Health Outcomes of Adolescents and Young Adults after Traumatic Injury: The Role of Stress Resilience and Social Support

Belanie Peavy
University of Texas Health Science Center at Houston-Cizik School of Nursing

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HEALTH OUTCOMES OF ADOLESCENTS AND YOUNG ADULTS AFTER TRAUMATIC INJURY: THE ROLE OF STRESS, RESILIENCE, AND SOCIAL SUPPORT

A DISSERTATION
SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN NURSING

THE UNIVERSITY OF TEXAS HEALTH SCIENCE CENTER AT HOUSTON SCHOOL OF NURSING

BY

BELANIE G. PEAZY, MSN, ACNP-BC

DECEMBER 2018
To the Dean for the School of Nursing:

I am submitting a dissertation written by Belanie G. Peavy and entitled "Health Outcomes of Adolescents and Young Adults after Traumatic Injury: The Role of Stress Resilience and Social Support." I have examined the final copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Nursing.

Rebecca Casarez, Committee Chair

We have read this dissertation and recommend its acceptance.

Accepted

Dean for the School of Nursing
Belanie Peavy
Health Outcomes of Adolescent and Young Adults Following Traumatic Injury: The Role of Stress, Resilience, and Social Support
December 2018

Abstract

Background: Traumatic injury is a major health problem and has been linked to mental and physical disability following injury. Although it is the leading cause of disability in the United States (US) for adolescents and young adults, there is a paucity of evidence in the literature regarding association(s) of perceived stress on the outcomes of anxiety and depressive symptoms and the moderating role of resilience and social support in which to develop prevention and treatment interventions for this patient population.

Purpose: The purpose of this study was to examine the effect the relationship of perceived stress on anxiety and depressive symptoms in adolescents and young adults who had been hospitalized for treatment following traumatic injury at one point in time on the trauma floor at a Level I in-patient trauma center acute care facility. The moderating effect of resilience and social support in the relationship between perceived stress and anxiety and depressive symptoms was also explored.

Methods: Face to face interviews were conducted in this cross-sectional research design for subjects admitted to an in-patient trauma unit. Data were collected via the Perceived Stress Scale (PSS), the Mood and Anxiety Symptom Questionnaire (MASQ), the Connor-Davidson Resilience Scale (CD-RISC-10), and the Medical Outcomes Study-Social Support Scale (MOS-SSS). Multiple
linear regression in the form of the general linear model was utilized to test 5 variables to describe the population and associations among the psychosocial factors.

**Results:** A total of 68 candidates were enrolled into the study after exclusions. Consequently, 73.5% were male and 26.5% were female whereas 23.5% were African Americans, 19% Caucasians, 51.5% of Hispanic origin and 6% classified as other with a mean age of 20.6. The results suggest that perceived stress, gender, and ethnicity are significantly associated with arousal anxiety (AA). The results indicate that males had higher AA scores than females ($p = .023$), African Americans and Caucasians had higher AA scores than Hispanics ($p = .021$), and higher perceived stress was associated with higher AA scores ($p = .001$). These findings suggest that an increase in stress is significantly associated with higher anxiety following physical traumatic injury. Anhedonic depression and perceived stress as well as the moderating roles of resilience and social support were non-significant.

**Conclusion:** The current study has revealed significance with perceived stress and anxiety as well as perceived stress between ethnicity and gender in adolescents and young adults who have experienced physical traumatic injury. Early identification, treatment and referral are possible solutions to address mental health issues associated with physical traumatic injury in adolescents and young adults and may ultimately contribute to prevention of untoward long-term patient outcomes. Health care may benefit from further study in the adolescent-
young adult population focusing on treatment and intervention and evidenced-based practice in the clinical setting.
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Summary of Study

A traumatic event may be a threat of death, serious injury or sexual assault experienced or witnessed by the victim. Traumatic injury includes blunt, penetrating or burn injuries inflicted upon an individual by either self-inflicted intent, assault from other individual(s) and/or incidental events from vehicles, machinery and/or falls. Traumatic events are stressors which have a direct impact on the person-environment transaction and the victim draws upon internal and external coping skills to deal with this disruption. Protective factors function in a catalytic fashion and can reside with the individual or the family, community, or institutions and can be biological and psycho social in nature. Exposure to traumatic injury has been linked to depression, anxiety and long-term development of PTSD (Suliman et al. 2009). Individuals who suffer from physical traumatic injury appraise the meaning of those events to different extents based on their own personal appraisal of the situation and in reference to their internal and external resources (Lazarus and Folkman, 1984).

Resilience and social support (protective factors) may act as moderators in the relationship between perceived stress and its effects on anxiety and depressive symptoms. Resilience refers to the dynamic process encompassing positive adaptation within the context of significant adversity and the maintenance of positive adjustment in the context of physical traumatic exposure (Lereya et al. 2016). Social support has a multidimensional nature as well as a stress-buffering effect which may include family, friends and other individuals in the community. It provides an empathetic safe environment in which individuals
are encouraged to share their experiences, thoughts and feelings and often referred to as a buffer against negative effects of stress (Wang, Cai, Qian and Peng, 2014).

There is scarce evidence in the literature with which to examine adolescents and young adults who have endured physical traumatic injury and the exploration of effects of perceived stress on anxiety and depressive symptom outcomes as well as the moderating effects of resilience and social support between perceived stress and anxiety and depressive symptoms. This study shifts from previous investigations which focused on veterans, young children and older adults and sought to analyze older adolescents and young adults, a population that experiences a high rate of traumatic injuries and is vulnerable to its negative psychological sequelae. A research base with focus on this critical stage of development will open up new avenues for developing interventions to prevent and address the negative psychological effects of physical traumatic injury which are tailored to the needs of older adolescents and young adults. This cross-sectional research design examined the effect of perceived stress on health outcomes (anxiety and depressive symptoms) and the moderating effect of resilience and social support in the relationship between perceived stress and health outcomes (anxiety and depressive symptoms).

Multiple linear regression in the form of the general linear model (GLM) was used to test for associations between perceived stress scale (PSS) score and arousal anxiety (AA) as well as anhedonic depression (AD) after adjusting for age, gender, and ethnicity. Results revealed that perceived stress was
significantly associated with anxiety arousal (p = .001). Gender (p= .023) and ethnicity (p = .021) were also significantly associated with perceived stress on AA. No significant relationship was found with anhedonic depression and perceived stress. Likewise, resilience and social support were non-significant in moderating the effects of perceived stress on outcomes of anxiety and depressive symptoms.
Proposal

Specific Aims

In 2011 alone, greater than 700,000 youth aged 10 to 24 years presented to the emergency department (ED) for trauma related injuries (DiMaggio et al. 2016). DiMaggio et al. found that there were 20,635,360 inpatient traumatic injury discharges in the US between 2000 and 2011, representing 4.4% of the total 465,342,651 all-cause hospital discharges during that time. The top three causes of nonfatal injury for adolescents and young adults 15-24 years of age included falls, struck by or against, and motor vehicle crashes (MVC), which accounted for 46.2% of all causes of injury within this age group (Centers for Disease Control [CDC], 2015). DiMaggio et al. also revealed that for all traumatic injury hospital discharges, the proportion of male and female discharges was approximately evenly split, with 50.2% female. The researchers discovered that population based rates of traumatic injury discharges for children and younger adults declined from 2000 to 2011, while rates for older adults held constant. Trauma (all types of injury) is a major health problem, as it remains a leading cause of death and disability in the United States for adolescents and young adults (CDC, 2012).

Although survival after trauma has been historically the outcome of interest, studies have examined the psychological impact on individuals who survive a traumatic physical injury (Wiseman, Foster and Curtis, 2013). Individuals who suffer from traumatic injury appraise the meaning of those events based upon their own personal appraisal of the situation. Perceived stress is the degree to which situations in one's life are perceived as stressful and influences
the way people interact with other people, their circumstances and response to life events which may be detrimental or beneficial to their psychosocial and physical well-being (Lazarus and Folkman, 1984). Suliman et al. (2009) have shown in their research that relationships exist between perceived stress and anxiety and depressive symptoms after physical injury.

Adverse effects of perceived stress on anxiety and depressive symptoms can be modified by resilience and social support. These two protective factors will be investigated in the proposed study as buffers against the effects of perceived stress on anxiety and depressive symptoms following injury. Resilience refers to the dynamic process encompassing positive adaptation within the context of significant adversity and the maintenance of positive adjustment in the context of this exposure [Lereya et al. (2016)]. Social support has a multidimensional nature as well as a stress-buffering effect. Social support includes family support, friends and other individuals in the community. It provides an empathetic safe environment in which individuals are encouraged to share their experiences, thoughts and feelings. It is often referred to as a buffer against negative effects of stress [Wang et al. (2014)].

Although various studies of resilience and traumatic injury have been conducted in different populations and settings, few have examined adolescents and young adults and their ability to cope with the psychological distress associated with traumatic injury based on their level of resilience and resources of social support. Therefore, it is the intent of this study to examine adolescents and young adults who have been hospitalized for treatment following traumatic
injury at one point in time upon admission to the trauma floor at a Level I trauma center in an acute care facility. The gap in knowledge in which this proposal will fill includes trauma injury victims 16-25 years of age as most studies have focused on children or adults ages 18 and up. Questions remain as to whether the level of perceived stress affects their health outcomes of anxiety and depressive symptoms and whether resilience and social support moderate those effects of perceived stress on health outcomes of anxiety and depressive symptoms following traumatic injury. We will use a cross-sectional research design with data collection occurring during hospitalization following traumatic injury in adolescents and young adults. The specific aims and hypotheses are to:

1. Examine the effect of perceived stress on health outcomes (anxiety and depressive symptoms).
   
   1.1. It is hypothesized that higher levels of perceived stress will be associated with higher anxiety and depressive symptoms;

2. Examine the moderating effect of resilience and social support in the relationship between perceived stress and health outcomes (anxiety and depressive symptoms).
   
   2.1. It is hypothesized that higher levels of resilience and social support will buffer the negative effects of perceived stress on health outcomes (anxiety and depressive symptoms).

The findings will provide a foundation for subsequent longitudinal studies to ascertain the psychological sequelae and coping resources that may emerge or diminish after hospital discharge. The long-term goals of this research study are
to determine if early post-injury depressive and anxiety symptoms lead to posttraumatic stress disorder (PTSD). Subsequently, research studies will be designed to test intervention strategies to address anxiety and depressive symptoms after traumatic injury and help to prevent PTSD. Minimizing adverse outcomes as they relate to injury science is an important public health issue, particularly for high-risk adolescents and young adults

**Research Strategy**

**Significance**

A traumatic event may be a threat of death, serious injury or sexual assault experience and/or witnessed by the victim. Examples of traumatic events from DSM-5 include physical attack, physical abuse, mugging, sexual violence, and other serious accidents. Traumatic injury includes blunt, penetrating or burn injuries inflicted upon an individual by either self-inflicted intent, assault from other individual(s) and/or incidental events from vehicles, machinery and/or falls. For females, unintentional motor vehicle (MV) traffic occupant injury ranked third as leading cause of non-fatal injury, but for males, it ranked fifth after the unintentional struck by/against, and unintentional cut/pierce categories. Fatal and non-fatal injuries are a major public health problem for all US residents because, in 2001, approximately 157,000 persons died as a result of injury and one in 10 persons was treated for an injury in a US hospital ED (CDC, 2015). For every death, an estimated 10 persons were hospitalized/transfered for specialized medical care, and 178 persons were treated and released from a US hospital ED (CDC, 2015).
Conceptual Framework

The basic conceptual framework used as a foundation for this study is a person-environment paradigm which integrates conceptual relationships and other factors which are activated following severe traumatic injury (Edwards and Cooper, 1990). In the absence of stress, a good person-environment fit exists and the person’s skills and abilities match a clearly defined, consistent set of role expectations. When stress is introduced to the environment, depressive and anxiety symptoms may result when role expectations are confusing and/or conflicting, or when the person’s skills and abilities to manage stress do not meet the demands of the social roles. Traumatic events are stressors which have a direct impact on the person-environment transaction and the victim draws upon internal and external coping skills to deal with the disruption. Protective factors, including biological and psychosocial domains may modify, ameliorate, or alter a person’s response to some environmental hazard that predisposes to a maladaptive outcome (Rutter, 1985). Protective factors function in a catalytic fashion and can reside with the individual or the family, community, or institutions and can be biological and psycho social in nature.

The two protective factors that will be investigated in this study are social support and resilience. Social support includes family support, friends and other individuals in the community. It provides an empathetic safe environment in which individuals are encouraged to share their experiences, thoughts and feelings. It is often referred to as a buffer against negative effects of stress [Wang et al. (2014)]. The metatheory of resiliency and resilience model by Glen E. Richardson supports coping with disruptive events by reintegration phases of
resilience (Richardson, 2002). According to Richardson’s conceptualization, loss means that people give up some motivation, hope or drive because of the demands that life prompts. Optimal coping, positive outcomes, moderate stress, and high resilience cause recovery and homeostasis. The positive outcomes as a result of recovery and homeostasis are mental and physical healthiness and personal growth. Minimal coping, negative adaptation, severe stress and low resilience can cause loss and dysfunction. The potentially negative outcomes that result from loss and dysfunction are anxiety and depressive symptoms which may lead to PTSD.

In the current study, perceived stress from traumatic injury or the appraisal of the stressor, experienced or witnessed, involve actual or threatened death or serious injury or a threat to the physical integrity of self or others (American Psychiatric Association [APA], 2013). It is hypothesized that the person’s perception or appraisal of the stressor will be associated with health outcomes of anxiety and depressive symptoms. It is further hypothesized that the levels of resilience and social support may buffer negative effects of perceived stress levels on health outcomes (anxiety and depressive symptoms). If the stress level is high, depressive and anxiety symptoms will also increase. If resilience and social support levels are high, levels of adverse health outcomes (anxiety and depressive symptoms) may decrease, even in the presence of high stress levels. Resilience and social support are moderating variables and their effects will buffer the negative effects of perceived stress on health outcomes (anxiety and depressive symptoms).
Figure 1. Conceptual Framework - depicts relationship between perceived stress and traumatic injury and health outcomes of anxiety (A) and depressive (D) symptoms as well as resilience and social support as moderating variables which have a buffering effect in the relationship between perceived stress and health outcomes (A & D Symptoms).

Exposure to traumatic injury has been linked to depression, anxiety and long-term development of PTSD (Suliman et al. [2009]). Additionally, early emotional disorders of depressive symptoms and extreme anxiety after injury serve as significant predictors of future psychological maladjustment (van der Kolk and Fisler, [1995]; van der Kolk, [2000]), and generalized anxiety disorders are among the most prevalent psychiatric disorders in the United States (Kessler, Chiu, Demler, Merikangas and Walters [2005]; Hilbert, Lueken, Muehlhan and Beesdo-Baum, [2017]). Individuals who suffer from traumatic injury appraise the meaning of those events to different extents based upon their own personal appraisal of the situation and in reference to their internal and external resources (Lazarus and Folkman, 1984). Stress, therefore, is the body’s nonspecific physical and mental response to any demand placed upon it, whether pleasant or not (Encyclopedia Britannica, 2008).
Stress and Perceived Stress

Everyone needs a certain level of stress to function optimally. However, when too much demand is placed upon the body, it can no longer function maximally. Stress may be categorized as acute or chronic in duration and physical or psychological in domain (Larzelere and Jones, [2008]; Johnson, [2014]). The general adaptation syndrome (GAS) as proposed by Selye (1956) suggests that after an encounter with physical or emotional stress, the person recognizes the stressor and develops a physiologic, psychologic or behavioral reaction to the stress until the adversary has been addressed and the event that caused the stress has passed or the person’s ability to overcome the response has been depleted. Acute stress initiates a reaction from the parasympathetic nervous system’s fight-or-flight response which causes rapid changes in the cardiovascular, immune, and endocrine systems. Stress becomes physical and evident by an increased heart rate, perspiration, muscle tension and spasms, headaches, fatigue and shortness of breath (Johnson, 2014). Psychologic factors will lead some individuals from acute stress to chronic stress because of their meanings or implications to the stressor. Chronic stress is thought to lead to hippocampal damage which reveals decreased volume, dendritic atrophy in pyramidal neurons, and decreased neuron generation because of overstimulation of glucocorticoid receptors (McEwen et al. [2015]). Stress may lead to psychosocial disequilibrium which reveals altered judgment leading to bad decisions, viewing difficult situations as threatening including reduced enjoyment, feelings of anger, anxiety, depression, aggression and isolation from others.
(Johnson, 2014). Psychologic models of stress rely in part on the concept of how stress has been perceived.

Perceived stress is the degree to which situations in one’s life are perceived stressful and influences the way people interact with other people, their circumstances and response to life events which may be detrimental or beneficial to their psychosocial and physical well-being (Lazarus and Folkman, 1984). Research has shown that relationships exist between perceived stress and the anxiety and depressive symptoms after physical injury. Exposure to traumatic injury has been linked to depression, anxiety and long-term development of PTSD (Suliman et al, 2009). Additionally, findings from the work of Deane et al. (2016) reveal that traumatic injury in low income adolescents are associated with posttraumatic stress and maladaptive adjustment and emotional disorders of depressive symptoms and extreme anxiety. Perceived stress are events or situations which are only stressful to the degree that the individual defines them as straining his or her ability to cope. Psychologically and for the purposes of this proposal, stress (perceived or experienced) is the event or situation which is traumatically significant and poses a threat to the person’s ability to cope with stress derived from the stressor of traumatic injury.

**Anxiety and Depressive Symptoms**

Phenomenologically, anxiety and depression are clearly distinct from one another. Anxiety is centered on the emotion of fear and involves feelings of worry, apprehension, and dread; in contrast, depression is dominated by the emotion of sadness and is associated with feelings of sorrow, hopelessness and
gloom, (Clark and Watson, 1991). Some studies suggest that psychological problems tend to last much longer than physical ones (van der Sluis, Eisma and Groothoff and Ten Duis, 1998). Depression is one such possible consequence after traumatic injury and is becoming increasingly recognized as a complication of injury (Zatzick, Russo and Katon, 2003). Recovery from acute physical injury may be influenced by three clusters of PTSD including 1) flash-backs, 2) avoidance of thoughts and 3) reminders of the event and irritability with startle reflexes as well as symptoms of psychological distress of anxiety and depression which are pre-determinants of PTSD (O'Donnell, Bryant, Creamer and Carty, [2008]; Anderson, Elklit and Vase, [2011]). Also just the exposure to those traumatic events has been positively associated with depression and anxiety O'Donnell et al. (2012), but the most common co-morbid diagnosis with PTSD is depression. In a study conducted by Suliman et al. (2009) on one thousand one hundred forty adolescents (final sample size of 922), between the ages of 14-18 years, and after exposure to serious qualifying traumatic events, findings suggest that adolescents exposed to multiple traumas are more likely to experience more severe symptoms of depression and PTSD, but does not seem to be associated with more severe anxiety symptoms.

Resilience and Social Support

According to Agaibi and Wilson, (2005) adverse effects of perceived stress on anxiety and depressive symptoms can be modified by resilience and social support. Resilience refers to the dynamic process encompassing positive adaptation within the context of significant adversity and the maintenance of
positive adjustment in the context of this exposure (Lereya et al. [2016]). Masten,
(2015) has developed a list of resilience factors in young people and /or their
environment and has concluded that resilience is not simply the outcome of the
sum of protective factors minus risk factors, but a dynamic process with
protective factors in varying developmental stages. The short-list of resilience
factors in young people and/or their environment includes (1) attachment and
close relationships with others; (2) effective caregivers; (3) intelligence and
problem-solving skills; (4) self-control, planfulness, and emotion regulation; (5)
motivation to succeed; (6) self-efficacy; (7) effective schools; (8) effective
neighborhoods; and (9) faith, hope, or belief that life has meaning (Masten,
2015). Recent resilience research has suggested that exposure to moderate
amounts of stress may be necessary for developing effective coping skills to
manage adversity (Masten, 2014). Traumatic injury to the organism not only has
the ability to attack the personality and self-processes but it also automatically
activates allostatic stress response patterns that are a part of the sensory
nervous system (SNS) and the neurohormonal engineering system governing
acute and prolonged forms of human stress response (Agaibi and Wilson, 2005).
These factors range from genetics to neurobiological responses to perceptions of
stress, trauma life events, cognitive style and social support (Agaibi and Wilson,
2005). The adversity of this outcome may lead to anxiety and depressive
symptoms. If homeostasis cannot be established and health status does not
return to baseline by way of stress mediators, deleterious effects on
psychological and physiological dysfunction may ensue (Charney, 2004). Agaibi
and Wilson, (2005) have concluded in their work that the relationship between trauma and psychological distress is complex and resilience is strongly associated with positives outcomes in terms of effect balance, fewer posttraumatic stress disorder (PTSD) symptoms, and better overall health status.

Those are some of the factors that may occur during the process of resilience along with the normal developmental stages of adolescence (e.g. identity issues, puberty, physical changes, and peer to peer relations/pressure) and young adulthood developmental stages (complexities in relationships) which may help or hinder their road to recovery physically and/or psychologically. For some, the transition from adolescence to adulthood progresses smoothly with some expected obstacles of setbacks and discouragement when adjusting to new demands and new roles, but they eventually adapt effectively to adult demands. Yet for others and the variations in cognitive and emotional maturity, levels of individual and parental psychopathology, differences in environmental supports or stresses, and other risk and resilience factors may cripple the transition to adulthood which may be difficult for many adolescents and their families, particularly those with past, ongoing or evolving mental health disorders (Schulenberg, Sameroff and Cicchetti, 2004). In a study conducted by Rainey, Petrey, Reynolds, Agtarap and Warren, (2014), they examined the impact of resilience on individuals who sustained traumatic injury, and found that resilience remained stable from the time of injury until the 12-month follow-up suggesting that resilience functions as a trait rather than a modifiable state. It was also determined that depression was found to be a frequently occurring condition in
this population. Finally, the study showed that a significant relationship exists between resilience and depression following traumatic injury. Resilience, therefore refers to the re-integration or coping that results in growth, knowledge, self-understanding, and increased strength in resilient qualities whereas homeostasis is when one has adapted physically, mentally, and spiritually to a set of circumstances whether good or bad (Richardson, 2002).

Social support is a fundamental construct in a person’s environment central to many development processes. Social support has been studied as an important protective factor during child and adolescent development and has been associated with a broad range of positive outcomes (Rueger, Malecki, Pyun, Aycock and Coyle, 2016). Regarding depression, investigations most often find a significant and negative association, whereas more social support appears to be protective against depression and less social support may be a risk factor for depression in youth. Social support has a multidimensional nature as well as a stress buffering effect. Most tests of stress-buffering focus on acute negative life events and perceived stress, but chronic stressors and living in stressful contexts has not been fully explored (Rueger et al. [2016]). According to Rueger et al., social support comprises multidimensional construct which includes four content including emotional, instructional, informational, and appraisal support. Emotional support involves caring in the context of love, empathy, and trust. Instrumental support consists of helping behaviors or financial support. Informational support consists of relevant information and giving advice. There are different types of social support including social networks, social support and
social relationships (Wang et al. [2014]). The distinctions among network support focus on specific sources of support whereas the direction of support refers to support that is received as opposed to given.

The adequacy of social support is directly related to reported severity of psychological and physical symptoms and/or acts as a buffer between stressful life events and symptoms (Wang et al. [2014]). Few have come to an amicable agreement upon its definition and many agree that some type of relationship exists as well as resources available for support of individuals who have experienced stressful life events. There is some belief that resources provided by others may have either a negative or positive effect (Cohen and Syme, 1985). These effects could occur either directly (direct effect), in which the perception of integration and social belonging leads the individual to better levels of health and care, as well as indirectly (effect buffer), in which the improvement in the levels of health would be due to the perception of having people who they can count on following or during stressful situations. Furthermore, the perception of social support not always reflects the actual available support and sometimes the actual social support might not be perceived. Poorer social support is associated with shorter survival because of isolation, lack of care and less engagement in activities. Some have based hypotheses on how social support is operationalized. Social support can be examined as a direct effect or as a buffering effect. Social support acts primarily as a buffer, protecting individuals from the harmful effects of stress (Cohen and McKay, 1984). Although social support may be directly helpful in all circumstances, it may be particularly
effective as a buffer during the time of stress. We hope to reveal from this study the moderating effects of social support and resilience and their effects upon perceived stress that would mitigate or modify the results of negative outcomes of anxiety and depressive symptoms.

**Innovation**

There is extensive literature on stress and psychological distress in adults with nonfatal traumatic injuries and there is a strong theoretical and empirical basis for the protective effects of social support and resilience. This study is innovative in that it shifts the focus to older adolescents and young adults, a population that experiences a high rate of traumatic injuries and is vulnerable to its negative psychological sequelae. A research base with a focus on this critical stage of development will open up new avenues for developing interventions to prevent and address the negative psychological effects of traumatic injury which are tailored to the needs of older adolescents and young adults. The adolescent and young adults are examined by specific assessments of perceived stress and health outcomes (anxiety and depressive symptoms). Additionally and finally, resilience and social support will be presented as moderating variables, which may play a significant role of mitigation between the health outcomes (anxiety and depressive symptoms) and psychosocial responses of perceived stress.

**Approach**

**Design and Setting**

This is a cross-sectional design with all assessments performed on the day of enrollment for subjects admitted to the in-patient trauma floor at Memorial
Hermann Health System (MHHS) in the Texas Medical Center (TMC) of Houston, Texas. The study is designed to test associations among variables at one point in time.

**Sample Selection and Sample Size**

The study sample will consist of adolescents and young adults ages 16-25 years old, status post traumatic injury (penetrating, blunt, burn, vehicular crash and fall), admitted to MHHS, Level I Trauma Center and transitioned to the in-patient trauma floor. The participants will have completed the recruitment, enrollment and informed consent process with study personnel prior to their taking part in the study. The participants will be assessed by study personnel within day 1-2 of admission to the trauma floor. Some of the participants will be admitted from the emergency department (ED) directly to the operating room (OR). Others are admitted to the Intensive Care Unit (ICU) / Intermediate Care Unit (IMU) or to the trauma floor from the Emergency Department. Yet others are admitted back and forth from ICU to IMU before admission to the trauma floor. For the purposes of this study, the participants who are admitted to the trauma floor from the ED, ICU and IMU will be eligible for enrollment into the research study because they would have passed the critical stage and will be able to provide consent or assent to take part in the study. A sample size of 68 has been estimated for multiple regression analysis with 5 independent variables, power of .80 and alpha level of .05 and effect size of \( R^2 = .11 \) (Faul, Erdfelder, Lang and Buchner, 2007).
The inclusion criteria are 1) 16-25 years of age; 2) must have experienced traumatic injury; 3) admitted to in-patient trauma floor; 4) must have signed informed assent/consent and/or signature of authorized representative; 5) literate in English language, and 6) must have sustained blunt, penetrating or burn-related mechanism of traumatic injury.

The exclusion criteria are 1) Traumatic Brain Injury (TBI), and known pre-existing psychiatric diagnosis not injury-related.

According to Memorial Hermann Hospital Trauma & Emergency Medicine System (EMS), data collected suggest that over a 12 month period, an average of 21 females and 65 males (16-25 years of age) are admitted to the Trauma Floor per month for traumatic injury (24.5% female and 75.5% male). In addition to those statistics, data collected also suggest that for this age group, 33.4 are admitted directly to floor from the ED; 19.3% from the ICU; 8.7% from the IMU; 25.2% from the OR, and 13.3% from the Observation Unit (OBS). Finally the total number admitted to the floor from the ICU and IMU over a 12 month period is 1032.

Screening, Recruitment and Informed Consent

Subject recruitment will be done in close collaboration among three research team members: Principal Investigator BP (Belanie Peavy), the Program Manager Research Center for Translational Research JP (Jeanette Podbielski) and Research Project Manager Emergency Medicine MH (Mandy Hill). The latter two members have day-to-day contact with potential study participants for recruitment at MHHS and UT Health. These three members have worked
together in the past coordinating and conducting research at MHHS and UT Health and have established working relationships.

It is anticipated that participants will be recruited and enrolled into the study at MHHS from the Department of Surgery, Trauma Service of Houston, Texas in the Texas Medical Center (TMC) after approval to conduct the study from the Institutional Review Board (IRBs) at the University of Texas- Health Science Center-Houston (UTHSC-H) and MHHS. After approval from the IRBs, the recruitment process begins with the following steps for enrollment to completion of the study for each qualified participant and by experienced and well-trained research team members. The Program Manager for the Center for Translational Research (JP) is the primary screener for the study and will screen for potential candidates during the Trauma Service morning report for review and assessment of admissions, transfers, discharges and dispositions of all patients admitted to the trauma service as well as those patients who are already included in the trauma registry report. The candidates will be screened according to the protocol’s inclusion and exclusion criteria. This study team member is primarily responsible for the maintenance of the screening logs for potential candidates and will identify all potential candidates for the duration of the study and, on the same day of identification of potential candidates, will notify the Project Manager (MH) who is responsible for the next phase of recruitment.

The Research Project Manager, Emergency Medicine MH, will approach the candidate and conduct the informed consent process with each candidate according to protocol for enrollment into the research study. The purpose of this
process is to insure that candidates are made aware and understand the nature of the research and knowledgeably and voluntarily decide whether or not to participate in this study. This study team member (MH) explains the type of study; why the individual is being asked to take part in the study; describes the research study in detail and instruments used for interviews within day 1-2 of admission; explains the risks and benefits and emphasizes voluntary withdrawal at any time during the study. This process is presented in a verbiage understood by the potential candidate, which allows him or her to make an informed decision. The candidate will be given ample time to think about his or her decision and discuss with family members if desired and will have an opportunity to have questions answered. If the candidate is a minor, an authorized representative will participate in the process for an informed decision on their part and will sign the consent form and the minor signs the assent form. Acceptance of the invitation to participate in the study will be confirmed by signatures of participant(s) and witness and/or authorized representative(s) if applicable. The document will include the date and time consent was signed. The candidate will be given a copy of the consent form, a copy will be filed in the participant’s chart and the original will be filed in a binder for this study in a locked cabinet in the Center for Translational Research. This study team member, (MH), will notify the PI (BP) and introduces her to the participant who has agreed to take part in the research study.
Procedures for Data Collection

The participant will be screened by Co-Investigator (JP) during the Trauma Service morning report for review and assessment of admissions, transfers, discharges and dispositions of all patients admitted to the trauma service as well as those patients who are already included in the trauma registry report and subsequently admitted to the trauma floor. JP screens potential participants who have met all of the inclusion and exclusion criteria based on protocol requirements. The potential candidate must have sustained a traumatic physical injury within 16-25 years of age range, without traumatic brain injury and with no known prior history of psychiatric mood disorders that are not injury-related. The participant will be assigned a unique identifier of four digits (2 for the month and 2 for sequential enrollment into the study). For example, the first participant enrolled in January will have an identifier of 0101, second enrolled in January 0102, third enrolled in February 0203 and so on and so forth. After deemed eligible for enrollment into the study, the Co-Investigator (MH) will approach the potential candidate and extend invitation for participation into the research study.

Only after the inclusion and exclusion criteria have been met, the informed consent process has been completed and the PI (BP) has been introduced to the candidate, will the PI (BP) collect data. This will take place within day 1-2 of admission to the trauma floor. The date and time and initials of the team member performing the research activities for this part of the research will be documented on the spreadsheet shared by research personnel. A spreadsheet shared among team members will have documentation of the date and time of the informed
consent process along with the subject’s unique identification code and the researcher’s initials which will be kept in a binder in the Center for Translational Research along with the screening log maintained by JP for those who have agreed to participate or not and those who have withdrawn voluntarily or involuntarily. This process by the three team members will be continued and conducted for the duration of the study to completion.

Demographic data will be collected initially including age, gender, ethnicity, mechanism of injury, injury severity score upon admission, systolic/diastolic blood pressure and heart rate at baseline and complications (yes or no). The perceived stress survey will be administered first by interview, followed by anxiety and depressive symptoms survey, then resilience and finally social support surveys. [Appendices 1 – 5]. The interview will be conducted in a private conference room or area used to counsel family members. If the client is unable to get out of bed, he or she will be allowed to read the questions silently on the electronic device with assistance and presence of interviewer then allowed to point to their selected response and the interviewer will input the choice at that time and will repeat this process until the interview has been completed. The data will be collected by the PI by interview with the subject and responses will be recorded electronically with a secure device and all responses will be uploaded into the statistical software system (current version of SPSS) to calculate scores. If a participant is found to have depressive symptoms, referral procedures will be conducted for the Neuro Psychologist at MHHS. Data will be collected, recorded, and stored on a secure device or in a locked-cabinet in in
the Center for Translational Research. The number is unique to each participant and no other identifying information for the subject will be revealed throughout the duration of the study.

Variables and Measurements

Perceived Stress

Perceived stress will be measured by the Perceived Stress Scale-10 (PSS-10) [Appendix 1] which was developed by Cohen and Williamson, (1988) from the original 14-item PSS developed by Cohen, Kamarck and Mermelstein, (1983). The PSS-10 has been used to research stress among different population groups including healthy university students, drug addicts, elderly populations, pregnant and postpartum women, public populations, asthmatic patients, cardiac patients, women with breast cancer and out-patients with depression. The PSS-10 is a 10-item scale that assesses subjective perceptions about life stress in the past month. It is a global self-reporting scale designed and presented by Cohen et al. (1983) to measure the intensity of perceived stress and evaluate the stressful situations of daily life. Response options are on a 5-point Likert scale (0 = never, 1 = almost never, 2 = sometimes, 3 = fairly often, 4 = very often). Possible scores range from 0 to 40, with higher scores indicating higher levels of perceived stress and the lower scores indicating lower levels of stress. Roberti, Harrington and Storch, (2006) examined 285 undergraduate college students (M = 23.8 years, median = 21.0 years) for further psychometric support of the PSS-10 which examined perceived stress, anxiety, health locus of control, religious faith and relational aggression. The Cronbach’s alpha reliability
coefficients for PSS-10 total score (10 items; .89), Perceived Helplessness factor (6 items; .85), and Perceived Self-Efficacy (4 items; .82). Item-total correlations were strong. Convergent and divergent validity was supported.

**Resilience**

Resilience will be measured by the 10-item Connor Davidson-Resilience Scale-10 (CD-RISC-10) which is an abridged version of the Connor-Davidson (CD-RISC) scale which contains 25 items. Each item is rated on a 5-point (0-4) scale with higher scores reflecting more resilience (Connor and Davidson, 2003) [Appendix 2]. Campbell-Sills and Stein (2007) conducted a study using the CD-RISC to find that the initial Exploratory Factor Analyses (EFA) showed the factor structure was not stable across two demographically equivalent subsamples but the two stable, well-defined and conceptually coherent concepts were hardness and persistence and therefore created an abridged version of the CD-RISC-25 which contains items that loaded on those two factors. One of the four items with overlapping content was retained and three discarded, which resulted in the 10-item version of CD-RISC-10. Scores on this unidimensional measure were highly correlated with scores on the original instrument ($r = .92$). Internal consistency for Cronbach’s alpha indicated good reliability at .85. Test-retest reliability obtained from participation in groups four and five revealed intraclass correlation of .87. Convergent and discriminant validity were established by correlating this scale with other more established instruments. Coates, Phare and Dedrick, (2013) examined psychometric properties of the CD-RISC-10 among low income African American men using confirmatory factor analysis and structural equation
modeling to examine a community sample 127 subjects measuring resilience, spirituality and psychological distress. To provide further validity evidence of the CD-RISC-10 scores, a structural equation model was tested in which latent variables of resilience and spirituality were used as predictors of psychological distress. Resilience was positively correlated with spirituality \((r = .60)\) which explained 7.4% of variance in psychological distress.

**Social Support**

Social Support will be measured by the Medical Outcomes Study-Social Support Scale (MOS-SSS), a well-established 19-item, self-report measure of emotional, tangible, informational, affectionate, and positive social interaction over the past month [Appendix 3] (Sherbourne & Stewart, 1991). The questionnaire was developed from previous instruments and has been demonstrated to be psychometrically sound and is universally applicable. Good temporal stability over one year \((r = .71)\) and very high Cronbach’s alpha \((.97)\) for the entire scale, and alpha coefficients of 0.91-0.96 for four subscales. Selected construct validity hypotheses were supported (Sherbourne & Stewart, 1991). Response options are 0 = none of the time, 1 = a little of the time, 2 = some of the time, 3 = most of the time and 4 = all of the time. Total scores on the MOS-SSS range from 0 – 76. Construct validity was established in a population-based study of adolescents by Fuller-Thomson, Hamelin and Granger, (2013).

**Anxiety and Depressive Symptoms**

Anxiety and depressive symptoms will be measured using Mood and Anxiety Symptom Questionnaire (MASQ) developed by Clark and Watson (1991)
The general distress subscale can be divided into three facets – general distress mixed symptoms, general distress depressive symptoms, and general distress: anxiety symptoms (Talkovsky and Norton, 2015). The 26-item scale will be used with anhedonic depression (AD) and anxious arousal (AA) for this current study. Participants are required to indicate on a 5-point scale, ranging from 1 (not at all) to 5 (extremely) how much they have experienced each symptom during the past week. The study conducted by Lin et al. (2014) used the short adaptation of the MASQ in adolescents and young adults. Internal consistencies ranged from 0.85 to 0.92 across the scales and comparison with the Center for Epidemiological Studies-Depression (CES-D) indicated adequate convergent/divergent properties. Lin et al. results indicated that the shorter version is a valid and reliable instrument in young people, allowing for quick assessment of tripartite dimensions of depression and anxiety.

**Abbreviated Injury Severity Score**

Abbreviated injury severity score revised in 2005 (AIS05) will be used to delineate between major and non-major trauma. The anatomical scoring system was introduced in 1969 with the initial publication in 1971 and it has now become the standard for documentation of anatomical injuries sustained during trauma events through four subsequent revisions update against survival in 1980, 1985, 1998, 2005 and 2008 (Palmer, Niggemeyer and Charman, 2010). The AIS05 represented the most significant change in injury classification in over 20 years. Injuries are ranked on a scale of 1 to 6, with 1 being minor, 2 moderate, 3 serious, 4 severe, 5 critical and 6 a non survivable injury. Injury Code mapping
between AIS versions appears to have validity, but mapping AIS05-coded data back to AIS98 for comparison is recommended. Scores will be used to describe the sample.

**Data Analysis Plan**

Descriptive statistics will be used to describe the sample regarding gender, ethnicity, age, mechanism of injury, injury severity, complications and baseline systolic/diastolic blood pressure and heart rate. We will control for gender, ethnicity and age for possible confounding effects on health outcomes (anxiety and depressive symptoms). The distributions of the dependent variables will be checked for normality and transformed if indicated.

Using a cross-sectional research design during hospitalization following traumatic injury in adolescents and young adults, the specific aims and hypotheses of this study are as follows:

1. Examine the main effect of the independent variable (perceived stress) on health outcomes (anxiety and depressive symptoms).
   1.1. It is hypothesized that increased stress will be associated with higher anxiety and depressive symptoms.

For hypothesis 1.1, a multiple regression analysis will be used to test for main effects of the independent variable (perceived stress), with the dependent variables (anxiety and depressive symptoms) while controlling for covariates of age, gender and ethnicity. Initially, all covariates will be included in each model. Non-significant covariates (> = .05) will be eliminated one at a time. A separate analysis was conducted for the two dependent variables.
Anxiety = Stress + Covariates variables (gender, age, ethnicity)

Depression = Stress + Covariates (gender, age, ethnicity).

2. Examine the moderating effect of resilience and social support in the relationship between perceived stress and health outcomes (anxiety and depressive symptoms).

2.1. It is hypothesized that increased levels of resilience and social support will buffer the negative effects of perceived stress on health outcomes (anxiety and depressive symptoms).

For hypothesis 2.1, we will test moderating effects of resilience and social support on the relationship independent variable (perceived stress) and the dependent variables health outcomes (anxiety and depressive symptoms). This will be accomplished in four separate analyses as described below. Specifically, the inclusion of resilience and social support as interaction terms with perceived stress will test the moderating effects of resilience and social support. Initially, all covariates will be included in each model. Non-significant covariates (>= .05) will be eliminated one at a time.

Anxiety = Stress + Resilience + (Stress x Resilience) + Covariates (gender, age, ethnicity)

Anxiety = Stress + Social Support + (Stress x Social Support) + Covariates (gender, age, ethnicity)

Depression = Stress + Resilience + (Stress x Resilience) + Covariates (gender, age, ethnicity)
Depression = Stress + Social Support + (Stress x Social Support) + Covariates (gender, age, ethnicity)

**Study Limitations**

There are some considerations that need to be addressed that may affect interpretation of this study. The sample size is relatively small. Although power analysis was used to determine sample size of 68, it may be insufficient to find significant relationships from the data if the effect size is smaller than specified. In future studies, an increase in sample size may better represent the population to whom the results will be generalized. Regarding the design of the study, we have implemented a cross-sectional design for one point in time to test the hypothesized relationships. This approach is feasible and is justified, given the lack of prior studies testing these hypotheses in samples of older adolescents and young adults. The results of the proposed study will provide a foundation for designing future studies using a longitudinal approach.

**Protection of Human Subjects**

**Risks to the Subjects**

Participants in this study will be victims of traumatic injury, aged 16 – 25 years. The population to be studied is from Houston, Texas and surrounding areas. Sixty-eight adolescents will be recruited to complete questionnaires for resilience, social support, perceived stress, anxiety and depressive symptoms. Data will be obtained by research personnel who will conduct the interviews from questionnaires selected for study purposes. Data will also be collected from the subjects’ medical records. Overall, potential risks associated with participation in
the study are unlikely. The data obtained will be specifically used for research purposes. The subjects will be interviewed and no invasive and medicinal implementation are required for this study. The participants will be asked to provide information regarding their physical and mental well-being and resources of social support. If potential participants are eligible for enrollment, experienced research personnel will approach the subject and extend an invitation to take part in the study.

**Adequacy of Protection against Risks**

Potential subjects will be screened for enrollment in the hospital setting at Memorial-Hermann Trauma Center in Houston, Texas. Prior to conducting any interviews, all participants will be provided information regarding study requirements through the informed consent process. They will be given time to read the form and the opportunity to ask questions. Participants or their authorized representatives will sign the form(s) indicating that they understand that they are being asked to participate in a research study, that they understand the risks involved by participating, that they can refuse to participate and if they agree to participate, they may voluntarily withdraw at any time. The information collected will be kept confidential. Every effort will be made to keep personal information private. However it may be necessary to submit health information to the Institutional Review Board (IRB) at UTHSC-H and the Clinical Research Department at UT School of Nursing to collect, review and record data from health records but will assure your research is conducted according to Good Clinical Practice (GCP) guidelines for research and the Health Insurance
Portability and Accountability Act (HIPAA) for confidentiality and privacy. Any identifying information will be kept confidential. There is no compensation for participation in this study.

**Protection against Risk**

Every effort will be made to minimize physical and psychological risks. Participants are free to not respond to any question that may result in psychological disturbance. For high scores indicative of depressive and anxiety symptoms, the client will be referred to the Neuro Psychologist at Memorial-Hermann Health System for further evaluation. Data collected will be for research purposes and will not become a part of their medical records. Their responses to the questionnaires will not be associated with any identifying information and will not interfere with their medical regimen at the hospital where the research is being conducted. These procedures are expected to eliminate physical and psychological risks associated with participation. Regarding risks to confidentiality, identifying information from the subject’s medical records will not be a part of the research records. Research records will have unique identifiers and kept in a locked cabinet in a locked room accessible only to research personnel. These efforts are expected to eliminate risks to confidentiality. The potential benefits of this study is to determine possible cause for anxiety and depressive symptoms following injury that may lead to Posttraumatic stress Disorder (PTSD) and intervention to prevent or treat current and future patients who may have those health outcomes as a result of traumatic injury. There are
no direct benefits to the participant but information gathered from the results of the study may benefit other individuals that may be victims of traumatic injury.

**Inclusion of Women and Children**

Male and female subjects may participate in the study. All ethnic groups may take part in the study. The age range is 16-25 years. If you have questions about this research you may direct them to the PI (BP) at 281-943-6815 or the Chairman of the IRB at 713-500-7943 with any concerns or questions regarding the conduction of this study or your rights as a study participant.
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Appendix 1

Cohen Perceived Stress Scale
COHEN PERCEIVED STRESS SCALE

The following questions ask about your feelings and thoughts during THE PAST MONTH. In each question, you will be asked HOW OFTEN you felt or thought a certain way. Although some of the questions are similar, there are small differences between them and you should treat each one as a separate question. The best approach is to answer fairly quickly. That is, don’t try to count up the exact number of times you felt a particular way, but tell me the answer that in general seems the best.

For each statement, please tell me if you have had these thoughts or feelings: never, almost never, sometimes, fairly often, or very often. (Read all answer choices each time)

<table>
<thead>
<tr>
<th></th>
<th>Never</th>
<th>Almost Never</th>
<th>Sometimes</th>
<th>Fairly Often</th>
<th>Very Often</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.1. In the past month, how often have you been upset because of something that happened unexpectedly?</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>B.2. In the past month, how often have you felt unable to control the important things in your life?</td>
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<tr>
<td>B.3. In the past month, how often have you felt nervous or stressed?</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>B.4. In the past month, how often have you felt confident about your ability to handle personal problems?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.5. In the past month, how often have you felt that things were going your way?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.6. In the past month, how often have you found that you could not cope with all the things you had to do?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.7. In the past month, how often have you been able to control irritations in your life?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.8. In the past month, how often have you felt that you were on top of things?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.9. In the past month, how often have you been angry because of things that happened that were outside of your control?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.10. In the past month, how often have you felt that difficulties were piling up so high that you could not overcome them?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix 2

Social Support Survey Instrument
### Social Support Survey Instrument

People sometimes look to others for companionship, assistance, or other types of support. How often is each of the following kinds of support available to you if you need it? Choose one number from each line.

<table>
<thead>
<tr>
<th>Emotional/Informational Support</th>
<th>None of The time</th>
<th>A little Of the Time</th>
<th>Some of The time</th>
<th>Most of The time</th>
<th>All of The time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Someone you can count on to listen to you when you need to talk</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Someone to give you information to help you understand a situation</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Someone to give you good advice about a crisis</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Someone to confide in or talk to about yourself or your problems</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Someone who has advice you really want</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Someone to share your most private worries and fears with</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Someone to turn to for suggestions about how to deal with personal problems</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Someone who understands your problems</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td><strong>Tangible support</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Someone to help you if you were confined to bed</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Someone to take you to the doctor if you needed it</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Someone to prepare your meals if you were unable to do it yourself</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Someone to help with daily chores if you were sick</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td><strong>Affectionate support</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Someone who shows you love and affection</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>---------------------------</td>
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<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Someone to love and make you feel wanted</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Someone who hugs you</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive social interaction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Someone to have a good time with</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Someone to get together with for relaxation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Someone to do something enjoyable with</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Additional item</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Someone to do things with to help you get your mind off things</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix 3

Connor-Davidson Resilience Scale-10 (CD-RISC-10)
## Connor-Davidson Resilience Scale 10 (CD-RISC-10)

<table>
<thead>
<tr>
<th></th>
<th>not true at all (0)</th>
<th>rarely true (1)</th>
<th>sometimes true (2)</th>
<th>often true (3)</th>
<th>true nearly all the time (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I am able to adapt when changes occur.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>2. I can deal with whatever comes my way.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>3. I try to see the humorous side of things when I am faced with problems.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>4. Having to cope with stress can make me stronger.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>5. I tend to bounce back after illness, injury, or other hardships.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>6. I believe I can achieve my goals, even if there are obstacles.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>7. Under pressure, I stay focused and think clearly.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>8. I am not easily discouraged by failure.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>9. I think of myself as a strong person when dealing with life's challenges and difficulties.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>10. I am able to handle unpleasant or painful feelings like sadness, fear, and anger.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
Appendix 4

Mood and Anxiety Symptom Questionnaire 26-Item
Mood and Anxiety Symptom Questionnaire 26-Item

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ID# ____________________

Mini-MASQ

Below is a list of feelings, sensations, problems, and experiences that people sometimes have. Read each item and then fill in the blank with the number that best describes how much you have felt or experienced things this way during the past week, including today. Use this scale when answering:

1 2 3 4 5
not at all a little bit moderately quite a bit extremely

1. Felt really happy
2. Felt tense or “high strung”
3. Felt depressed
4. Was short of breath
5. Felt withdrawn from other people
6. Felt dizzy or lightheaded
7. Felt hopeless
8. Hands were cold or sweaty
9. Felt like I had a lot to look forward to
10. Hands were shaky
11. Felt like nothing was very enjoyable
12. Felt keyed up, “on edge”
13. Felt worthless
14. Had trouble swallowing
15. Felt like I had a lot of interesting things to do
16. Had hot or cold spells
17. Felt like a failure
18. Felt like I was choking
19. Felt really lively, “up”
20. Felt uneasy
21. Felt discouraged
22. Muscles twitched or trembled
23. Felt like I had a lot of energy
24. Was trembling or shaking
25. Felt like I was having a lot of fun
26. Had a very dry mouth
Appendix 5

Injury Severity Score
Injury Severity Score

Injury Severity Scoring is a process by which complex and variable patient data is reduced to a single number. This value is intended to accurately represent the patient's degree of critical illness. In truth, achieving this degree of accuracy is unrealistic and information is always lost in the process of such scoring. As a result, despite a myriad of scoring systems having been proposed, all such scores have both advantages and disadvantages.

INJURY SEVERITY SCORE (ISS) & NEW INJURY SEVERITY SCORE (NISS)

The Injury Severity Score (ISS) is an anatomical scoring system that provides an overall score for patients with multiple injuries. Each injury is assigned an AIS and is allocated to one of six body regions (Head, Face, Chest, Abdomen, Extremities (including Pelvis), External). Only the highest AIS score in each body region is used. The 3 most severely injured body regions have their score squared and added together to produce the ISS score.

An example of the ISS calculation is shown below:

<table>
<thead>
<tr>
<th>Region</th>
<th>Injury Description</th>
<th>AIS</th>
<th>Square top Three</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head and Neck</td>
<td>Cerebral Contusion</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>Face</td>
<td>No Injury</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Chest</td>
<td>Flail Chest</td>
<td>4</td>
<td>16</td>
</tr>
<tr>
<td>Abdomen</td>
<td>Minor Contusion of Liver Complex Rupture of Spleen</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Extremity</td>
<td>Fractured Femur</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>External</td>
<td>No Injury</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

Injury Severity Score 50

ABBREVIATED INJURY SCALE. The Abbreviated Injury Scale (AIS) is an anatomical scoring system first introduced in 1969. Since this time it has been revised and updated against survival so that it now provides a reasonably accurate ranking of the severity of injury. The latest incarnation of the AIS score is the 1998 revision. The AIS is monitored by a scaling committee of the Association for the Advancement of Automotive Medicine.

Injuries are ranked on a scale of 1 to 6, with 1 being minor, 5 severe, and 6 a nonsurvivable injury. This represents the 'threat to life' associated with an injury and is not meant to represent a comprehensive measure of severity. The AIS is not an injury scale, in that the difference between AIS1 and AIS2 is not the same as that between AIS4 and AIS5. There are many similarities between the AIS scale and the Organ Injury Scales of the AAST.

<table>
<thead>
<tr>
<th>INJURY</th>
<th>AIS SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Minor</td>
</tr>
<tr>
<td>2</td>
<td>Moderate</td>
</tr>
<tr>
<td>3</td>
<td>Serious</td>
</tr>
<tr>
<td>4</td>
<td>Severe</td>
</tr>
<tr>
<td>5</td>
<td>Critical</td>
</tr>
<tr>
<td>6</td>
<td>Unsurvivable</td>
</tr>
</tbody>
</table>
Manuscript

Cover Letter

The author(s) affirm:

1. That the work has not been published previously and is not currently under consideration elsewhere;

2. That the work is original and the author(s)'s own, and that no copyright has been breached by the inclusion of any content drawn from another source;

3. That the publication has been approved by all co-author’s and, if required, by the governing authorities at entity under which the research was carried out;

4. That the author(s) have no conflicts of interests or have declared any such conflicts; and

5. That the study followed ethical guidelines and was either approved or deemed exempt by an institutional or governmental authority.
Abstract

Individuals who suffer from traumatic injury appraise the meaning of those events based upon their own personal appraisal of the situation (perceived stress) which may consequently result in the inability to mentally return to baseline. In which case, adverse effects of perceived stress on anxiety and depressive symptoms may ensue, which may predispose the individual to long-term post-traumatic stress disorder (PTSD). This study examined 68 adolescents and young adults who sustained physical traumatic injury and the association of perceived stress on health outcomes of anxiety and depressive symptoms. In addition, this study explored the moderating effects of resilience and social support and the relationship between perceived stress and the outcomes of anxiety and depressive symptoms. Multiple linear regression in the form of the general linear model (GLM) was used to test for associations between perceived stress and arousal anxiety (AA) as well as anhedonic depression (AD) after adjusting for age, gender, and ethnicity. Results revealed that perceived stress was significantly associated with anxiety arousal (p = .001). Gender (p= .023) and ethnicity (p =.021) were also significantly associated with perceived stress on AA. No significant relationship was found with anhedonic depression and perceived stress. Finally, resilience and social support were non-significant in moderating the relationship(s) between effects of perceived stress on outcomes of anxiety and depressive symptoms. The study findings provide information that will contribute to education, research and practice with new results found in the patient population, basis for further research regarding the research queries and suggestions for implementation in the clinical setting.
**Introduction**

A traumatic event may be a threat of death, serious injury or sexual assault experienced or witnessed by the victim. Traumatic injury includes blunt, penetrating or burn injuries inflicted upon an individual by either self-inflicted Intent, assault from other individual(s) and/or incidental events from vehicles, machinery and/or falls. Traumatic events are stressors which have a direct impact on the person-environment transaction and the victim draws upon internal and external coping skills to deal with this disruption. Protective factors function in a catalytic fashion and can reside with the individual or the family, community, or institutions and can be biological and psycho social in nature. Exposure to traumatic injury has been linked to depression, anxiety and long-term development of PTSD (Suliman et al. [2009]). Individuals who suffer from physical traumatic injury appraise the meaning of those events to different extents based upon their own personal appraisal of the situation and in reference to their internal and external resources (Lazarus and Folkman, 1984).

Resilience and social support (protective factors) may act as moderators on perceived stress and its effects on anxiety and depressive symptoms. Resilience refers to the dynamic process encompassing positive adaptation within the context of significant adversity and the maintenance of positive adjustment in the context of physical traumatic exposure (Lereya et al. [2016]). Social support has a multidimensional nature as well as a stress-buffering effect which may include family, friends and other individuals in the community. It provides an empathetic safe environment in which individuals are encouraged to share their experiences,
thoughts and feelings and often referred to as a buffer against negative effects of stress (Wang, Cai, Qian et al, 2014).

There is paucity of evidence in the literature that examines adolescents and young adults who have endured physical traumatic injury; how perceived stress relates to health outcomes of anxiety and depressive symptoms in that population, and how resilience and social support moderate those effects. This study shifts the focus from veterans, children and adults to analyze older adolescents and young adults, a population that experiences a high rate of traumatic injuries and is vulnerable to its negative psychological sequelae. A research base with focus on this critical stage of development will open up new avenues for developing interventions to prevent and address the negative psychological effects of physical traumatic injury which are tailored to the needs of older adolescents and young adults.

This cross-sectional research design for this patient population examined the effect of perceived stress on health outcomes (anxiety and depressive symptoms) and the moderating effect of resilience and social support in the relationship between perceived stress and health outcomes (anxiety and depressive symptoms). It was hypothesized that increased stress was associated with higher anxiety and depressive symptoms. It was also hypothesized that increased levels of resilience and social support will buffer the negative effects of perceived stress on health outcomes (anxiety and depressive symptoms).
Method

Participants and Procedures

This was a cross-sectional design with all assessments performed on the day of enrollment for patients admitted to the in-patient trauma floor at Memorial Hermann Health System (MHHS) in the Texas Medical Center (TMC) of Houston, Texas. The study was designed to test associations among variables at one point in time. Before the study began, approval was obtained from the Institutional Review Board (IRB).

Adolescents and young adults’ ages 16-25 years old, status post physical traumatic injury were admitted to MHHS, Level I Trauma Center and transitioned to the in-patient trauma floor. The participants were recruited, enrolled and completed the informed consent process with study personnel prior to taking part in the study and were assessed by study personnel within day 1-2 of admission to the trauma floor. It was estimated that a sample size of 68 was necessary for multiple regression analysis with 5 independent variables (one independent variable, 2 independent variable and 2 moderating variables), power of .80 and alpha level of .05 and effect size of $R^2 = .11$ (Faul, Erdfelder, Lang and Buchner, 2007).

The inclusion criteria were as follows: 1) 16-25 years of age; 2) must have experienced traumatic injury; 3) admitted to in-patient trauma floor; 4) must have signed informed consent/assent and/or signature of authorized representative; 5) literate in English language, and 6) must have sustained blunt, penetrating or burn-related mechanism of injury. The exclusion criteria were 1)
Traumatic Brain Injury (TBI), and known pre-existing psychiatric diagnosis not injury-related.

The participants were screened every day during the Trauma Service morning report for review and assessment of admissions, transfers, discharges and dispositions of all patients admitted to the trauma service who were subsequently admitted to the trauma floor. When eligibility was confirmed for enrollment into the study, the potential candidate was extended invitation for participation. After which, the interviewer conducted interviews and collected data with four questionnaires within day 1-2 of admission to the trauma floor and entered all responses directly into the electronic device data capture system.

**Measures**

Demographic data were collected at baseline including age, gender, and ethnicity, mechanism of injury, injury severity score, systolic/diastolic blood pressure, heart rate and complications (yes or no). The interviewer administered the perceived stress survey first, followed by the anxiety and depressive symptoms survey, then resilience questionnaire and finally social support survey (see Appendices E–H). If a participant was found to have depressive symptoms, referral procedures were conducted for Neuro Psychology at MHHS. Responses were recorded directly into the REDCap system at the time of interview for all participants (Harris et al. [2009]).

**Perceived stress.**

Perceived stress was measured by the Perceived Stress Scale-10 (PSS-10) [Appendix E] which was developed by Cohen and Williamson, (1988) from
the original 14-item PSS developed by Cohen, Kamarck and Mermelstein, (1983). The PSS is a 10-item scale that assesses subjective perceptions about life stress in the past month. Response options are on a 5-point Likert scale (0 = never, 1 = almost never, 2 = sometimes, 3 = fairly often, 4 = very often). Possible scores range from 0 to 40, with higher scores indicating higher levels of perceived stress and the lower scores indicating lower levels of stress. Roberti, Harrington and Storch, (2006) examined 285 undergraduate college students (M = 23.8 years, median = 21.0 years) for further psychometric support of the PSS-10 which examined perceived stress, anxiety, health locus of control, religious faith and relational aggression. The Cronbach’s alpha reliability coefficients for PSS-10 total score (10 items; .89), Perceived Helplessness factor (6 items; .85), and Perceived Self-Efficacy (4 items; .82). Item-total correlations were strong. Convergent and divergent validity was supported (Roberti et al. [2006]).

**Social support.**

Social Support was measured by the Medical Outcomes Study-Social Support Scale (MOS-SSS) [Appendix F], a well-established 19-item, self-report measure of emotional, tangible, informational, affectionate, and positive social interaction over the past month (Sherbourne and Stewart, 1991). The questionnaire was developed from previous instruments and has been demonstrated to be psychometrically sound and is universally applicable. Good temporal stability over one year (r = .71) and very high Cronbach’s alpha (.97) for the entire scale, and alpha coefficients of 0.91-0.96 for four subscales. Selected construct validity hypotheses were supported (Sherbourne and Stewart, 1991).
Response options are 0 = none of the time, 1 = a little of the time, 2 = some of the time, 3 = most of the time and 4 = all of the time. Total scores on the MOS-SSS range from 0 – 76. Construct validity was established in a population-based study of adolescents by Fuller-Thomson, Hamelin and Granger, (2013).

**Resilience.**

Resilience was measured by the 10-item CD-RISC-10 (Appendix G) which is an abridged version of the 25 item CD-RISC (Connor and Davidson, 2003). Campbell-Sills and Stein (2007) conducted a study using the CD-RISC to develop CD-RISC-10 with Exploratory Factor Analyses (EFA) which showed the factor structure was not stable across two demographically equivalent subsamples but the two stable, well-defined concepts were hardiness and persistence and therefore created an abridged version of the CD-RISC-25. Each item is rated on a 5-point (0-4) scale with higher scores reflecting more resilience. Response options 0 = not true at all, 1 = rarely true, 2 = sometimes true, 3 = often true, and 4 = true nearly all the time. The scores are added up from each column to obtain CD-RISC range score 0-40. Lowest to highest quartiles are 0-29. 30-32. 33-36 and 37-40 (Campbell-Sills, Forde and Stein, 2009). Internal consistency for Cronbach’s alpha indicated good reliability at .85. Test-retest reliability obtained from participation in two groups revealed intraclass correlation of .87. Convergent and discriminant validity were established by correlating this scale with other more established instruments (Campbell-Sills et al. [2009]).
Anxiety and depressive symptoms.

Anxiety and depressive symptoms were measured using MASQ (Appendix H) developed by Clark and Watson, (1991). The general distress subscale can be divided into three facets – general distress mixed symptoms, general distress depressive symptoms, and general distress: anxiety symptoms (Talkovsky and Norton, 2015). The 26-item scale was used with anhedonic depression (AD) and anxious arousal (AA) subscales for this current study. Participants were required to indicate on a 5-point scale, ranging from 1 (not at all) to 5 (extremely) how much they had experienced each symptom during the past week. The study conducted by Lin et al. (2014) used the short adaptation of the MASQ in adolescents and young adults. Internal consistency reliability coefficients ranged from 0.85 to 0.92 across the scales. Comparison with the Center for Epidemiological Studies-Depression (CES-D) indicated adequate convergent/divergent properties. Results indicated that the shorter version is a valid and reliable instrument in young people, allowing for quick assessment of tripartite dimensions of depression and anxiety (Lin et al., 2014).

Reliability of the instruments in this current study: PSS-10 (.846), CD-RISC-10 (.823), MOS-SSS (.944) and subscale of MASQ Arousal Anxiety (AA) [.871] all had excellent reliability (Cronbach’s alpha coefficient), except subscale of MASQ Anhedonic Depression (AD) which was considerably lower at .527.

Abbreviated injury severity score.

Abbreviated injury severity score (ISS) revised in 2005 (AIS05) (Appendix I) was used to delineate between major and non-major trauma. The anatomical
scoring system was introduced in 1969 with the initial publication in 1971 and it has now become the standard for documentation of anatomical injuries sustained during trauma events through four subsequent revisions update against survival in 1980, 1985, 1998, and 2005 (Palmer et al., 2010). Injuries are ranked on a scale of 1 to 6, with 1 being minor, 2 moderate, 3 serious, 4 severe, 5 critical and 6 a nonsurvivable injury. Injury Code mapping between AIS versions appears to have validity, but mapping AIS05-coded data back to AIS98 for comparison is recommended. The ISS score takes value from 0 to 75. Scores will be used to describe the sample. Complications were coded yes (1) or no (2) and measured by hospital- acquired infections and multiple blood product infusions.

Data Analysis

IBM Statistical Package for Social Science (SPSS 25) was used to analyze descriptive statistics of the sample regarding gender, ethnicity, age, mechanism of injury, injury severity, complications and baseline systolic/diastolic blood pressure and heart rate. Gender, ethnicity and age were controlled for possible confounding effects on health outcomes (anxiety and depressive symptoms). The distributions of the dependent variables were checked for normality and transformed if indicated.

The independent, dependent and moderating variables in this current study were labeled as scale data in which to examine the mean values to see if they were close to what was expected and to check the shape of distribution. Descriptive statistics (n = 68) for all variables examined in this study are depicted in Table 1. The minimum and maximum statistics are shown for the independent
variable of perceived stress; dependent variables of arousal anxiety and anhedonic depression, and moderating variables of social support and resilience. The means of the data are reasonably expected based upon the minimum and maximum statistic for each variable. The main assumption examined from this data is normality. To check the normality assumption for the variables, the skewness should lie between -1 and 1. All of the variables are normally distributed except for social support which is slightly skewed to the left greater than -1 (-1.195). Thus, it can be assumed that all the variables are approximately normally distributed.

Table 1

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PSS</td>
<td>68</td>
<td>5.00</td>
<td>33.00</td>
<td>17.56</td>
<td>7.34</td>
<td>.371</td>
<td>.291</td>
</tr>
<tr>
<td>AA</td>
<td>68</td>
<td>10.00</td>
<td>45.00</td>
<td>20.89</td>
<td>9.03</td>
<td>.547</td>
<td>.291</td>
</tr>
<tr>
<td>AD</td>
<td>68</td>
<td>8.00</td>
<td>36.00</td>
<td>22.09</td>
<td>5.51</td>
<td>.065</td>
<td>.291</td>
</tr>
<tr>
<td>CD</td>
<td>68</td>
<td>10.00</td>
<td>40.00</td>
<td>28.87</td>
<td>7.01</td>
<td>-.482</td>
<td>.291</td>
</tr>
<tr>
<td>SSS</td>
<td>68</td>
<td>1.53</td>
<td>5.00</td>
<td>4.16</td>
<td>.77</td>
<td>-1.195</td>
<td>.291</td>
</tr>
</tbody>
</table>

Note. PSS (Perceived Stress Scale) score; AA (Arousal Anxiety) score; AD (Anhedonic Depression) score; CD (Connor-Davidson) resilience scale score, and SSS (Social Support Survey) score.

Using a cross-sectional research design during hospitalization following physical traumatic injury in adolescents and young adults, the specific aims and hypotheses of the study were to:

1. Examine the main effect of the independent variable (perceived stress) on health outcomes (anxiety and depressive symptoms).
1.1. It was hypothesized that increased stress was associated with higher anxiety and depressive symptoms.

For hypothesis 1.1, multiple regression analysis was used to test for main effects of the independent variable (perceived stress), with the dependent variables (anxiety and depressive symptoms) while controlling for covariates of age, gender and ethnicity. Initially, all covariates were included in each model. Non-significant covariates ($>\leq .05$) were eliminated one at a time. A separate analysis was conducted for the two dependent variables.

Anxiety = Stress + Covariates variables (gender, age, ethnicity)
Depression = Stress + Covariates (gender, age, ethnicity).

2. Examine the moderating effect of resilience and social support in the relationship between perceived stress and health outcomes (anxiety and depressive symptoms).

2.1. It was hypothesized that increased levels of resilience and social support will buffer the negative effects of perceived stress on health outcomes (anxiety and depressive symptoms).

For hypothesis 2.1, moderating effects of resilience and social support on the relationship independent variable (perceived stress) and the dependent variables health outcomes (anxiety and depressive symptoms) were tested in the four separate analyses described below.

Specifically, the inclusion of resilience and social support as interaction terms with perceived stress tested the moderating effects of resilience and social
support. Initially, all covariates were included in each model. Non-significant covariates ($\geq .05$) were eliminated one at a time.

Anxiety = Stress + Resilience + (Stress $\times$ Resilience) + Covariates (gender, age, ethnicity)

Anxiety = Stress + Social Support + (Stress $\times$ Social Support) + Covariates (gender, age, ethnicity)

Depression = Stress + Resilience + (Stress $\times$ Resilience) + Covariates (gender, age, ethnicity)

Depression = Stress + Social Support + (Stress $\times$ Social Support) + Covariates (gender, age, ethnicity)

Results

Descriptive statistics of the 68 participants included 73.5% male and 26.5% female. Regarding ethnicity 23.5% African American, 19.1% Caucasian, 51.5% Hispanic and 5.9% categorized as other. The mean age was 20.6 years. The mean age for males was 23.2 years while the mean age for females was 17.8 years. A total of 93 candidates were screened for enrollment into the study. Six candidates were discharged home before approached for invitation to participate; 1 was excluded for diagnosis of cerebral palsy; 8 refused participation in study procedures; 3 were still in intensive care unit; 3 had known prior psychiatric conditions; 2 were diagnosed with mild traumatic brain injury; and 2 had suicidal tendencies.

Demographic and other baseline characteristics including gender, ethnicity, mean age, minimum, maximum and mean statistic for injury severity
score, systolic blood pressure, diastolic blood pressure, heart rate and complications (Table 2). Other percentages included mechanism of injury blunt (78%), penetrating (22%), and complications yes (18%), and complications no (82%) [Data not shown]. The injury severity score (0-75) ranged from 5 to 48 in study participants. The higher the number, the more severe the injury. The mean was around 19. All four of the questionnaires (perceived stress, mini mood anxiety, resilience and social support) were available for all 68 participants.

For specific aim 1, it was hypothesized that increased stress was associated with higher anxiety symptoms. Multiple linear regression in the form of the general linear model (GLM) was used to test association between PSS score and arousal anxiety (AA) after adjusting for age, gender, and ethnicity. Controlling for these variables, perceived stress was significantly associated with AA (p = .001) suggesting an increase in stress is significantly associated with higher anxiety. Age was not significant (p = .390) in the initial model and was removed. Two other covariates (gender and ethnicity) were significantly associated with AA. Males had higher AA scores than females (p = .023) [Table 3a]. The unstandardized regression coefficient (B) for predicting anxiety arousal from perceived stress is 0.481 (95% CI 0.200, 0.761) [Table 3b]. This finding indicates that for every one point increase in PSS score, AA score increases by about a half point (.481). African Americans and Caucasians had higher AA scores than Hispanics (p = .021) [Table 3a]. Thus, we can reject the null hypothesis of no association and state that an increase in the level of perceived
stress is a statistically significant predictor of an increase in anxiety, after adjusting for age, gender and ethnicity.

For specific aim 1, it was also hypothesized that increased stress was associated with higher depressive symptoms. In the GLM for the association of the independent variable perceived stress with the dependent variable of anhedonic depression (AD) symptoms (p = .442), adjusting for covariates of age (p = .660), gender (p = .133), and ethnicity (p = .092), all were non-significant (Data not shown). Initially, the main independent variable, PSS score, and three covariates, gender, ethnicity and age, were included in this model with AD as the dependent variable. Each of the non-significant covariates was removed one at time; all three were nonsignificant. After removing all covariates, the significance level of PSS score and AD score was p = .290. The regression coefficient for perceived stress and AD was not statistically significant and indicates that there is no statistically significant association between levels of perceived stress and anhedonic depressive symptoms.
Table 2

Descriptive Statistics Demographic/Physiologic Data

<table>
<thead>
<tr>
<th>Demographic/Physiologic Data</th>
<th>Min Stat</th>
<th>Max Stat</th>
<th>Mean Stat</th>
<th>Std Deviation Stat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>16.00</td>
<td>25.00</td>
<td>20.67</td>
<td>2.40</td>
</tr>
<tr>
<td>Gender</td>
<td>1</td>
<td>2</td>
<td>1.26</td>
<td>.444</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>1</td>
<td>5</td>
<td>3.16</td>
<td>1.300</td>
</tr>
<tr>
<td>MOI</td>
<td>1</td>
<td>2</td>
<td>1.78</td>
<td>.418</td>
</tr>
<tr>
<td>ISS</td>
<td>5</td>
<td>48</td>
<td>18.59</td>
<td>9.850</td>
</tr>
<tr>
<td>SBP</td>
<td>91.00</td>
<td>189.00</td>
<td>124.8</td>
<td>17.11</td>
</tr>
<tr>
<td>DBP</td>
<td>53.00</td>
<td>101.00</td>
<td>69.7</td>
<td>10.13</td>
</tr>
<tr>
<td>HR</td>
<td>53.00</td>
<td>110.00</td>
<td>80.32</td>
<td>12.83</td>
</tr>
<tr>
<td>Complications</td>
<td>1</td>
<td>2</td>
<td>1.82</td>
<td>.384</td>
</tr>
</tbody>
</table>

Note. N = 68. Gender 1 = male; 2 = female; Ethnicity 1 = African American 3 = Caucasian 4 = Hispanic 5 = Other. MOI = Mechanism of Injury 1 = blunt 2 = penetrating. ISS = Injury Severity Score. SBP = Systolic Blood Pressure. DBP = Diastolic Blood Pressure. HR = Heart Rate. Complications 1 = yes 2 = no.

For specific aim 2, it was hypothesized that increased levels of resilience and social support will buffer the negative effects of perceived stress on health outcomes (anxiety and depressive symptoms). Using the GLM testing for the main effect between AA on perceived stress and interaction effect of resilience and perceived stress controlling for the covariates of age, gender and ethnicity, the findings related to this aim were non-significant (Data not shown). This model was repeated with main effects of AD on perceived stress and interaction effect of AD and perceived stress controlling for the covariates, the findings were non-significant. The models were repeated testing main and interaction effects of AA and AD on and with perceived stress, deleting each covariate one at a time. The
results were non-significant. Social support or resilience did not moderate the effect of perceived stress on the outcome of (AA) symptom. Social support or resilience did not moderate the effects of perceived stress on the outcome of (AD) symptom. Thus, we do not reject the null hypothesis that resilience and social support do not moderate the effects of perceived stress on outcomes of anxiety and depressive symptoms.

Table 3a

Analysis of Variance Arousal Anxiety Test of Between Subjects Effects
Dependent Variable: AA Score

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>1</td>
<td>326.866</td>
<td>5.456</td>
<td>.023</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>3</td>
<td>209.650</td>
<td>3.500</td>
<td>.021</td>
</tr>
<tr>
<td>PSS_Score</td>
<td>1</td>
<td>704.160</td>
<td>11.754</td>
<td>.001</td>
</tr>
<tr>
<td>Error</td>
<td>62</td>
<td>59.908</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>68</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note. Predictor variable PSS score. Dependent variable AA score. The F tests the effect of covariates Gender; Ethnicity from PSS score. The degrees of freedom for the F tests for Gender are 1 for the numerator and 62 for the denominator; Ethnicity is 3 for numerator and 62 for denominator and for PSS score 1 for numerator and 62 for denominator. The tests are based on linearly independent pairwise comparisons among the estimated marginal means. The mean difference is significant at .05 level.*
Table 3b

*Summary of Linear Regression Analysis for Dependent Variable: AA (N = 68)*

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>Std. Error</th>
<th>t</th>
<th>Sig</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender = 1</td>
<td>5.286</td>
<td>2.263</td>
<td>2.336</td>
<td>.023</td>
<td>.762</td>
</tr>
<tr>
<td>Gender = 2</td>
<td>0a</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Ethnicity = 1</td>
<td>5.424</td>
<td>4.347</td>
<td>1.248</td>
<td>.217</td>
<td>-3.264</td>
</tr>
<tr>
<td>Ethnicity = 3</td>
<td>6.931</td>
<td>4.432</td>
<td>1.564</td>
<td>.123</td>
<td>-1.929</td>
</tr>
<tr>
<td>Ethnicity = 4</td>
<td>-.171</td>
<td>4.135</td>
<td>-.041</td>
<td>.967</td>
<td>-8.436</td>
</tr>
<tr>
<td>Ethnicity = 5</td>
<td>0a</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>PSS_Score</td>
<td>.481</td>
<td>.140</td>
<td>3.428</td>
<td>.001</td>
<td>.200</td>
</tr>
</tbody>
</table>

Note. Gender 1 (male); Gender 2 (female); Ethnicity 1 (African American); Ethnicity 3 (Caucasian); Ethnicity 4 (Hispanic); Ethnicity 5 (Other), and PSS (Perceived Stress Scale). a. This parameter is set to zero because it is reference point.

Table 4

*Pairwise Comparisons: Dependent Variable AA Score and Ethnicity*

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Ethnicity</th>
<th>Mean Difference</th>
<th>Std Error</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
<td>-1.507</td>
<td>2.930</td>
<td>.609</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>5.595</td>
<td>2.458</td>
<td>.026</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>5.424</td>
<td>4.347</td>
<td>.217</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>1.507</td>
<td>2.930</td>
<td>.609</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>7.102</td>
<td>2.545</td>
<td>.007</td>
</tr>
<tr>
<td>5</td>
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<td>6.931</td>
<td>4.432</td>
<td>.123</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>-5.595</td>
<td>2.458</td>
<td>.026</td>
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<tr>
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<td>2.545</td>
<td>.007</td>
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<tr>
<td>5</td>
<td></td>
<td>-.171</td>
<td>4.135</td>
<td>.967</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>-5.424</td>
<td>4.347</td>
<td>.217</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>-6.931</td>
<td>4.432</td>
<td>.123</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>.171</td>
<td>4.135</td>
<td>.967</td>
</tr>
</tbody>
</table>

Note. Ethnicity 1 (African American); Ethnicity 3 (Caucasian); Ethnicity 4 (Hispanics), and Ethnicity 5 (Other).
Discussion

The findings of the current study suggest that higher levels of perceived stress following traumatic injury are significantly associated with high levels of arousal anxiety. Controlling for age, gender and ethnicity, perceived stress was significantly associated with AA ($p = .001$). Therefore increased stress is significantly associated with increased anxiety after physical traumatic injury in the adolescent and young adult population.

In an integrative literature review on the relationship between physical trauma and mental health following physical traumatic injury, it was discovered that anxiety, depression and PTSD were frequent sequelae associated with physical traumatic injury (Wiseman, Foster and Curtis, 2012). Yet, in a recent study conducted by Wiseman, Curtis, Lam and Foster (2015), the researchers investigated injury severity in ages ranging from 18-94 years. The findings for 101 participants suggested that anxiety, depression and stress in hospitalized patients following physical traumatic injury are common and anticipated in patients admitted to the ICU. Whereas, the current study examined participants’ ages 16-25 years who were admitted to the trauma floor, the study conducted by Wiseman et al. (2015), ages ranged from 18-94 years in an ICU setting, and their findings may not be generalizable to the adolescent/ young adult population represented in the current study.

This current study also suggests that males have higher anxiety levels than females. Although, gender was not a specific aim, statistically significant results were noteworthy as current literature suggests females experience higher anxiety levels following potentially traumatic events than males. Recently, one
study conducted by Overstreet, Berenz, Kendler, Dick and Amstadter (2017) revealed that exposure to potentially traumatic events (PTEs) has been associated with psychiatric disorders including generalized anxiety and panic disorder. In this study, prevalence and correlates of mental health outcomes of male and female college students of different races who were exposed to PTEs were examined. The researchers found that female sex was associated with higher anxiety symptoms (B=0.04, p < 0.05) than male sex. They also discovered that interpersonal PTEs and trauma-related stress were associated with higher anxiety symptoms (Bs=0.07, 0.11, ps < 0.001). So this may have been a unique and notable finding in this current study in which males had higher levels of anxiety than females following traumatic injury as opposed to PTEs and interpersonal PTEs. It should be noted that this sample was small and included only 18 females, indicating the need for further research in this regard.

Ethnicity and increased arousal anxiety revealed significant associations in the present study whereas African American and Caucasian adolescent and young adult males have shown higher levels of anxiety following physical traumatic injury than their Hispanic counterparts (Table 4). There is limited research in the literature regarding the association of ethnicity and anxiety symptomatology in this patient population.

Although, in one study conducted by Davis et al. (2006), archival data were collected from 94 consecutive charts of clients who presented at an outpatient clinic specializing in the treatment of trauma victims in an urban area in a southeast region of the US, including 72% Caucasian, 21% African American,
and 1% Hispanic. One percent Hispanic participants and only female makes it difficult to compare with the current study findings. The researchers also found that Caucasians reported greater distress on arousal anxiety following various types of trauma and were diagnosed with post-traumatic stress disorder more than African Americans. However, the samples were small in both studies. There was not a significant difference between Caucasians and African Americans in this current study. Conversely, Ghafoori, Barragan, Tohidian and Palinkas (2012) examined the association between race/ethnicity and symptom severity of generalized anxiety disorder and posttraumatic stress disorder in 170 Black, White and Hispanic trauma-exposed adults over 18 years of age. In their study, findings revealed no significant relationship between racial/ethnic group status and general anxiety distress symptom severity following exposure to trauma. The current study revealed significant differences among African Americans, Caucasians and Hispanics.

In this current study, statistically significant results showed that African Americans and Caucasians have higher AA levels than Hispanics following physical traumatic injury, but Caucasians are not significantly different from African Americans. The findings of significantly lower levels of AA for Hispanics than African American and Caucasian counterparts following physical traumatic injury are substantially unique in this study and previous studies have not included substantial numbers of Hispanics nor have they been focused on adolescents or young adults.
Further analysis of the current study indicated that the effect of perceived stress on anhedonic depressive symptoms were non-significant. As the reliability was low (.527) on the subscale (AD) of the MASQ, it may have directly affected this finding. These findings may differ from several studies which have shown that depressive symptoms occur in survivors of traumatic injury. Depressive symptoms were shown to be associated with weak coping mechanisms, increased risk of substance use, and other mental health problems such as PTSD and anxiety in a study conducted by Van Horn, (2009) of 50 injured patients who were 25-55 years old from 2 US hospitals. Likewise, Amstadter and Vernon, (2008) discovered in a retrospective cohort study of 165 participants ranging from, 17-28 years of age from long term care institutions where four traumatic event types were examined for specific emotions with several scales. Depression was evident in 42% of those sampled at 6 months following injury. The current study was a cross-sectional study at one point in time. Longitudinal studies would probably yield more conclusive results.

In another retrospective cohort study of 335 injury survivors examined by Holtslag, Van Beeck, Lindeman and Leenen (2007), it was revealed that at 12-18 months following injury, 28% of the study sample had a new onset of depressive symptoms and functional disability affecting their activities of daily living. Most of those studies were able to examine the research over longer periods of time or retrospectively as most were thought to have depressive symptoms 6-18 months to several years following their injuries. In the current cross-sectional study, examination of depression was conducted at one point in time during
hospitalization. Possibly, had there been more than one visit assessing levels of depressive symptoms, outcomes may have been different. Other studies have shown depressive symptoms after traumatic injury but further out than 2-3 days as in the current study.

Additionally, the data in the current study did not show that social support or resilience moderate the effect of perceived stress on anxiety and depressive symptoms as originally predicted, although studies have found that social support system can mitigate severity of PTSD in individuals following traumatic events and it has been shown to have the potential to reduce stress, depression, and enhance health, and thus is understood to be a protective factor for individuals experiencing trauma (Evans, Steel and DiLillo, 2013). Evans et al. (2013) have suggested in this study that the beneficial effects of social support can reduce the likelihood of development of PTSD after exposure to traumatic events. According to Ehlers and Clark (2000), research findings suggest social support can influence the cognitive and emotional reactions in the aftermath of trauma. However, Pinto, Morgado, and Monteiro, Levendosky & Jongenelen (2017) in their study of at risk-sample of adolescents 13-17 years of age concluded that social support was not enough to reduce PTSD symptoms in those who had been exposed to trauma and adversity.

The studies mentioned above examined stress and social support effect(s) upon PTSD and concluded that social support may mitigate or influence the severity of PTSD. The current study examined perceived stress and the moderating effect(s) of social support upon anxiety and depressive symptoms
outcomes which are pre-determinants of PTSD. The current population does not have a diagnosis of PTSD and therefore the previous studies findings may not represent this population. Overstreet et al. (2017) examined the relationships between PTE characteristics and early environmental factors and resilience with regard to mental phenotypes. Their findings suggest that social support and self-reported resilience are associated with fewer symptoms of anxiety and depression. Still, other research suggests that strengthening levels of perceived support and control and reducing psychosocial difficulties may improve psychological resilience and reduce the likelihood of psychiatric symptom development (Pietrzak and Cook, 2013). Further research is needed to explore social support and resilience moderating or perhaps mediating effects upon the relationship between stress and health outcomes of depressive and anxiety symptoms in the adolescent/young adult population.

Although there were non-significant values for the moderating variables of resilience and social support of perceived stress on anxiety and depressive symptoms, other significant findings of gender, ethnicity and perceived stress were consistent with the original prediction. Anhedonic depression was expected to increase with increased levels of perceived stress with or without age but did not reveal any significance. The low reliability (.527) of the subscale for this instrument MASQ (AD) may have been a direct contributor to the non-significant findings.
**Strengths and Limitations**

A strength of this study was the focus on adolescents and young adults who are at risk of traumatic physical injury but are underrepresented in previous studies of survivors. There have been very few studies that have examined psychosocial variables with this adolescent young adult population following physical traumatic injuries other than with combat veterans. All data were collected by the same interviewer using the same instruments in the same order of administration. The instruments had good reliability except for the anhedonic subscale of the MASQ and the data was relatively easy to analyze. The sample size of 68 was moderately sufficient and revealed significant and unique findings. This study significantly revealed that adolescent and young adult patients of Hispanic origin showed lower levels of AA than their African American and Caucasian counterparts. In addition to this unique significance, a major advantage for data collection was that the subjects were recruited from a large Level I Trauma Center in the Texas Medical Center, Houston, Texas.

Although there are significant values for perceived stress and arousal anxiety associations as well as gender and ethnicity differences in this current study, there are limitations that should be noted. First of all, the cross-sectional study allows examination of associations and relationships, there is no causality in this study design. Changes over time were not measured. Therefore, a longitudinal study design is recommended and it may reveal long-term effects which traumatic injury may impose upon this patient population and could serve as a follow-up to this cross-sectional study for more robust data collection. Follow-up research study may allow time to enroll clients from shock trauma
intensive care (STICU) and intermediate care units (IMU) as well as the orthopedic trauma floor. This would allow comparisons of outcomes from the three units including upper and lower range of injury severity scores and comparison between those who have endured specific complications and those who did not to further examine the effects on psychosocial outcomes.

Social support and resilience did not show any evidence of moderating the level of perceived stress on the psychosocial outcomes of anxiety and depressive symptoms. Other instruments of moderating or mediating variables may be administered to examine possible significant p values from levels of perceived stress on outcomes of anxiety and depressive symptoms. The low reliability of the subscale, AD, on the MASQ instrument may have misrepresented depressive symptom outcomes in both male and female populations. A depressive symptom scale with good reliability may significantly impact the findings of perceived stress on depressive symptoms following physical traumatic injury.

**Implications for Research**

This study reveals increased levels of perceived stress which are associated with increased levels of anxiety. Few studies have examined those variables in adolescent and young adult populations following traumatic injury. Further longitudinal studies may be conducted to examine if arousal anxiety which occurs early after traumatic injury predisposes the victim to PTSD or if arousal anxiety and depressive symptoms predisposes the subject to long-term PTSD.
This study may also be replicated to compare results to examine similarities and differences. Subsequent studies may be implemented which include a higher range for injury severity scores or which compares lower severity range to higher range severity scores and the psychosocial outcomes. Intervention studies could also be conducted which focus on prevention of arousal anxiety and treatment groups for long-term effects of PTSD. This current research study may also serve to provide further knowledge about psychiatric disorders which may incur as a result of the physical traumatic injury providing a foundation for evidence-based practice in the clinical setting for treatment intervention. Public health initiatives are necessary to address the mental health burden caused by psychiatric effects of physical traumatic injuries.

**Implications for Practice**

This study suggests that participants may incur mental health symptoms during hospitalization and other studies suggest that early symptoms may predispose to long term effects of anxiety, depression, and PTSD. The services of early intervention case managers have been found to be effective in improving return to optimal level of functioning after injury. In the findings noted by Van Horn (2009), the researchers strongly suggest that health care facilities integrate case management for mental health screening in patients with a traumatic injury. All too often, patients experience early, maybe subtle depressive and anxiety symptoms which are frequently missed because of the intensity of the treatment for physical trauma. Early identification and follow-up of mental health symptoms are strongly recommended for survivors of posttraumatic physical injury. Further
follow-up research is warranted to fully understand the psychological sequelae of adolescents and young adults following physical traumatic injury to determine further implications for practice in health care.

**Conclusion**

Despite the limitations in the current research and credit to the strength of the significant findings revealed, there are significant associations of perceived stress and anxiety as well as perceived stress between ethnicity and gender in physically traumatically injured adolescents and young adults. It has been suggested by several studies that physical traumatic injury has been highly associated with mental health problems. Early identification, treatment and referral are possible solutions to address mental health issues associated with physical traumatic injury in adolescents and young adults and may ultimately contribute to prevention of untoward long-term patient outcomes. Health care may benefit from further study in the adolescent-young adult population focusing on treatment and intervention and evidenced based practice in the clinical setting. Innovative methodologies may be implemented collaboratively from a multi-disciplinary approach to identify misdiagnosed and underdiagnosed clients in this population who present to the emergency department and subsequently following standardized assessment and intervention protocols once admitted to the in-patient settings.
Acknowledgements

The author(s) acknowledge the assistance of Duck-Hee Kang, PhD, RN, FAAN (deceased) in the design phase of this study and Mr. Stanley Cron, MPH in the statistical analysis.
References


Appendix A

Approval to Begin Research UTHealth
Appendix A: Approval to Begin Research UTHealth

NOTICE OF APPROVAL TO BEGIN RESEARCH

HSC-SN-18-3001 - Health Outcomes of Adolescents and Young Adults After Traumatic Injury: The Role of Stress Resilience and Social Support

Number of Subjects Approved: Target: 68/Screen: 150

PROVISIONS: This approval relates to the research to be conducted under the above referenced title and/or to any associated materials considered by the Committee for the Protection of Human Subjects, e.g. study documents, informed consent, etc.

APPROVED: By Expedited Review and Approval

REVIEW DATE: 02/21/2018

APPROVAL DATE: 02/21/2018

EXPIRATION DATE: 01/31/2019

CHAIRPERSON: L. Maximilian Buja, MD

Subject to any provisions noted above, you may now begin this research.

CHANGES: The principal investigator (PI) must receive approval from the CPHS before initiating any changes, including those required by the sponsor, which would affect human subjects, e.g. changes in methods or procedures, numbers or kinds of human subjects, or revisions to the informed consent document or procedures. The addition of co-investigators must also receive approval from the CPHS. ALL PROTOCOL REVISIONS MUST BE SUBMITTED TO THE SPONSOR OF THE RESEARCH.

INFORMED CONSENT DETERMINATION:
Signed Parental Consent/One Parent Signature

INFORMED CONSENT: When informed consent is required, it must be obtained by the PI or designee(s), using the format and procedures approved by the CPHS. The PI is responsible to instruct the designee in the methods approved by the CPHS for the consent process. The individual obtaining informed consent must also sign the consent document. Please note that only copies of the stamped approved informed consent form can be used when obtaining consent.

HEALTH INSURANCE PORTABILITY and ACCOUNTABILITY ACT (HIPAA):
HIPAA Authorization required:
HIPAA Authorization within consent form

UNANTICIPATED RISK OR HARM, OR ADVERSE DRUG REACTIONS: The PI will immediately inform the CPHS of any unanticipated problems involving risks to subjects or others, of any serious harm to subjects, and of any adverse drug reactions.

RECORDS: The PI will maintain adequate records, including signed consent and HIPAA documents if required, in a manner that ensures subject confidentiality.
Appendix B

Approval to Conduct Research at Memorial Hermann
Approval to Conduct Research at Memorial Hermann

April 19th, 2018

Thank you for choosing Memorial Hermann as your service provider for this research study.

IRB ID: HSC-SN-18-0001

PRINCIPAL INVESTIGATOR: Belanie Peavy, PhD.

STUDY TITLE: Health Outcomes of Adolescents and Young Adults After Traumatic Injury: The Role of Stress Resilience and Social Support.

NUMBER OF SUBJECTS: 68

Approval is hereby granted by Memorial Hermann Healthcare System to initiate this research study at the Memorial Hermann – Texas Medical Center location. This approval is subject to the Principal Investigator’s acceptance of the following stipulations:

STUDY SPECIFIC STIPULATIONS:

Research Informed Consent:
1. The Joint Commission requires that a copy of the signed consent form for hospital-based studies be in all subjects’ hospital medical records. In addition, the MHHS Authorization for Disclosure of Protected Health Information for Research (with IRB approval stamp) must be placed in all subjects’ hospital medical records. The informed consent and disclosure form must remain in the subjects’ charts.

Data Security and HIPAA:
2. All data security computer devices and Protected Health Information used in this study must be password protected and/or data encrypted.
3. The Principal Investigator will use a “linking log” that contains the subject name, MRN (Medical Record Number) and study number to identify subjects. The MRN must not be used on the data collection tool.

Other requirements:
4. Please remember to acknowledge the Memorial Hermann – Texas Medical Center in any publications resulting from this study, and provide a copy of the publication to the Director, Clinical Research for Memorial Hermann Clinical Innovation & Research Institute (Sheila.Ryan@memorialhermann.org). The methods of acknowledgement may include:
   a. Memorial Hermann – Texas Medical Center as an author’s affiliation;
   b. mention in an “acknowledgement” section; or
   c. as a footnote.

Please sign and return a copy of this letter to the Memorial Hermann Clinical Innovation & Research Institute to the attention of eleonora.balibita@memorialhermann.org to indicate your acceptance of our terms and policies (guidelines attached).

This study may not be initiated until the letter is signed and returned to the Memorial Hermann Clinical Innovation & Research Institute.

If you have questions or need additional information, please contact the Memorial Hermann Clinical Innovation & Research Institute at (713) 704-3430.
INSERVICE EDUCATION
The Investigator will provide in-service education regarding study procedures and requirements to all unit, clinic and/or department staff participating in the study including unit directors and managers.

PATIENT RECORDS/INFORMED CONSENT
The Joint Commission requires that the signed copy of the informed consent form for hospital-based studies be in all subjects' hospital medical records. In addition, the MHHS Authorization for Disclosure of Protected Health Information for Research (with IRB approval stamp) must be placed in all subjects' hospital medical records. The informed consent and disclosure form must remain in the subjects' charts.

RESEARCH ORDERS
Investigator must document in the medical record the subject's participation in the research study including consent process, study procedures, and treatments, with notation of research related procedures.

FINANCIAL RESPONSIBILITIES
Investigator agrees to make payment on the research account within 45 days of the billing date and according to the rates set forth in the attached Budget Worksheet. The budget provides a standard discount for research-related services. Research billing statements are distributed on a monthly basis. Please contact the MH Research Institute at (713) 704-4210 with billing questions. Past due accounts may be referred by Memorial Hermann to the appropriate Medical School Department Chair or Memorial Hermann Hospital CFO.

MEDICAL RECORD ACCESS
Requests for medical records must be submitted three (3) business days in advance. The Investigator must provide copies of the signed informed consent and MHHS Authorization for Disclosure of Protected Health Information for Research for each record requested. Records will be held in the Research Room for one week. There is a 20 record limit per request. At Memorial Hermann-TMC, the Research Room is open Monday through Friday, 8am-5pm. Please contact Health Information to make arrangements for after-hours access to records. Investigator must also provide three (3) business days notice of all monitoring visits to the Health Information Department (Medical Records).

DATA SECURITY
All data security computer devices used in this study must be password protected and/or data encrypted.

INVESTIGATIONAL DRUG SERVICE (IDS) PHARMACY
Upon receipt of the Memorial Hermann Approval Letter, IDS will need approximately two weeks to prepare the pharmacy protocol, create a distribution system, and in-service the Pharmacy staffs before enrollment of patients can begin. The Study Set-Up/Administrative Fee will be charged to the Research Billing Account once the preparation process is completed.

CONTINUING IRB REVIEW
Memorial Hermann requires continuous approval by the IRB for all research studies. The Principal Investigator is responsible for maintaining continuing review approval during the conduct of the study.

FEDERAL REGULATORY AGENCY
The MH Clinical Innovation & Research Institute must be notified, in advance, of any regulatory agency visit or review. Contact Cheryl M Chanaud, PhD, MHHS Vice President of Research, (713) 704-4216.
APPROVED:

Sheila L. Ryan, JD, MPH, CCRP
Director, Clinical Research
Clinical Innovation and Research Institute
Memorial Hermann Health System

04/19/2018

ACCEPTANCE:

Belanie Peavy, PhDc
Principal Investigator

4-25-2018

cc:
Sheila Lopez, Director, Trauma

Attachments:
Memorial Hermann Clinical Innovation and Research Institute Guidelines
Appendix C

Consent Form
INFORMED CONSENT FORM TO TAKE PART IN RESEARCH
Health Outcomes of Adolescents and Young Adults After Traumatic Injury: The Role of Stress Resilience and Social Support HSC-SN-18-0001

INVITATION TO TAKE PART

This dissertation research is being conducted by Belanie Peavy for partial fulfillment of the requirements for the degree of doctorate of philosophy in the Graduate School of UT Health School of Nursing. In this consent form, the word "you" may refer to both the child who is participating in the study and the child's parent or legal guardian.

You are invited to take part in a research project called, Health Outcomes of Adolescents and Young Adults after Traumatic Injury: The Role of Stress Resilience and Social Support, conducted by Principal Investigator (Belanie Peavy) of the University of Texas Health Science Center, School of Nursing and the Co-Investigators (Mandy Roberts and Jeanette Podhilecki) at the University of Texas Medical School. For this research project, they will be called the Principal Investigator or PI and Co-Investigators or Co-(i)s.

Your decision to take part is voluntary. You may refuse to take part or choose to stop from taking part, at any time. A decision not to take part or to stop being a part of the research project will not change the services available to you from physicians and hospital.

This research project has been reviewed by the Committee for the Protection of Human Subjects (CPHS) of the University of Texas Health Science Center at Houston as HSC-SN-18-0001.

PURPOSE

The purpose of this research study is to evaluate health outcomes of adolescent and young adults following traumatic injury. Traumatic injury refers to physical (harm to one’s body) of sudden onset and seriousness which require immediate medical attention. It is the intent of this study to examine adolescents and young adults who have been hospitalized for treatment following traumatic injury at one point in time upon admission to the trauma floor at a Level I trauma center in an acute care facility. Questions remain as to whether the level of perceived stress affects their health outcomes of anxiety and depressive symptoms and whether resilience (to recover quickly from injury accidents) and social support (the belief that one is cared for or has help from other people) moderate (make or become less intense or weakened) those effects of perceived stress on health outcomes of anxiety and depressive symptoms following traumatic injury.

This is a local study with its only location in Houston, Texas in the Texas Medical Center at Memorial Hermann Hospital System (MHHS). The study will enroll a total of 68 adolescent and young adults locally in the Houston, Texas and surrounding areas. This is a non-funded study.

IBB NUMBER: HSC-SN-18-0001
IBB APPROVAL DATE: 02/21/2018
PROCEDURES

If you agree and are able to take part in this study you will undergo the following procedures:

- After you have completed the informed consent process with study personnel, you will complete four questionnaires for perceived stress, resilience, social support, anxiety and depression.
- Study personnel will interview you using those questionnaires and this process will take about 30 minutes.

TIME COMMITMENT

The total amount of time you will take part in this research study is 30 minutes. The data collected will remain in the Research Department of the University of Texas health Science School of Nursing for at least 3 years.

BENEFITS

Taking part in this study may or may not help you. We do hope to learn something from this research. And someday hope it will help other adolescents who have unexpected injuries.

RISKS AND/OR DISCOMFORTS

Questionnaires: There are no physical risk(s) and very minimal psychological risks related to answering personal questions regarding your thoughts and feelings following the traumatic injury. You may experience potential emotional risks of feelings of sadness or anxiety and potential loss of confidentiality and time. You may decline to answer any, or all questions.

ALTERNATIVES

The only alternative is not to take part in this study.

STUDY WITHDRAWAL

Your decision to take part in this study is voluntary. A decision not to take part or to stop being a part of the research project will not change the services available to you from the physician, hospital staff and other department services. The PI may withdraw you from taking part in the study. The information collected about you may still be used for study analysis even if you have been withdrawn from the study.

You should report any concerns reading this research study to Belanie Peavy (281) 943-6815 and to the Committee for the Protection of Human Subjects at (713) 500-7943. You will not give up any of your legal rights by signing this consent form.
COSTS, REIMBURSEMENT AND COMPENSATION

If you decide to take part in this research study, you will not incur any additional costs. You will not be compensated for your taking part in the study.

CONFIDENTIALITY

You will not be personally identified in any reports or publications that may result from this study. Any personal information about you that is gathered during this study will remain confidential to every extent of the law. A special number (code) will be used to identify you in the study and only the investigator will know your name. There is a separate section in this consent form with which you will be asked to sign which details the use and disclosure of your protected health information.

QUESTIONS

If you have questions at any time about this research study, please feel free to contact the PI Belanie Peavy at (281) 943-6815, who will gladly answer your questions. You can contact the study team to discuss problems, voice concerns, obtain information, and offer input in addition to asking questions about the research.
AUTHORIZATION TO USE AND DISCLOSE
PROTECTED HEALTH INFORMATION FOR RESEARCH

Patient Name: __________________________ Date of birth: __________________

Protocol Number and Title: HSC-SN-18-0001 Health Outcomes of Adolescents and Young Adults after Traumatic Injury:
The Role of Stress Resilience and Social Support

Principal Investigator: Belanie Peavy, RN

If you sign this document, you give permission to The University of Texas Health Science Center at Houston AND/OR Memorial Hermann Healthcare System to use or disclose (release) your health information that identifies you for the research study named above.

The health information that we may use or disclose (release) for this research includes demographic data such as age, gender, ethnicity, mechanism of injury, injury severity score upon admission, complications (yes or no), and baseline systolic/diastolic blood pressure and heart rate.

The health information listed above may be used by and/or disclosed (released) to researchers and their staff. The researchers may disclose information to employees at The University of Texas Health Science Center at Houston AND/OR Memorial Hermann Healthcare System for the purposes of verifying research records.

The University of Texas Health Science Center at Houston AND/OR Memorial Hermann Healthcare System is required by law to protect your health information. By signing this document, you authorize The University of Texas Health Science Center at Houston AND/OR Memorial Hermann Healthcare System to use and/or disclose (release) your health information for this research. Those persons who receive your health information may not be required by Federal privacy laws (such as the Privacy Rule) to protect it and may share you or your child’s information with others without your permission, if permitted by laws governing them.

If all information that does or can identify you is removed from your health information, the remaining information will no longer be subject to this authorization and may be used or disclosed for other purposes. No publication or public presentation about the research described above will reveal your identity without another authorization from you.

Please note that you do not have to sign this Authorization, but if you do not, you or your child may not participate in this research study. University of Texas Health Science Center AND/OR Memorial Hermann Healthcare System may not withhold treatment or refuse treating you if you do not sign this Authorization.
You may change your mind and revoke (take back) this Authorization at any time. Even if you revoke this Authorization, researchers may still use or disclose health information they already have obtained about you or your child as necessary to maintain the integrity or reliability of the current research. To revoke this Authorization, you must write to:

Primary Investigator Belanie Peavy, RN
The University of Texas Health Science Center at Houston
Address: 6901 Berner SON-580F
Texas 77030
Fax:

Privacy Officer
Memorial Hermann Healthcare System
909 Frostwood
Texas 77074
Fax: 713-338-4542

This Authorization will expire six (6) years after the end of the study.

SIGNATURES

Sign below only if you understand the information given to you about the research and you choose to take part. Make sure that any questions have been answered and that you understand the study. If you have any questions or concerns about your rights as a research subject, call the Committee for the Protection of Human Subjects at (713) 500-7943. You may also call the Committee if you wish to discuss problems, concerns, and questions; obtain information about the research; and offer input about current or past participation in a research study. If you decide to take part in this research study, a copy of this signed consent form will be given to you.

Printed Name of Subject  Signature of Subject  Date/Time

Printed Name of Person Obtaining Consent  Signature of Person Obtaining Consent  Date/Time

CPHS STATEMENT: This study (HSC-SN-18-0001) has been reviewed by the Committee for the Protection of Human Subjects (CPHS) of the University of Texas Health Science Center at Houston. For any questions about research subject’s rights, or to report a research-related injury, call the CPHS at (713) 500-7943.
Appendix D

Adolescent Assent Form
Adolescent Assent Form

UTHealth
The University of Texas Health Science Center at Houston

THE UNIVERSITY OF TEXAS HEALTH SCIENCE CENTER - HOUSTON
Adolescent/Assent Form
Age 7 – 17 Years

Protocol Title: Health Outcomes Of Adolescents And Young Adults After Traumatic Injury: The Role Of Stress Resilience And Social Support

PI Name: Belanie Peavy, RN

Protocol No: HSC-SN-18-0001

INVITATION TO TAKE PART IN A RESEARCH STUDY
Belanie Peavy, RN is inviting you to take part in a research study. You need to know about the study so you can decide if you would like to join the study or not. Your parents have already agreed that we can talk to you about being in the study. You may talk with your family before making your decision.

This dissertation research is being conducted by Belanie Peavy for partial fulfillment of the requirements for the degree of doctorate of philosophy in the Graduate School of UT Health School of Nursing.

If you want to be in this study you will be asked to sign this form.

The study will enroll a total of 68 teenagers. This study will be done at one center (Memorial Hermann Health System, Texas Medical Center in Houston, Texas).

WHY IS THIS STUDY BEING DONE?
We are inviting you to take part in a research study because we are trying to learn more about adolescents and young adults who have been admitted to the hospital for care after unexpected injury. We will try to answer questions about your level of stress after the incident and if it acts on health outcomes of anxiety and depressive signs. We would like to see if you are able to bounce back from getting hurt and if you have family and friends who will support you enough to help you recover from the injury without anxiety and depressive signs.

WHAT WILL HAPPEN IF YOU JOIN THE STUDY?
If you agree to be in this study, the following things will happen:

- You will be asked questions by a researcher that will take about 30 minutes

Your parent(s)/legal guardian will also be asked to give their permission for you to take part in this study. Please talk this over with your parent(s)/legal guardian before you decide whether or not to be in the study.

HOW LONG WILL THIS TAKE?
You will be in the study for 30 minutes. One visit is required and it will take about 30 minutes.
WHAT ARE THE BENEFITS TO TAKING PART IN THIS STUDY?
Taking part in this study may or may not help you. We do hope to learn something from this research. And someday hope it will help other teenagers who have an unexpected injury like you do.

WHAT ARE SOME OF THE RISKS AND DISCOMFORTS? WHAT COULD HAPPEN THAT NO ONE WOULD LIKE?
There are no physical risk(s) in this study but you may become tired of answering questions during the interview.

CAN YOU STOP BEING IN THE STUDY?
Your parent(s) or legal guardian must give permission for you to take part in this study, but you can choose if you want to be in this study or not. You do not have to be in the study. No one will be mad at you if you do not want to do this. Your doctor will still take care of you like before. If you do not want to be in this study, just tell someone. You do not have to tell them a reason. If you decide to be in the study, you can stop at any time.

IS THERE A COST TO BE IN THE STUDY?
None.
You will not be paid to take part in the study.

WHO WILL KNOW YOU ARE IN THE STUDY?
When researchers are working on a research project like this, everything you say and everything they write down is private. Researchers don’t talk or show the information to anyone who is not working on the study unless are in danger and need help right away. When anything is written down about you a special number is written instead of your name. The list and codes of names are kept in a secure locked file.

WHAT IF YOU HAVE ANY QUESTIONS?
You can ask questions any time. You can ask now or you can ask later. You can talk to the researcher or you can talk to someone else. If you would like to contact the researcher he/she can be contacted at (231-943-6815).
Appendix E

Cohen Perceived Stress Scale
The following questions ask about your feelings and thoughts during THE PAST MONTH. In each question, you will be asked HOW OFTEN you felt or thought a certain way. Although some of the questions are similar, there are small differences between them and you should treat each one as a separate question. The best approach is to answer fairly quickly. That is, don't try to count up the exact number of times you felt a particular way, but tell me the answer that in general seems the best.

For each statement, please tell me if you have had these thoughts or feelings: never, almost never, sometimes, fairly often, or very often. (Read all answer choices each time)

<table>
<thead>
<tr>
<th></th>
<th>Never</th>
<th>Almost</th>
<th>Sometimes</th>
<th>Fairly</th>
<th>Very</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.1. In the past month, how often have you been upset because of something that happened unexpectedly?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.2. In the past month, how often have you felt unable to control the important things in your life?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.3. In the past month, how often have you felt nervous or stressed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.4. In the past month, how often have you felt confident about your ability to handle personal problems?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.5. In the past month, how often have you felt that things were going your way?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.6. In the past month, how often have you found that you could not cope with all the things you had to do?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.7. In the past month, how often have you been able to control irritations in your life?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Question</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>-------------------------------------------------------------------------</td>
<td>---</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.8.</td>
<td>In the past month, how often have you felt that you were on top of things?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.9.</td>
<td>In the past month, how often have you been angry because of things that happened that were outside of your control?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.10.</td>
<td>In the past month, how often have you felt that difficulties were piling up so high that you could not overcome them?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix F

Social Support Survey Instrument
Social Support Survey Instrument

People sometimes look to others for companionship, assistance, or other types of support. How often is each of the following kinds of support available to you if you need it? Choose one number from each line.

<table>
<thead>
<tr>
<th>Emotional</th>
<th>None of the time</th>
<th>A little of the time</th>
<th>Some of the time</th>
<th>Most of the time</th>
<th>All of the time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Someone you can count on to listen to your when you need to talk</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Someone to give you information to help you understand a situation</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Someone to give you good advice about a crisis</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Someone to confide in or talk to about yourself or your problems</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Someone who has advice you really want</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Someone to share your most private worries and fears with</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Someone to turn to for suggestions about how to deal with personal problems</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Someone who understands your problems</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Tangible</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Someone to help you if you were confined to bed</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Someone to take you to the doctor if you needed it</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Someone to prepare your meals if you were unable to do it yourself</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Someone to help with daily chores if you were sick</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Affectionate</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Someone who shows you love and affection</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Someone to love and make you feel wanted</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Someone who hugs you</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Positive social interaction+</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Description</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>-----------------------------------------------------------------------------</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Someone to have a good time with</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Someone to get together with for</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>relaxation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Someone to get together with for</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>relaxation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Someone to do something enjoyable with</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Additional Item</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Someone to do things with to help you get Your mind off things</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix G

Connor-Davidson Resilience Scale-10
Connor-Davidson Resilience Scale 10 (CD-RISC-10) ©

<table>
<thead>
<tr>
<th>Statement</th>
<th>not true at all (0)</th>
<th>rarely true (1)</th>
<th>sometimes true (2)</th>
<th>often true (3)</th>
<th>true nearly all the time (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I am able to adapt when changes occur.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. I can deal with whatever comes my way.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. I try to see the humorous side of things when I am faced with problems.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Having to cope with stress can make me stronger.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. I tend to bounce back after illness, injury, or other hardships.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. I believe I can achieve my goals, even if there are obstacles.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Under pressure, I stay focused and think clearly.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. I am not easily discouraged by failure.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. I think of myself as a strong person when dealing with life’s challenges and difficulties.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. I am able to handle unpleasant or painful feelings like sadness, fear, and anger.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Add up your score for each column: 0 + ___ + ___ + ___ + ___

Add each of the column totals to obtain CD-RISC score: ___________________
Appendix H

Mood and Anxiety Symptom Questionnaire 26-Item
Mini-MASQ
Below is a list of feelings, sensations, problems, and experiences that people sometimes have. Read each item and then fill in the blank with the number that best describes how much you have felt or experienced things this way during the past week, including today.

Use this scale when answering::
1 not at all 2 a little bit 3 moderately 4 quite a bit 5 extremely

1. Felt really happy
2. Felt tense or "high strung"
3. Felt depressed
4. Was short of breath
5. Felt withdrawn from other people
6. Felt dizzy or lightheaded
7. Felt hopeless
8. Hands were cold or sweaty
9. Felt like I had a lot to look forward to
10. Hands were shaky
11. Felt like nothing was very enjoyable
12. Felt keyed up, "on edge"
13. Felt worthless
14. Had trouble swallowing
15. Felt like I had a lot of interesting things to do
16. Had hot or cold spells
17. Felt like a failure
18. Felt like I was choking
19. Felt really lively, "up"
20. Felt uneasy
21. Felt discouraged
22. Muscles twitched or trembled
23. Felt like I had a lot of energy
24. Was trembling or shaking
25. Felt like I was having a lot of fun
26. Had a very dry mouth
Appendix I

Injury Severity Score
Injury Severity Score

Abbreviated Injury Severity Scoring (ISS) is a process by which complex and variable patient data is reduced to a single number. This value is intended to accurately represent the patient’s degree of critical illness. In truth, achieving this degree of accuracy is unrealistic and information is always lost in the process of such scoring. As a result, despite a myriad of scoring systems having been proposed, all such scores have both advantages and disadvantages.

INJURY SEVERITY SCORE (ISS)

The Injury Severity Score (ISS) is an anatomical scoring system that provides an overall score for patients with multiple injuries. Each injury is assigned an AIS and is allocated to one of six body regions (Head, Face, Chest, Abdomen, Extremities (including Pelvis), and External). Only the highest AIS score in each body region is used. The 3 most severely injured body regions have their score squared and added together to produce the ISS score.

An example of the ISS calculation is shown below:

<table>
<thead>
<tr>
<th>Region</th>
<th>Injury Description</th>
<th>AIS</th>
<th>Square top three</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head and neck</td>
<td>Cerebral contusion</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>Face</td>
<td>No Injury</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Chest</td>
<td>Flail Chest</td>
<td>4</td>
<td>16</td>
</tr>
<tr>
<td>Abdomen</td>
<td>Minor contusion of liver</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Complex rupture of spleen</td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td>Extremity</td>
<td>Fractured Femur</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>External</td>
<td>No Injury</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Injury Severity Score</strong></td>
<td></td>
<td>50</td>
</tr>
</tbody>
</table>

ABBREVIATED INJURY SCALE. The Abbreviated Injury Scale (AIS) is an anatomical scoring system. Injuries are ranked on a scale of 1 to 6, with 1 being minor, 5 severe, and 6 a non-survivable injury. This represents the ‘threat to life’ associated with an injury and is not meant to represent a comprehensive measure of severity.

<table>
<thead>
<tr>
<th>Injury</th>
<th>AIS Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Minor</td>
</tr>
<tr>
<td>2</td>
<td>Moderate</td>
</tr>
<tr>
<td>3</td>
<td>Serious</td>
</tr>
<tr>
<td>4</td>
<td>Severe</td>
</tr>
<tr>
<td>5</td>
<td>Critical</td>
</tr>
<tr>
<td>6</td>
<td>Unsurvivable</td>
</tr>
</tbody>
</table>
Appendix J

Study Protocol
Study Protocol

After IRB approval was obtained, subject recruitment began and was done in close collaboration among three research team members: Principal Investigator BP (Belanie Peavy), the Program Manager Research Center for Translational Research JP (Jeanette Podbielski) and Research Project Manager Emergency Medicine MH (Mandy Hill) from April 2018 until July 2018. The latter two members have day-to-day contact with potential study participants for recruitment at MHHS and UT Health. These three members have worked together in the past coordinating and conducting research at MHHS and UT Health and have established working relationships.

Participants were recruited and enrolled into the study at MHHS from the Department of Surgery, Trauma Service of Houston, Texas in the Texas Medical Center (TMC) after approval to conduct the study from the Institutional Review Board (IRBs) at the University of Texas- Health Science Center-Houston (UTHSC-H) and MHHS. After which, the recruitment process began with the following steps for enrollment to completion of the study for each qualified participant and by an experienced and well-trained research team. The Program Manager of the Center for Translational Research (JP) was the primary screener for the study and screened for potential candidates during the Trauma Service morning report for review and assessment of admissions, transfers, discharges and dispositions of all patients admitted to the trauma service as well as those patients who were already included in the trauma registry report. The candidates were screened according to the protocol’s inclusion and exclusion criteria. JP was primarily responsible for the maintenance of the screening logs for potential
candidates and identified all potential candidates for the duration of the study and on the same day of identification of potential candidates, notified the Project Manager (MH) and Principal Investigator (BP) who were responsible for the next phases of recruitment.

MH or BP approached the candidate and conducted the informed consent process with each candidate according to protocol for enrollment into the research study. The purpose of this process was to insure that candidates were made aware and understood the nature of the research and knowledgeably and voluntarily decided whether or not to participate in this study. Team members explained the type of study; why the individual was being asked to take part in the study; described the research study in detail and instruments used for interviews within day 1-2 of admission; explained the risks and benefits and emphasized voluntary withdrawal at any time during the study. The process was presented in a verbiage understood by the potential candidate which allowed him or her to make an informed decision. The candidate was given ample time to think about his or her decision and discussed with family members if desired and was given the opportunity to have questions answered. If the candidate was a minor, an authorized representative participated in the process for an informed decision on behalf of the participant and signed the consent form whereas the minor signed the assent form. Acceptance of the invitation to participate in the study was confirmed by signatures of participant(s) and witness and/or authorized representative(s) if applicable. The consent document was dated and timed. The candidate was given a copy of the consent form, a copy was filed in
the participant’s chart and the original was filed in a binder for this study in a locked cabinet in the Center for Translational Research.

Study data were collected and managed using REDCap (Research Electronic Data Capture) created by Vanderbilt University and hosted by UTHSC-H (Harris, Taylor and Thielke et al, 2009). REDCap is a secure web-based application designed to support data capture for research studies, which provides a) an intuitive interface for validated data entry; b) audit trails for tracking data manipulation and export procedures; c) automated export procedures from seamless data downloads to statistical packages; and d) procedures for importing data.
Curriculum Vitae

Belanie G. Peavy, MSN, ACNP-BC

EDUCATION:

University of Texas Medical Branch
Galveston, Texas 2009 MSN Nursing

Webster University
St Louis, Missouri 1998 MA Hlth Admin

University of Texas
Houston, Texas 1990 BSN Nursing

Houston Baptist University
Houston, Texas 1984 BS Accounting

PROFESSIONAL POSITIONS:

Lone Star College System
Houston, Texas
Associate Degree Nursing Program
Assistant Professor 2017-present

Wellness Management Group
Houston, Texas
Personal Injury Medicine
Nurse Practitioner 2011-2015

UT Health
Houston, Texas
Orthopedic Trauma
Nurse Practitioner 2010-2011
M. D. Anderson Cancer Center
Houston, Texas
Critical Care Research
Research Nurse 2006-2009

UT Health
Houston, Texas
Trauma Critical Care Research
Research Nurse 1999-2006

United States Air Force (Nurse Corps)
Solid Organ Transplant
San Antonio, Texas
Major 1995-1999

PROFESSIONAL MEMBERSHIPS:
American Nurses Association 2016-present
American Nurses Credentialing Center 2009-present