic Checklist

Instructions: Below is a list of problems that people sometimes have in response to a very stressful experience. Please read each problem carefully and then circle one of the numbers to the right to indicate how much you have been bothered by that problem in the past month. You may skip any questions you do not wish to answer.

In the past month, how much were you bothered by:	***Not at all***	***A little bit***	***Moderately***	***Quite a bit***	***Extremely***
1. Repeated, disturbing, and unwanted memories of the stressful experience?	**0**	**1**	**2**	**3**	**4**
2. Repeated, disturbing dreams of the stressful experience?	**0**	**1**	**2**	**3**	**4**
3. Suddenly feeling or acting as if the stressful experience were actually happening again (as if you were actually back there reliving it)?	**0**	**1**	**2**	**3**	**4**
4. Feeling very upset when something reminded you of the stressful experience?	**0**	**1**	**2**	**3**	**4**
5. Having strong physical reactions when something reminded you of the stressful experience (for example, heart pounding, trouble breathing, sweating)?	**0**	**1**	**2**	**3**	**4**
6. Avoiding memories, thoughts, or feelings related to the stressful experience?	**0**	**1**	**2**	**3**	**4**
7. Avoiding external reminders of the stressful experience (for example, people, places, conversations, activities, objects, or situations)?	**0**	**1**	**2**	**3**	**4**
8. Trouble remembering important parts of the stressful experience?	**0**	**1**	**2**	**3**	**4**

In the past month, how much were you bothered by:	***Not at all***	***A little bit***	***Moderately***	***Quite a bit***	***Extremely***
9. Having strong negative beliefs about yourself, other people, or the world (for example, having thoughts such as: I am bad, there is something seriously wrong with me, no one can be trusted, the world is completely dangerous)?	**0**	**1**	**2**	**3**	**4**
10. Blaming yourself or someone else for the stressful experience or what happened after it?	**0**	**1**	**2**	**3**	**4**
11. Having strong negative feelings such as fear, horror, anger, guilt, or shame?	**0**	**1**	**2**	**3**	**4**
12. Loss of interest in activities that you used to enjoy?	**0**	**1**	**2**	**3**	**4**
13. Feeling distant or cut off from other people?	**0**	**1**	**2**	**3**	**4**
14. Trouble experiencing positive feelings (for example, being unable to feel happiness or have loving feelings for people close to you)?	**0**	**1**	**2**	**3**	**4**
15. Irritable behavior, angry outbursts, or acting aggressively?	**0**	**1**	**2**	**3**	**4**
16. Taking too many risks or doing things that could cause you harm?	**0**	**1**	**2**	**3**	**4**
17. Being “superalert” or watchful or on guard?	**0**	**1**	**2**	**3**	**4**
18. Feeling jumpy or easily startled?	**0**	**1**	**2**	**3**	**4**
19. Having difficulty concentrating?	**0**	**1**	**2**	**3**	**4**
20. Trouble falling or staying asleep?	**0**	**1**	**2**	**3**	**4**

Live Events Checklist

Listed below are a number of difficult or stressful things that sometimes happen to people. For each event check one or more of the boxes to the right to indicate that: (a) it ***happened to you*** personally; (b) you ***witnessed it*** happen to someone else; (c) you ***learned about it*** happening to a close family member or close friend; (d) you were exposed to it as ***part of your job*** (for example, paramedic, police, military, or other first responder); (e) you're ***not sure*** if it fits; or (f) it ***doesn't apply*** to you. You may skip any questions you do not wish to answer.

Be sure to consider your ***entire life*** (growing up as well as adulthood) as you go through the list of events.

	Event	Happened to me	Witnessed it	Learned about it	Part of my job	Not Sure	Doesn't Apply
1.	Natural disaster (for example, flood, hurricane, tornado, earthquake)	5	4	3	2	1	0
2.	Fire or explosion	5	4	3	2	1	0
3.	Transportation accident (for example, car accident, boat accident, train wreck, plane crash)	5	4	3	2	1	0
4.	Serious accident at work, home, or during recreational activity	5	4	3	2	1	0
5.	Exposure to toxic substance (for example, dangerous chemicals, radiation)	5	4	3	2	1	0
6.	Physical assault (for example, being attacked, hit, slapped, kicked, beaten up)	5	4	3	2	1	0

7.	Assault with a weapon (for example, being shot, stabbed, threatened with a knife, gun, bomb)	5	4	3	2	1	0
8.	Sexual assault (rape, attempted rape, made to perform any type of sexual act through force or threat of harm)	5	4	3	2	1	0
9.	Other unwanted or uncomfortable sexual experience	5	4	3	2	1	0
10.	Combat or exposure to a war-zone (in the military or as a civilian)	5	4	3	2	1	0
11.	Captivity (for example, being kidnapped, abducted, held hostage, prisoner of war)	5	4	3	2	1	0
12.	Life-threatening illness or injury	5	4	3	2	1	0
13.	Severe human suffering	5	4	3	2	1	0
14.	Sudden violent death (for example, homicide, suicide)	5	4	3	2	1	0
15.	Sudden accidental death	5	4	3	2	1	0

16.	Serious injury, harm, or death you caused to someone else	5	4	3	2	1	0
17.	Any other very stressful event or experience?	5	4	3	2	1	0