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Suicidal Ideation in Patients Hospitalized for Emergency Medical Treatment Related to Physical Trauma: Effects of Posttraumatic Stress and Depression

Erin E. Carney

Western Kentucky University, erin.carney582@topper.wku.edu

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SUICIDAL IDEATION IN PATIENTS HOSPITALIZED FOR EMERGENCY
MEDICAL TREATMENT RELATED TO PHYSICAL TRAUMA: EFFECTS OF
POSTTRAUMATIC STRESS AND DEPRESSION

A Thesis
Presented to
The Faculty of the Department of Psychological Sciences
Western Kentucky University,
Bowling Green, Kentucky

In Partial Fulfillment
Of the Requirements for the Degree
Master of Science

By
Erin Carney

May 2016

SUICIDAL IDEATION IN PATIENTS HOSPITALIZED FOR EMERGENCY
MEDICAL TREATMENT RELATED TO PHYSICAL TRAUMA: EFFECTS OF
POSTTRAUMATIC STRESS AND DEPRESSION

Date Recommended 4/19/16



Dr. Amy Brausch, Director of Thesis



Dr. Andrew Mienaltowski



Dr. Reagan Brown



Dean, Graduate Studies and Research

4/25/16
Date

To my parents, J.P., Aunt Chris, Uncle Gerry, Karl, Megs, Beth, Jessica, Kandice, Allison,
Dr. Brausch, Dr. Mienaltowski, Dr. Reagan Brown, 915 College Street, & Sammy:
thank you.

To all those who have struggled, are currently struggling, and will soon struggle with the
thought of suicide: “Good timber does not grow with ease: the stronger wind, the stronger
trees.” Keep fighting.

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Erin Carney

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Directed by: Dr. Amy Brausch, Dr. Andrew Mienaltowski, and Dr. Reagan Brown

Department of Psychological Sciences

Western Kentucky University

Survivors of physical trauma may be at increased risk for developing suicidal ideation and behavior both during and after their inpatient hospitalization for medical treatment of wounds. It remains to be understood why a population hospitalized for non-psychiatric reasons may ultimately develop a desire to take their own life. The current study sought to answer this question by hypothesizing that symptoms of posttraumatic stress (PTS) and depression during the recovery period individually mediated the relationship between physical pain and suicidal ideation. Researchers assessed these relationships in 246 patients who were receiving emergency medical treatment for wounds associated with a physically traumatic event. Patients were interviewed using a battery of assessments, including the PTSD Checklist-Civilian, Beck Scale for Suicidal Ideation, Medical Outcomes Study Short Form, and the Patient Health Questionnaire. Regression analyses provided support for the role of PTS and depression as mediators of the relationship between physical pain and suicidal ideation. These findings suggest that it may be important for behavioral health professionals to monitor symptoms of PTS and depression during a trauma survivor's painful recovery period, as this may provide a crucial window of intervention during which the escalation of suicidal feelings can be prevented.

Introduction

Suicide in the United States: A Link to Traumatic Injuries?

In 2013, suicide was listed as the 10th leading cause of death in the United States by the Centers for Disease Control and Prevention (Kochanek, Murphy, and Xu, 2014). Approximately every 12th person per 100,000 took their own life, resulting in 39,518 deaths in this year alone. With these numbers in mind, suicide continues to be a public health problem with an etiology that has yet to be fully understood. Findings from psychological autopsies suggest that 90% of suicide decedents suffered from a mental illness, which supports the perception that ailing mental health plays a role in an individual's wish to die (Cavanagh, Carson, Sharpe, & Lawrie, 2003). As such, the focus of researchers and behavioral health providers who seek to prevent suicide tends to be on mental illness, especially as it relates to traumatic events.

Indeed, a 2010 study of both developed and developing countries found that suicidal ideation and attempts can be triggered by emotionally traumatic events (Stein et al. 2010). Depressive and posttraumatic symptoms are not uncommon after trauma—co-occurring in approximately 40% of patients admitted to the emergency room (Shalev et al., 2014)—and both may be factors that put individuals at risk for suicide.

Psychologically traumatic events can also be physical in nature, yet relatively less is known about the possible role physical trauma may play in suicidal ideation and behavior.

Physical trauma, also known as traumatic injury, refers to a wound “caused by the application of external force or violence” to the body (Centers for Disease Control

[CDC], 2015). Traumatic injuries can result from events such as burns, falls, motor vehicle accidents, or physical attacks. In 2014, 41 million Americans visited emergency rooms to receive treatment for injuries related to traumatic injury (CDC, 2014). Physical and psychological trauma are not necessarily mutually exclusive, thus a patient may also potentially exhibit symptoms of depression and posttraumatic stress disorder (PTSD) in the aftermath of the event, e.g. survivors of motor vehicle crashes (Irish et al., 2013). With this in mind, individuals with trauma exposure who also struggle with depression and posttraumatic stress may also exhibit suicidal ideation and behavior.

Suicide in Physical Trauma Survivors

Individuals who have survived traumatic experiences tend to be at increased risk for death by suicide (Dougall et al., 2014; Grossman, Soderberg, & Rivara, 1993; Ryb, Soderstrom, Kufera, & Dischinger, 2006; Zambon, Laflamme, Spolaore, Visentin, & Hasselberg, 2011). Preventing these deaths involves understanding these trauma patients' heightened risk for suicidal ideation and behavior, an association that has been studied in several different populations. One such population includes patients receiving medical treatment for wounds related to physical trauma, as some patients have been found to endorse suicidal ideation during their inpatient stay and/or several months after being discharged (Kishi, Robinson, & Kosier, 2001).

Although previous research has looked at risk factors associated with ideation in other trauma populations, the mechanisms driving suicidal ideation in adult patients hospitalized for treatment of injuries related to physical trauma are not yet fully understood. Two candidate mechanisms include PTSD and depression, conditions that tend to occur in hospitalized patients (Shih, Schell, Hambarsoomian,

Belzberg, & Marshall, 2010; Zatzick et al., 2007). In particular, the specific manner in which posttraumatic stress symptoms and depression contribute to ideation in this population has yet to be characterized. Given the dearth of research in this specific area, it is useful to review the literature on studies across multiple populations. The association of depression and PTSD with suicidal ideation and behaviors will be discussed, followed by an examination of how physical trauma can psychologically impact an individual, whether they merely witnessed the event or experienced it firsthand. Finally, it is important to understand how physical impairment and pain related to a recent traumatic event may be associated with suicidal ideation.

Using Mental Disorders to Predict Subsequent Suicidal Ideation and Attempts

Nock et al. (2009) studied the relationship between mental disorders and suicide attempts in a cross-national sample involving adults from 21 developed and developing countries. They found that the presence of a mental disorder predicted a nonfatal suicide attempt. Furthermore, the rates of progression from suicidal ideation to making an actual suicide attempt varied with the type of disorder, as the number of attempts tended to be higher in individuals with mood disorders such as depression. Not all individuals with depression, however, went on to make an actual suicide attempt. This is to say, depression may contribute to an individual's desire to die, but it alone may not be necessary or sufficient for suicidal behavior. Instead, Nock and colleagues (2009) found that a mood disorder coupled with a heightened level of agitation and an inability to regulate impulsivity conferred the greatest risk, as patients who had both a mood disorder and these characteristics tended to have more suicide attempts than those who had a mood disorder alone. Thus a mental disorder may predict suicidality in those with particular state and temperament risk factors.

The findings from the Nock et al. (2009) study beg the question: are other disorders characterized by marked agitation, such as PTSD, also potentially useful in predicting suicidal ideation and behavior? Perhaps individuals who are comorbid for both PTSD and depression and have a highly impulsive temperament are at the highest risk for making an actual suicide attempt. As such, it may be crucial to understand how PTSD and depression operate in trauma-exposed individuals in order to prevent suicides in this population.

Psychological Impact of Witnessing and Experiencing Physical Trauma

Witnessing Trauma: Adolescents. Violent events afflicted upon the self or others can induce significant stress in the victim, and the weeks or even years after a traumatic event may be a sensitive period where—in the absence of effective healthy coping resources—negative health outcomes may result. Mazza and Reynolds (1999) suggested that merely witnessing a traumatic event can precipitate severe psychological symptoms. In their study, they focused on youth with an average age of 12 years residing in a low-income neighborhood of New York City. The researchers specifically chose this population because of its high risk for exposure to violence, with 88% of inner-city adolescents reporting having witnessed a violent event. Using a self-report battery, they administered questions on violence exposure and mental health symptoms, assessing participants at two time points. They found that the adolescents had experienced an average of five violent events over the past year and that there was a unique relationship between violence exposure and symptoms of depression, PTSD, and suicidal ideation.

More specifically, mediational analysis suggested that PTSD functioned as a mediator of the violence exposure-depression relationship as well as the violence exposure-suicidal ideation relationship. These results suggest that re-experiencing details of the event, a symptom of posttraumatic stress, may foster feelings of helplessness and hopelessness, which may in turn aggravate depressive ways of thinking and precipitate a wish to die. Thus merely witnessing a violent event can negatively impact psychological well-being, resulting in depression, posttraumatic stress, and suicidal ideation.

Experiencing Trauma: Young Adults. In a similar study, Wilcox, Storr, and Breslau (2009) examined how experiencing trauma may be related to subsequent suicidal behaviors by focusing on the association between PTSD and suicide attempts. For 15 years, researchers followed a cohort of 1,698 first-grade students living in an urban setting, measuring the occurrence of lifetime traumatic experiences and PTSD once the participants reached an average age of 21 years. Over the data collection period, 81% of their sample reported exposure to at least one traumatic event, 8% of whom developed PTSD. Of the subset exposed to a traumatic event, 10% of individuals with PTSD and 2% of those without PTSD went on to attempt suicide. Thus participants with PTSD were more likely to have attempted suicide than those without the disorder, a difference that remained even when researchers controlled for a history of a major depressive episode, substance abuse, gender, race, and age. Furthermore, individuals who experienced assaultive types of trauma (e.g. rape or stabbing) were found to be at a significantly greater risk for making a suicide attempt than those who experienced non-assaultive trauma (e.g. serious accident or life-threatening illness), but only when the individual also had symptoms of posttraumatic stress (Wilcox et al., 2009). Thus posttraumatic stress may be an independent predictor of a subsequent suicide attempt, such that survivors of

assaultive trauma who develop PTSD are at a greater risk for attempting suicide than those without the disorder. Overall, these results argue that posttraumatic stress may, like depression, be used to predict a suicide attempt in those who have experienced physical trauma.

Experiencing Trauma: Military Populations. Similar to youth who have been exposed to violence, military personnel are also at a high risk for incurring physical and emotional wounds as a result of service-related hazards. Symptoms of depression, PTSD, and suicidal ideation are often observed in service members who have witnessed and/or experienced physical trauma. One study by Ramsawh and colleagues (2014) measured depression symptoms, past year serious suicidal ideation and attempts, and PTSD symptoms related to trauma in both civilian and military contexts in a sample of 5,927 active duty service members. They found that 6% of their sample reported either suicidal ideation or an attempt in the past year; 80% of this subsample endorsed ideation and 30% reported an actual attempt. Furthermore, the proportion of those reporting suicidal ideation or an attempt increased if a psychiatric diagnosis was present, as individuals diagnosed with PTSD were 4.7 times more likely and those with depression 3.2 times more likely to endorse serious suicidal ideation and/or having made an attempt in the past year. These results are consistent with the aforementioned idea of psychopathology as a risk factor for suicide (Nock et al., 2009), but they still do not sufficiently explain how PTSD and depression individually and/or collectively influence suicidal ideation and attempts.

In order to further understand the relationship between a specific diagnosis and suicidal ideation and attempts in their sample, Ramsawh et al. (2014) utilized Population-Attributable Risk Proportions (PARP), which estimate the proportion of suicidal ideation and attempts that could be prevented if a given predictor—in this study, depression and PTSD—were not present. PARP analysis effectively provides a rough idea of how important a diagnosis may be to precipitating serious suicidal ideation and attempts. Results suggested that 45% of past year suicidal ideation and attempts may be due to having a comorbid diagnosis of depression and PTSD, all of which theoretically could have been prevented if both PTSD and depression symptoms were eliminated. This proportion decreased if an individual had only a single diagnosis, with 24% of past-year suicidal ideation and attempts being attributable to PTSD and 29% to depression, suggesting only a slight reduction in suicidal ideation and attempts in the absence of depression.

Thus for those who have experienced trauma, suicidal ideation and behavior is more likely when survivors have a comorbid diagnosis of depression and PTSD than those with either disorder alone. With this in mind, perhaps depression and posttraumatic stress interact to propel an at-risk individual towards a wish to die, escalating their feelings of hopelessness to the point of an actual attempt. Further research would be needed to support such an association. Nevertheless, Ramsawh et al.'s (2014) findings provide evidence for the idea that both depression and PTSD uniquely contribute to a trauma survivor's suicide risk, and that individuals presenting with comorbid diagnoses are at a greater risk for suicidal ideation and attempts.

Overall, past research in adolescents, young adult, and military populations has supported the idea that trauma—whether witnessed or experienced firsthand—can lead to

symptoms of depression and posttraumatic stress. Those who experienced a traumatic event where they incurred physical injuries may carry an additional burden of recovering from their wounds, potentially complicating their recovery. Thus the combination of having both psychological and physical challenges in the time period after a traumatic event may put individuals at an even greater risk for developing suicidal ideation.

Suicidal Ideation in Trauma Patients

Prevalence of Ideation in Trauma Survivors. As previously discussed, individuals who have experienced a traumatic event often face a number of psychological challenges—including suicidal thoughts, feelings, and behaviors—as they cope in the aftermath. A 2010 World Health Organization population survey of 21 countries estimated that approximately 15% of all suicidal ideation and 22% of all attempts can be attributed to having experienced a traumatic event (Stein et al., 2010). This prevalence highlights a crucial need for the early identification of factors that place trauma patients at risk for taking their own lives. As such, research within the past decade has focused on understanding the increased risk for suicide in patients who are currently receiving medical treatment for trauma-related injuries, an observation that has been made across several different populations.

Zambon, Laflamme, Spolaore, Visentin, and Hasselberg (2010) studied a Swedish cohort of 1,616,342 patients, ages 7-26 years, who had been hospitalized for treatment of unintentional injuries and found their suicide risk to be three times that of the general population. It is important to note, however, that the true population risk may be even greater, especially because these estimates rely on the willingness of participants to disclose and/or seek medical treatment for suicidal behavior. Nevertheless, this high risk begs the question of why patients with unintentional injuries are exhibiting a desire to take

their life.

Mechanisms Driving Suicidal Ideation in Trauma Survivors. In an effort to understand the mechanisms behind the suicide risk of trauma patients, several longitudinal studies have tracked the mental health symptoms of patients from the point of initial admission up to months or even years after their discharge (O'Connor et al., 2014; Ramchand, Marshall, Schell, & Jaycox, 2008; Ryb, Soderstrom, Kufera, & Dischinger, 2006). One study followed a sample of rehabilitation patients recovering after life-threatening physical illnesses, including traumatic brain injury and spinal cord injury, who had a current plan to die by suicide (Kishi, Robinson, & Kosier, 2001). This ideation was found to occur both while the individual was still receiving inpatient services and throughout the post-hospitalization period, though the risk factors for their suicidality seemed to differ between these time points. Those who ideated while still being hospitalized tended to be younger in age, unmarried, and have a diagnosis of major depression. Those who ideated after being discharged not only had higher levels of depressive symptoms, but they also reported a lower amount of social support at the time of admission to the hospital. These differences suggest that a trauma patient's suicidal ideation may not remain static throughout the recovery period. Additionally, a key finding of this study is that once depressive symptoms improved, ideation tended to decrease, which suggests that low social support and depression can play major roles in driving a patient's wish to die.

A more recent study by O'Connor and colleagues (2014) also found several differences between the risk factors for suicidal ideation during and post-hospitalization. Focusing on ideation at the time of hospitalization, an important distinction between patients who were suicidal and those who were not was that suicidal patients tended to

have a more extensive history of traumatic events. In addition, not only did suicidal patients tend to have a history of at least one major depressive episode, they also showed more symptoms of posttraumatic stress. Thus symptoms relating to both depression and posttraumatic stress may be significantly contributing to ideation, a concerning association given the frequent comorbidity of these two disorders. Current research still seeks to understand, however, the direct effects of depression and posttraumatic stress on ideation.

Posttraumatic Stress, Physical Functioning, and Ideation in Trauma Survivors

Individuals with posttraumatic stress are four times more likely to experience suicidal ideation (Jakupcak et al., 2009). Those recovering after physical trauma may be especially prone to developing posttraumatic psychological distress, as aspects of their injury such as pain or disfiguring wounds may act as a constant reminder of the event (Ramchand et al., 2008). Schnurr, Hayes, Lunney, McFall, and Uddo (2006) examined the relationship between physical functioning and PTSD in a primarily older sample of 325 veterans with chronic PTSD. Using a longitudinal design, researchers found that over the course of a year, the severity of PTSD symptoms had a significant negative association with physical functioning. This is to say, there was a synchronous relationship between PTSD and physical quality of life, where a change in one seemed to be related to change in the other. Though this study lacked a measure of suicidal ideation, these findings may have implications for trauma survivors receiving medical treatment for physical injuries. In particular, over the recovery period following discharge, patients may experience several changes—in disability level, in severity of posttraumatic stress symptoms, etc.—that may interact to ultimately influence ideation.

In another longitudinal study, Ramchand and colleagues (2008) tracked patients'

physical and mental health functioning from the point of admission up to a year after discharge. Additionally, the researchers sought to understand the temporal sequence of posttraumatic stress and physical functioning, that is, whether PTSD preceded physical health problems or if physical health problems exacerbated PTSD. They used a sample of 413 patients who were admitted to a hospital for treatment of physical injuries related to community violence, the majority of whom were Hispanic males averaging 25 years of age and were receiving treatment for gunshot wounds. Posttraumatic stress and physical functioning were assessed at various time points following the injury. Using a structural equation model, they found that individuals with higher levels of posttraumatic stress at one week post-injury also tended to have worse physical functioning at three months post-injury. Furthermore, worse physical functioning at three months predicted higher levels of posttraumatic stress at 12 months.

Researchers in this study were unable to demonstrate a significant temporal order between physical functioning and posttraumatic stress, but their results do suggest a strong interaction between these two constructs. Furthermore, although risk for suicidal ideation or behavior was not assessed in this study, the relationship between physical functioning and posttraumatic stress is useful when gauging the likelihood that a patient will ideate and/or self-harm, especially given that an obstacle such as physical impairment may limit the individual's ability to function well in their career or in relationships. One study suggested a link between physical pain and suicide. Ratcliffe, Enns, Belik, and Jitender (2008) assessed chronic pain in a nationally representative sample and found that pain was significantly associated with suicidal ideation and attempts, even when controlling for a mental disorder diagnosis. Similar studies of samples of individuals with chronic pain have also found increased risk for suicide in this

population and have suggested that patient perception of feeling like a burden in their interpersonal relationships may play a major role in their ideation (Tang & Crane, 2006; Wilson, Kowal, Henderson, McWilliams, & Peloquin, 2013). Thus physical functioning may have its own unique association with suicidal ideation and behavior.

Predicting Ideation Using PTS, Physical Functioning, & Depression Symptoms

In weighing the contributions of PTS and depression to suicidal ideation, Suris, Link-Malcolm, and North (2011) suggest that symptoms of depression may be better than that of PTSD at predicting suicidal ideation. In a sample of sexually assaulted veterans who had been diagnosed with PTSD, separate correlational analyses showed that both PTSD and depression symptoms were associated with suicidal ideation, but a single regression analysis involving both constructs suggested that only depressive symptoms can independently predict ideation. Researchers proposed that posttraumatic stress symptom severity may be reduced in the presence of a depression diagnosis, thereby making depression a better predictor of ideation. Thus individuals with a comorbid diagnosis of posttraumatic stress and depression are at greater risk for suicidal ideation than others with a single diagnosis, but depression may play a more significant role in precipitating a cognitive desire to die.

Similar findings have been found in studies using civilian samples. One study of PTSD in civilians (Tarrier & Gregg, 2004) found that more depressive symptoms and impaired functioning were associated with an increased risk of suicidal ideation. Of note, the percentage of participants who tended to endorse severe or extreme life impairment increased across subject groups, from 36.6% in the no ideation group to 69.5% in ideation group to 82.3% of patients who had made plans or previous suicide attempts. This is to say, individuals diagnosed with PTSD who endorse more severe physical

impairment also tend to act more on their suicidal ideation. Pain, although not explicitly measured in this study, may have an association with impaired physical functioning, which may have implications in our current study involving patients who are being treated for physical injuries. Thus the findings of the Tarrier and Gregg (2004) study suggest that patients who are comorbid for PTSD and depression may be at risk for suicidal behavior when their physical and/or psychological injuries impair their ability to function in life.

Current Study

Survivors of physical trauma are at high risk for developing symptoms of posttraumatic stress and depression, which can in turn lead to suicidal ideation and/or behavior. Additionally, highly agitated and impulsive individuals who are comorbid for PTSD and depression and whose trauma injuries impair their physical functioning may be at the greatest risk for suicide. Although previous research has examined the effects of posttraumatic stress and depression in several populations—including adolescent, young adult, and military groups—the unique effects of these symptoms have yet to be fully explained in adults hospitalized for medical treatment of wounds related to physical trauma. Current research has provided evidence for an association between posttraumatic stress and physical functioning in patients recovering from physical trauma, but it is unclear how depression may be associated with physical functioning and suicidal ideation in this population. Understanding how physical pain, in the context of a recent traumatic event, may interact with posttraumatic stress and depression during the immediate recovery period may inform assessment and intervention strategies related to suicide prevention.

In the current study, the impact that post-traumatic stress symptoms and that

depression can have on the relationship between physical pain and suicidal ideation was explored using a sample of individuals who experienced a physical trauma. Given the results of the aforementioned studies, we expected that physical pain's association with suicidal ideation would be mediated by depression and posttraumatic stress symptoms when tested separately. More specifically, we expected that higher reports of pain severity would be directly associated with higher reported depressive and PTSD symptoms, which in turn would be associated with greater suicidal ideation.

Method

Participants

The secondary data analysis utilized data from the Trauma Survivors Outcomes and Support Study-IV, the study procedures of which were approved by the institutional review board at the University where the study took place (Zatzick et al., 2011). Subjects were 246 patients who were admitted to the inpatient surgical floor at a level one trauma center. Recruited patients had to meet the following criteria: English-speaking; 18 years or older; live no more than 100 miles from the hospital; do not require immediate psychiatric attention; not recently violent, facing criminal charges, or incarcerated; do not have self-inflicted injuries. Eligible patients who met this criteria were approached by a member of the research team, offered the opportunity to participate in the study, and provided written consent to enroll. Consented subjects completed a baseline assessment while still on the surgical floor.

Measures

Physical Pain. Physical pain severity was determined by a single item from the Medical Outcomes Study Short Form 36 (MOS SF-36) Physical Component Summary (PCS), which assesses physical health and function (Ware, Snow, & Kosinski, 1993). The physical item asks, “On a scale of 0 to 10, please state your current level of pain. 0 would be no pain, 5 would be moderate pain, and 10 would be the worst pain possible.” The MOS SF-36 is used in public health and medical settings, and it has acceptable psychometric properties that have been widely studied (e.g. McHorney, Ware Jr, & Raczek, 1993).

Posttraumatic Stress. Severity of PTSD symptoms was determined by calculating the total score on the PTSD Checklist Civilian Version (PCL-C). The PCL-C has 17 items that ask about symptoms of posttraumatic stress since their injury, with questions like: “How much have you been bothered by repeated, disturbing memories, thoughts, or images of a stressful experience from the past?” Patients can respond on a scale from 1 (not at all) to 5 (extremely), with total scores ranging from 17 to 85. The measure was developed and validated by Weathers, Litz, Huska, and Keane (1994). Bliese et al. (2008) demonstrated its reliability in populations who have been exposed to trauma. With respect to the current sample, the internal consistency of this measure was 0.87.

Depressive Symptoms. Severity of depressive symptoms were determined by calculating the total score on the Patient Health Questionnaire depression screen (PHQ-9). The PHQ-9 asks about depression symptoms since a patient’s injury, with questions like: “Have you been bothered by little interest or pleasure in doing things?” The measure was developed and validated by Kroenke, Spitzer, and Williams (2001) and it is currently used in clinical settings to assess the severity of a patient’s potential depression symptoms. Patients can respond on a scale from 0 (not at all) to 3 (nearly all the time). Total scores can range from 0 to 27. It has an internal consistency of 0.82 for the current sample.

Suicidal Ideation. Severity of suicidal ideation will be determined by calculating the total score on the screening items (5 total questions) from the Scale for Suicide Ideation (SSI), with total scores ranging from 0 to 10. The SSI asks the patient to think about a time since their injury where they felt the most suicidal or

worst emotionally and answer questions as they would have at that time. Patients have three response options to questions such as: “Tell me about your desire to live at that time. Was it moderate to strong? Weak? Or none,” and “Would you say your reasons for living outweighed your reasons for dying? Would you say that your reasons for dying outweighed your reasons for living? Or were they about equal?” The original measure contained 19 items and was developed and validated by Beck, Kovacs, and Weissman (1979), and its psychometric properties have been subsequently validated in a variety of populations (Ballard et al., 2014; Beck, Brown, & Steer, 1997). The items used for the current study had an internal consistency of 0.76.

Other Patient Characteristics. Additional information regarding patient history of traumatic events, posttraumatic stress, and use of mental health services was collected using the National Comorbidity Survey (Mackenzie et al., 2007). Information regarding injury characteristics, including severity (Abbreviated Injury Scale), type, treatment, and circumstances under which the event occurred (e.g. blood alcohol content), were originally assessed by a medical professional and later collected from the electronic medical record by members of the research team. Demographic information regarding age, gender, race, education, marital status, offspring, income, insurance status, traumatic brain injury, legal history, and homelessness status were obtained at the baseline interview. Although part of the data set, these patient characteristics were not entered in the regression analyses used to test the current study’s hypothesis. Please note that Table 1 presents demographic data and clinical characteristics for the sample.

Table 1*Demographic and Clinical Characteristics of 246 Physical Trauma Survivors*

	Patients with PTS Symptoms (N=241)	Patients with Depression Symptoms (N=235)	Patients with Suicidal Ideation (N=84)
Characteristics	N (%)	N (%)	N (%)
Gender			
Female	83 (34.4)	82 (35.0)	22 (26.2)
Male	148 (61.4)	142 (60.7)	58 (69.0)
Race			
Caucasian	141 (58.5)	141 (60.3)	41 (48.8)
African American	43 (17.8)	40 (17.1)	17 (20.2)
Asian	9 (3.7)	9 (3.8)	3 (3.6)
Other	7 (2.9)	7 (3.0)	3 (3.6)
Native Hawaiian/Pacif. Islander	2 (0.8)	2 (0.9)	0 (0)

Marital Status

Single	116 (48.1)	113 (48.3)	44 (52.4)
Living with Partner	13 (5.4)	13 (5.6)	4 (4.8)
Married	45 (18.7)	44 (18.8)	13 (15.5)
Widowed	7 (2.9)	5 (2.1)	1 (1.2)
Divorced	44 (18.3)	46 (19.7)	18 (21.4)
Separated	13 (5.4)	13 (5.6)	4 (4.8)

Max. Abbreviated Injury Score

≤1 (Minor)	13 (5.4)	13 (5.5)	6 (7.2)
2 (Moderate)	64 (26.6)	61 (26.1)	18 (21.4)
3 (Serious)	87 (36.1)	84 (35.9)	37 (44.0)
4 (Severe)	53 (22.0)	52 (22.2)	15 (17.9)
5 (Critical)	22 (9.1)	22 (9.4)	7 (8.3)

Age (years)	<i>M</i> =44.0, <i>SD</i> =15.8	<i>M</i> =44.1, <i>SD</i> =15.9	<i>M</i> =44.7, <i>SD</i> =14.7
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Data Analysis

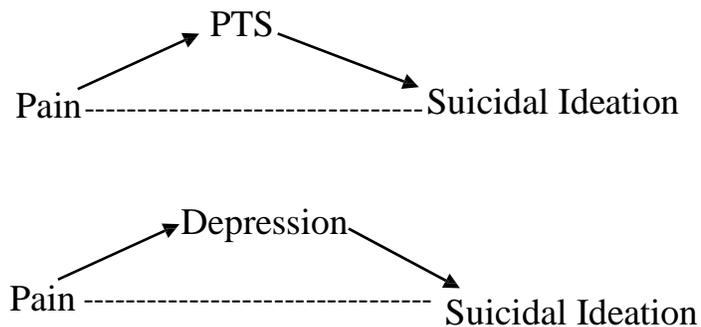
Mediation analysis was used to test the hypothesis regarding the relationship between physical pain, symptoms of depression and posttraumatic stress, and suicidal ideation. Per the recommendation of Baron and Kenny (1986), mediation was tested using a series of regression equations in IBM SPSS Statistics for Windows, Version 23 (IBM Corporation, 2015). First, each mediator (PTSD symptoms and depression) was regressed on the independent variable (physical pain). Second, the dependent variable (suicidal ideation) was regressed on the independent variable (physical pain). Finally, the dependent variable (suicidal ideation) was regressed on both the independent variable (physical pain) and each mediator (PTSD symptoms and depression).

A variable was identified as a mediator if the following four conditions were met in the predicted direction: (1) the independent variable (physical pain) is significantly correlated with the dependent variable (suicidal ideation); (2) the independent variable (physical pain) is significantly correlated with the mediator variable (depression or PTSD symptoms); (3) the mediator variable (depression or PTSD symptoms) affected the dependent variable (suicidal ideation); and (4) either the following occurred: controlling for the proposed mediator (depression or PTSD symptoms) resulted in the independent (physical pain) variable no longer having an effect on the dependent variable (suicidal ideation), that is $R=0$ (complete mediation), or if the introduction of the proposed mediator to the model reduced the value of the regression coefficient between the independent and dependent variables to a nonzero number (partial mediation).

Additionally, the indirect effect of the independent variable was used as a

measure of the amount of mediation present in the model. This effect was calculated by multiplying the unstandardized regression coefficient for the association between physical pain and each mediator by that of the association between suicidal ideation and each mediator. The significance of the indirect effect was assessed using the Sobel Test, a conservative significance test recommended by Baron and Kenny (1986) for mediational analyses. Finally, the authors also recommended quantifying effect sizes for the indirect effect using R^2 , which was calculated by multiplying the two regression coefficients described above. As this effect size is the product of two effects ($R \times R$), it was recommended that the sizes be interpreted according to the following guidelines: 0.01 for small, 0.09 for medium, and 0.25 for large.

The proposed models were as follows:



Results

Of the total group of 246 physical trauma survivors, seven individuals were excluded from the analysis of suicidal ideation because of missing data. Of the remaining 239 patients, 84 (35.1%) endorsed having symptoms of suicidal ideation since their injury. The majority of patients also endorsed having experienced some symptoms of PTS and depression (98.0% and 85.5%, respectively) since their injury. Table 2 provides the descriptive statistics for items on measures of PTS, depression, and ideation. There were no major characteristic differences between individuals who endorsed PTS, depression, or ideation. On average, individuals who reported symptoms of any of these mental states tended to be male, Caucasian, single, 44 years old, and were rated by medical professionals as having a maximum abbreviated injury score of 4 (severe injury).

Table 2

Descriptive statistics for items on the PCLC, PHQ, and SSI

PCLC	<i>M</i>	<i>SD</i>
Repeated, disturbing memories, thoughts, or images of the event in which you were injured?	2.41	1.396
Repeated, disturbing dreams of the event in which you were injured?	1.65	1.135
Suddenly acting or feeling as if the event in which you were injured was happening again?	1.71	1.224
Feeling very upset when something reminded you of the event in which you were injured?	2.27	1.480
Having physical reactions (e.g., heart pounding, trouble breathing, sweating) when something reminded you of the event in which you were injured?	2.10	1.414
Avoiding thinking about or talking about the event in which you were injured or avoiding having feelings related to it?	1.89	1.300
Avoiding activities or situations because they reminded you of the event in which you were injured?	1.77	1.321

Trouble remembering important parts of the event in which you were injured?	2.54	1.607
Loss of interest in activities you used to enjoy?	2.01	1.364
Feeling distant or cut off from other people?	2.14	1.440
Feeling emotionally numb or being unable to have loving feelings for those close	1.58	1.103
Feeling as if your future somehow will be cut short?	2.03	1.382
Trouble falling asleep or staying asleep?	3.04	1.481
Feeling irritable or having angry outbursts?	2.07	1.318
Having difficulty concentrating?	2.47	1.428
Being “super-alert” or watchful and on guard?	2.43	1.499
Feeling jumpy or easily startled?	2.13	1.413

PHQ	<i>M</i>	<i>SD</i>
Little interest or pleasure in doing things	.99	1.070
Feeling down, depressed or hopeless	1.10	1.118
Trouble falling or staying asleep, or sleeping too much	1.74	1.176
Feeling tired or having little energy	1.93	1.073
Poor appetite or overeating	1.37	1.257
Feeling bad about yourself- or that you are a failure or have let yourself or your family down	.97	1.128
Trouble concentrating on things, such as reading the newspaper or watching television	1.30	1.207
Moving or speaking so slowly that other people could have noticed? Or the opposite – being so fidgety or restless that you have been moving around a lot more than usual	1.11	1.134
Thoughts that you would be better off dead or of hurting yourself in some way	.27	.636

SSI	<i>M</i>	<i>SD</i>
Can you tell me about your desire to live, your wish to live at that time?	.21	.516
Can you tell me about your desire to die, your wish to die at that time?	.36	.658
Would you say that your reasons for living outweighed your reasons for dying?	.16	.439
What was your desire to make an active suicide attempt, to actively harm yourself?	.09	.366

At that time did you have any passive suicidal feelings?	.13	.438
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In the unmediated model (Figure 1), physical pain had a statistically significant positive association with suicidal ideation ($b = 0.12$, $SE = 0.42$, $p < 0.05$). In the proposed mediational models (Figures 2 & 3), however, the relationship between suicidal ideation and physical pain lost statistical significance after the addition of depression ($b = 0.02$, $SE = 0.04$, $p = 0.64$) and posttraumatic stress ($b = 0.04$, $SE = 0.04$, $p = 0.35$). Physical pain had a statistically significant positive association with symptoms of depression ($b = 0.93$, $SE = 0.14$, $p < 0.05$) and posttraumatic stress symptoms ($b = 1.98$, $SE = 0.29$, $p < 0.05$). In turn, the proposed mediator variables, depression ($b = 0.10$, $SE = 0.02$, $p < 0.05$) and posttraumatic stress ($b = 0.04$, $SE = 0.01$, $p < 0.05$), were also significantly associated with suicidal ideation. The indirect effect of physical pain on suicidal ideation after the addition of depression (indirect effect = 0.09; $z = 4.35$, $SE = 0.02$, $p < 0.01$) and posttraumatic stress (indirect effect = .075; $z = 3.58$, $SE = 0.02$, $p < 0.01$) was also statistically significant in both proposed models. The significance of the indirect effect can also be addressed by examining the significance tests of the path connecting the independent variable to the mediator and the path connecting the mediator to the dependent variable. If both of these paths are significant, then we conclude that the indirect effect is significant (Fritz & MacKinnon, 2007). As shown above, the relevant paths were significant for both analyses, providing support consistent with the Sobel test for partial mediation.

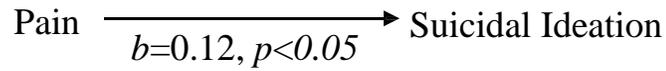


Figure 1. The unmediated effect of physical pain on suicidal ideation. The unstandardized regression coefficient is presented along with its statistical significance.

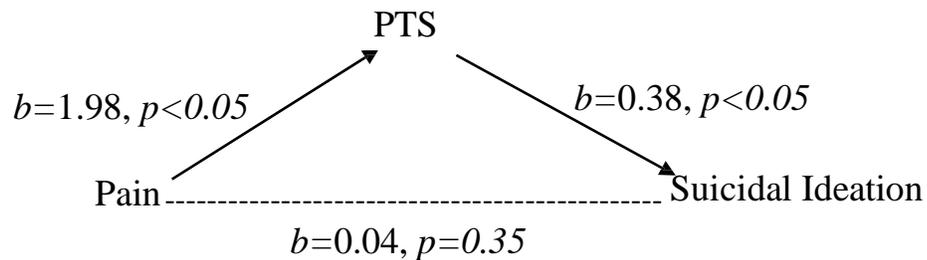


Figure 2. The mediational effect of posttraumatic stress on the association between physical pain and suicidal ideation. The unstandardized regression coefficients of the direct and indirect relationships are presented along with their statistical significance. Note that the association between physical pain and suicidal ideation is no longer significant.

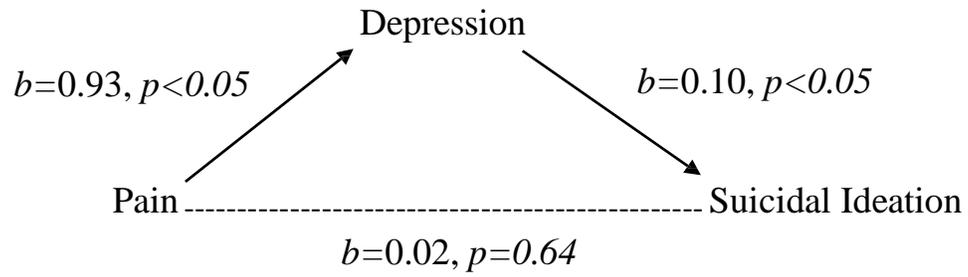


Figure 3. The mediational effect of depression on the association between physical pain and suicidal ideation. The unstandardized regression coefficients of the direct and indirect relationships are presented along with their statistical significance. Note that the association between physical pain and suicidal ideation is no longer significant.

Discussion

The current study was intended to understand suicidal ideation in individuals who have been admitted to a hospital for emergency medical treatment of injuries related to physical trauma. More specifically, we sought to understand how symptoms related to two conditions, depression and posttraumatic stress, influence suicidal ideation in survivors of physical trauma. We proposed that physical pain's association with ideation would be mediated by the severity of depression and posttraumatic stress symptoms, and both of these mediators operated as expected confirming our hypothesis.

Depression and Suicide Ideation in Survivors of Physical Trauma

These results support the role of depression as a partial mediator of the relationship between physical pain and suicidal ideation. In this way, when a trauma survivor is experiencing physical pain, his or her risk for suicidal ideation increases if they also have more severe symptoms of depression. Thus pain may aggravate symptoms of depression, but it remains unclear how this ultimately confers an increased risk for ideation. Perhaps more severe symptoms of depression may impair the individual's daily functioning and lead to thoughts about ending one's life. A previous longitudinal study of patients treated at Level 1 trauma centers found that higher levels of depression and anxiety early on in the post- injury recovery time period was associated with decreased functioning in subsequent months (Wegener et al., 2011). Decreased functioning, in turn, can significantly influence one's ability to work, participate in physical therapy, or make desired contributions to society, increasing their feeling like a burden on others (Van Orden et al., 2010) and triggering suicidal ideation and behavior (Kaplan, McFarland, Huguet, & Newsom, 2007).

Alternatively, pain and depression may have a reciprocal relationship, such that more severe symptoms of depression may help to maintain or influence the perception of pain. In terms of the latter, there is evidence that disrupted sleep, a symptom of depression, is associated with increased sensitivity to and interference with pharmacological treatments for pain (Chiu et al., 2005; Lautenbacher, Kundermann, & Krieg, 2006). Given that the majority (3/4) of patients in the current study endorsed sleep disturbances, with 36% of disruptions taking place “all the time,” it is plausible that patients experienced higher intensities of physical pain as a function of sleep deprivation. Furthermore, the continued disruption of sleep by pain during the recovery period may contribute to the onset and/or maintenance of depression symptoms, as previous studies have suggested insomnia as a predictor of an episode of major depression (Breslau, Roth, Rosenthal, & Andreski, 1996). Similarly, another symptom of depression—feeling low in energy—also affected the majority of patients in the current sample. This finding is important to note, as depression symptoms, sleep disturbances, and pain have all been found to have independent associations with suicidal thoughts and behaviors (Pigeon, Pinquart, & Conner, 2012; Tang & Crane, 2006). With this in mind, the combination of interrupted sleep, decreased energy, and increased pain may be a typical *physical* consequence of the inpatient experience and/or the recovery period after physical trauma, one that has significant *cognitive* and *emotional* effects on the survivor and increases the likelihood that they will experience symptoms of clinically significant pathology.

Post-traumatic Stress and Suicide Ideation in Survivors of Physical Trauma

The results also provide support for the role of posttraumatic stress as a partial mediator of the relationship between physical pain and suicidal ideation. As previously mentioned, pain may act as a constant reminder of the traumatic event that led to the

patient's injuries (Ramchand et al., 2008), which may aggravate the re-experiencing symptoms associated with PTSD and potentially contribute to the precipitation of maladaptive psychological reactions during the recovery period. Indeed, 25.6% of patients endorsed experiencing repeated, disturbing memories, thoughts, or images of their accident "a little bit" of the time since their injury. Another 25% endorsed "trouble falling or staying asleep," making these symptoms the two most frequently endorsed of the assessed signs of posttraumatic stress.

It is important to note, however, that for the other items on the PCLC, a high percentage of patients tended to endorse having not experienced symptoms at all. This finding may point to the fact that current diagnostic criteria for posttraumatic stress disorder requires that symptoms persist for at least one month since the event of injury. These patients were assessed for PTS almost immediately after they received their wounds, which may be too soon to make a formal assessment; posttraumatic stress may have yet to develop or may exist at a severity that is too low to detect by the PCLC.

Though PCLC total scores in the current sample are too low to meet diagnostic criteria for PTSD, the results of this study suggest that PTS symptoms are nevertheless strong enough at the time of hospitalization to mediate the relationship between physical pain and suicidal ideation. This is to say, patients endorsing pain from physical trauma appear to experience enough stress in the immediate aftermath of their injury to trigger suicidal ideation. This is consistent with previous research on subthreshold PTSD, a label for posttraumatic symptoms that are of insufficient number or severity to meet full diagnostic criteria.

Marshall et al. (2001) found that subthreshold PTSD symptoms can impair functioning and increase risk for suicidal ideation, even after controlling for major depressive disorder. Alternatively, patients may not necessarily be exhibiting symptoms of a subclinical disorder but acute stress disorder (ASD) instead. The symptoms of ASD resemble that of PTSD, the major diagnostic distinction being that ASD symptoms must persist for at least three days but no more than one month after trauma exposure. There is some evidence that individuals who experience symptoms of acute stress are at higher risk for going on to develop PTSD (Harvey & Bryant, 1998) and to die by suicide (Gradus et al., 2010). It is likely that a significant percentage of the sample meet criteria for ASD, which provides a potential alternative explanation for the role of stress reactions as mediators of the physical pain-ideation relationship. The current study, however, did not use any formal assessment for acute stress, an overlooked aspect that may provide useful information if pursued in future research.

Limitations

Although the current study sheds light on the possible roles that depression and PTS play as mediators of the physical pain-ideation relationship, a complete understanding of the mechanisms behind suicidal ideation in survivors of physical trauma has yet to be achieved. The study was limited in its assessments, namely inconsistency in when pain was assessed in patients. It is possible that a self-reported rating of pain may drastically change depending on if the patient was questioned before or after the application of any analgesic treatments (e.g. pain medication), a variation that resulted from research team interviewers not having

full control over when they would be able to speak with patients. Additionally, the current findings only relate to suicidal ideation, thus it would be helpful if future work focused on how the effect of pain, depression, and PTSD looked in suicidal behavior as well.

Above all, it has yet to be fully understood how a patient group admitted for non- psychiatric medical treatment becomes a psychiatric population. The question of causation remains; physical trauma survivors in the present study may have had risk factors or prior history for mental illness that were aggravated by the traumatic event, or the nature of physical trauma itself may lead to the development of complex negative psychological outcomes. Nevertheless, the findings of this study highlights the fact that medical professionals are in a key position to detect individuals who may be at risk of developing psychiatric challenges as a result of their physical trauma. Early intervention may play a crucial role in preventing the mental deterioration of individuals who are recovering in the aftermath of a physically painful event, thereby ameliorating the emotional pain associated with suicidal ideation and potentially deterring the patient from ending their life.

Appendix A
PTSD Checklist Civilian Version

plc Now I will read a list of problems and complaints that people sometimes have in response to stressful life experiences like the event that brought you to the hospital. For each item, I would like you to tell me how bothered you have been by these experiences **since you were injured**:

Since you were injured, how BOTHERED have you been by:		Not at All	A Little Bit	Moderately	Quite a Bit	Extremely
[1.]	Repeated, disturbing memories , thoughts, or images of the event in which you were injured?	1	2	3	4	5
[2.]	Repeated, disturbing dreams of the event in which you were injured?	1	2	3	4	5
[3.]	Suddenly acting or feeling as if the event in which you were injured was happening again (as if you were reliving it)?	1	2	3	4	5
[4.]	Feeling very upset when something reminded you of the event in which you were injured?	1	2	3	4	5

[5.]	Having physical reactions (e.g., heart pounding, trouble breathing, sweating) when something reminded you of the event in which you were injured?	1	2	3	4	5
[6.]	Avoiding thinking about or talking about the event in which you were injured or avoiding having feelings related to it?	1	2	3	4	5
[7.]	Avoiding activities or situations because they reminded you of the event in which you were injured?	1	2	3	4	5
[8.]	Trouble remembering important parts of the event in which you were injured?	1	2	3	4	5
[9.]	Loss of interest in activities you used to enjoy?	1	2	3	4	5
[10.]	Feeling distant or cut off from other people?	1	2	3	4	5
[11.]	Feeling emotionally numb or being unable to	1	2	3	4	5

	have loving feelings for those close to you?					
[12.]	Feeling as if your future somehow will be cut short?	1	2	3	4	5
[13.]	Trouble falling asleep or staying asleep?	1	2	3	4	5
[14.]	Feeling irritable or having angry outbursts?	1	2	3	4	5
[15.]	Having difficulty concentrating?	1	2	3	4	5
[16.]	Being “super-alert” or watchful and on guard?	1	2	3	4	5
[17.]	Feeling jumpy or easily startled?	1	2	3	4	5

Appendix B
Patient Health Questionnaire

<i>phq</i>	Since your injury, how often have you been bothered by any of the following problems?	Not at all	A little of the time	More than half the time	Nearly all the time
[1.]	Little interest or pleasure in doing things	0	1	2	3
[2.]	Feeling down, depressed or hopeless	0	1	2	3
[3.]	Trouble falling or staying asleep, or sleeping too much	0	1	2	3
[4.]	Feeling tired or having little energy	0	1	2	3
[5.]	Poor appetite or overeating	0	1	2	3
[6.]	Feeling bad about yourself- or that you are a failure or have let yourself or your family down	0	1	2	3
[7.]	Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
[8.]	Moving or speaking so slowly that other people could have noticed? Or the opposite - being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3

[9.]	Thoughts that you would be better off dead or of hurting yourself in some way.	0	1	2	3
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Appendix C

Scale for Suicide Ideation

*Think about a time since your injury that you felt the most suicidal or the worst off emotionally. Think about that time and answer all of the following questions how you would have answered at **that time**:*

<i>ssi</i>	<u>I. CHARACTERISTICS TOWARD LIVING/DYING</u>		
	[1.] WISH TO LIVE		
	Can you tell me about your desire to live, your wish to live at that time ? Was it moderate to strong? Weak? Or None?		
	Moderate to strong 0	Weak 1	None 2
	[2.] WISH TO DIE		
	Can you tell me about your desire to die, your wish to die at that time ? Was it moderate to strong? Weak? Or None?		
	None 0	Weak 1	Moderate to strong 2
	[3.] REASONS FOR LIVING AND DYING		
	Would you say that your reasons for living outweighed your reasons for dying? Would you say that your reasons for dying outweighed your reasons for living? Or were they about equal?		
	For living outweigh for dying 0	About equal 1	For dying outweigh for living 2
	[4.] DESIRE TO MAKE ACTIVE SUICIDE ATTEMPT		
	(At that time) what was your desire to make an active suicide attempt, to actively harm yourself, actively kill yourself? Was there no desire at all? Was it a weak desire, or moderate to strong?		
	None 0	Weak 1	Moderate to strong 2
	[5.] PASSIVE SUICIDAL ATTEMPT		

<p>At that time did you have any passive suicidal feelings? For instance would you, in fact, take precautions necessary to save your life? Would you take medicine to save your life? Would you drive safely to keep yourself alive? Or, would you be deliberately careless, leaving life and death to chance? An example might be, crossing the street without looking, having a fatalistic attitude that if you live, you live; if you get hit, it was meant to be, i.e. not really caring what happens; being very careless with your life. Or, would you actively avoid steps to save or maintain your life, i.e. if you were diabetic, would you deliberately avoid taking your insulin as a way of showing that you didn't care about life or death?</p>		
<p>Would take precautions 0</p>	<p>Would leave life/death to chance 1</p>	<p>Would avoid steps necessary to save or maintain life 2</p>

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