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# Anxiety Sensitivity as a Moderator for PTSD Mediated Combat Exposure in Predicting Suicide Risk in a Military Sample

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# Anxiety Sensitivity as a Moderator for PTSD Mediated Combat Exposure in Predicting Suicide Risk in a Military Sample

by

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## Dedication

This project is dedicated to my parents as a small token of gratitude for three decades (and counting) of love and support; I dare not think about where I would be without it.

**Acknowledgements**

I would like to extend heartfelt appreciation to all those who contributed directly to this thesis: to my committee, Dr. Karen Saules and Dr. Dean Lauterbach, for sharing their wisdom and helping to make the project better than it ever would have been had I done it on my own; to my lab mates and colleagues for their ears and their ideas; to Dr. Sheila Rauch and (especially) Dr. Katherine Porter at the Ann Arbor VA for their willingness to support this venture and for their help in navigating the intricate machine in which they work; to my (other) new friends at the VA for accommodating me and making me feel welcome; and particularly to my advisor, Dr. Ellen Koch, for investing her time, energy, and confidence in me – and for answering each in a sometimes endless stream of questions with diligence, thoughtfulness, and enthusiasm.

**Abstract**

Suicide took almost 40,000 U.S. lives in 2011, with military rates exceeding the general population (and rising). Anxiety sensitivity (AS; the fear of fear) includes three components: physical, cognitive, and social. Recent studies indicate a connection between AS and suicidality through the Interpersonal-Psychological Theory of Suicide (IPTS). Separate research has proposed that the development of severe psychopathology, like posttraumatic stress disorder (PTSD) and suicide, may be moderated by AS. The present study considered this mechanism from an IPTS perspective with a cross-sectional sample of veterans and active duty members from a Veterans Affairs clinic database. Regression models tested whether physical AS would moderate the relationship between combat exposure and PTSD; whether PTSD would mediate the relationship between combat exposure and suicidality; and whether social AS would predict suicidality. None of the hypotheses were supported. However, PTSD, combat exposure, and cognitive AS predicted suicidality, supporting other recent results.

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# Anxiety Sensitivity as a Moderator for PTSD Mediated Combat Exposure in Predicting Suicidal Ideation in a Military Sample

Suicide accounted for almost 40,000 U.S. deaths in 2011 (Hoyert & Xu, 2012), with recent rates of active duty service members in the Navy and Air Force exceeding the U.S. average, and rates in the Army and Marines as high as double that of the general population (Harrell & Berglass, 2011). Of even greater concern are former military members: they account for approximately 20% of suicides in the U.S. [Centers for Disease Control and Prevention (CDC), 2012], while only representing 7.6% of the population [United States Department of Veterans Affairs (USDVA), 2011]. One theory that may shed light on the causes of such relatively high rates of suicide is the Interpersonal-Psychological Theory of Suicide (IPTS; Joiner, Van Orden, Witte, & Rudd, 2009), which postulates there are three conditions necessary for engaging in serious suicidal behavior (including ideation, attempt, and completion): *perceived burdensomeness* – the sense that one is a burden to specific others or society as a whole; *thwarted belongingness* – the opposite of connectedness, indicating feelings of social isolation; and *acquired capability* – the loss of fear of, and ability to engage in, suicide. A recent series of studies (Capron, Blumenthal, et al., 2012; Capron, Cougle, Ribeiro, Joiner, & Schmidt, 2012; Capron, Fitch, et al., 2012; Capron, Gonzalez, Parent, Zvolensky, & Schmidt, 2012) proposed and examined potential relations between suicidal ideation and anxiety sensitivity (AS) – a fear of arousal-related sensations (Taylor, 1999). AS is currently conceptualized as being composed of three factors indicating that fear of physical (physical AS), cognitive (cognitive AS), and social (social AS) symptoms will lead to death, insanity, and social rejection, respectively (Taylor et

al., 2007). The series of studies not only demonstrated that measures of AS are predictive of suicidal ideation, but also advanced the understanding of the mechanisms involved by linking the IPTS to a multifaceted conceptualization of AS. In particular, they showed an association between higher levels of AS-social and increased suicidal ideation (Capron, Fitch, et al., 2012); and that lower levels of physical AS are also associated with increased suicidal ideation (Capron, Cougle, et al., 2012; Capron, Gonzalez, et al., 2012). Thus far, however, no studies have considered the usefulness of these relationships with the important and at-risk military population. Other research has shown severe pathology such as posttraumatic stress disorder (PTSD) to be predictive of suicide (S. E. Bruce et al., 2001), while yet another area of study has proposed one potential mechanism for the development of severe psychopathology is AS moderated trauma (Feldner, Lewis, Leen-Feldner, Schnurr, & Zvolensky, 2006). Further, it has been suggested that trauma, such as combat exposure, can lead to a desensitization towards violence, including self-directed violence such as suicide (Bryan, Kanzler, Durham, West, & Greene, 2010). As such, the present study sought to confirm, combine, and extend these developing lines of research by considering how the dimensions of AS – both independently and via interaction with combat exposure through a mechanism involving PTSD – may help predict suicidal behavior in the at-risk military population.

## Suicide

**Prevalence and costs.** Almost one million people die by suicide each year worldwide, which is approximately one premature death every 40 seconds [World Health Organization (WHO), 2012]. Suicide rates have increased 60% over the last 45 years,

with the most significant increases coming from those aged 15-44 years, becoming the third leading cause of death among those in that age group (WHO, 2012).

In the U.S., suicide currently rates 10th among the leading causes of death (4th among those 25-45 years old and 2nd among those 15-24 years old), accounting for 38,285 premature deaths in 2011 (based on preliminary data; Hoyert & Xu, 2012). Approximately 79% of all suicides are by men (CDC, 2012), and 87% of those committing suicide have a psychological disorder (Arsenault-Lapierre, Kim, & Turecki, 2004).

Beyond emotional suffering and other indirect costs of suicide, the 1.3 million years of life lost annually costs society an estimated $26.7 billion per year in forfeited productivity and medical expenses (CDC, 2012). This is in addition to the $3.8 billion per year spent on hospitalizations due to uncompleted suicide attempts (CDC, 2012).

**Rates among the military.** Recent rates of suicide among military service members in the U.S. exceed those of the general population (Harrell & Berglass, 2011). Estimates for suicide rates among military veterans vary by study methodology, but many show rates more than double that of the general population after adjusting for other factors such as sex and age (Kaplan, Huguet, McFarland, & Newsom, 2007; Malbran, 2007). In fact, veterans account for roughly 20% of suicides (CDC, 2012), while only comprising 7.6% of the population (USDVA, 2011). For the most recent cohort of veterans – those returning from Operation Enduring Freedom (OEF), Operation Iraqi Freedom (OIF), and Operation New Dawn (OND) – the most recent data available (from 2008) show suicide rates more than triple the general population (Bagalman, 2011;

McIntosh, 2011). Currently the number of deaths by suicide exceeds those caused by combat, and suicide rates are rising (Thompson, 2010).

**Predictors of suicide.** Due to the finality of suicide, a substantial amount of research attempts to understand risk factors. The most direct line of research has been that of suicidal behavior, including suicidal ideation and attempts. Studies have shown that past suicidal behavior predicts current suicidal behavior, even after controlling for multiple potential confounds (e.g., Joiner et al., 2005). Similarly, research supports that suicidal ideation predicts suicide attempts (Kuo, Gallo, & Tien, 2001), and that attempts predict completed suicides in both U.S. epidemiological studies (Kessler, Borges, & Walters, 1999), as well as those worldwide (Borges et al., 2010).

Psychological disorders and their symptoms have been another focus of suicide prediction research and are among the strongest predictors of suicide attempts (Kessler et al., 1999). One large subset of these studies focuses on anxiety disorders as predictors of suicide (e.g., Bolton et al., 2007). Overall, panic disorder and PTSD are the strongest predictors of suicide amongst these disorders, though social anxiety disorder (SAD), obsessive-compulsive disorder (OCD), specific phobias, and generalized anxiety disorder (GAD) were also found to be significant predictors of suicide ideation or attempts (Cougle, Keough, Riccardi, & Sachs-Ericsson, 2009; Nepon, Belik, Bolton, & Sareen, 2010). Anxiety disorders, in addition to being an independent risk factor, also magnify the effect mood disorders have on suicide attempts (Sareen et al., 2005).

Mood disorders, too, have demonstrated their individual forecasting ability for suicidal ideation (e.g., Nock, Hwang, Sampson, & Kessler, 2010), suicide attempts (e.g., Bolton & Robinson, 2010), and completed suicides (e.g., Yoshimasu, Kiyohara, &

Miyashita, 2008). The most prominent of these is Major Depressive Disorder (MDD), which is frequently the strongest predictor of suicide among all psychological disorders. While not as strongly predictive of suicide as mood disorders, substance use disorders also significantly portend suicide (Bolton & Robinson, 2010). The power of alcohol and other substance abuse and dependence in predicting suicide remained significant even after controlling for other psychological disorders (Nock et al., 2010). In fact, one review of suicide risk factors highlights comorbid substance use and mood disorders as being a condition of considerable concern (Yoshimasu et al., 2008).

Most of the key predictors of suicide in the general population are also critical risk factors in the military population. Significant predictors for veterans and active duty members of the military include: panic disorder (Pfeiffer, Ganoczy, Ilgen, Zivin, & Valenstein, 2009), GAD (Pfeiffer et al., 2009), PTSD (Black, Gallaway, Bell, & Ritchie, 2011; Hyman, Ireland, Frost, & Cottrell, 2012; Pfeiffer et al., 2009), MDD (Black et al., 2011; Hyman et al., 2012; Mrnak-Meyer et al., 2011; Pfeiffer et al., 2009), and substance use disorders (Black et al., 2011; Hyman et al., 2012; Pfeiffer et al., 2009). The present study confirmed which of these predictors correlated significantly with suicidal behavior and controlled for them in analyses to avoid potential confounds – with the exception of PTSD (given its relationship with trauma and involvement in the hypotheses).

**The Interpersonal-Psychological Theory of Suicide.** Within the empirical literature, there are several theories of suicide that attempt to explain its underlying processes. One of these – the Interpersonal-Psychological Theory of Suicide (IPTS) – has withstood more than twenty direct empirical tests (Joiner, Van Orden, Witte, & Rudd,

2009). Recent studies show the IPTS applies to the veteran population and (separately) links to the latest formulations of AS.

According to the IPTS, individuals will only engage in suicide if they have both the desire to die and the ability to enact that motive (Figure 1). *Suicidal desire* is a construct that includes what is typically referred to as suicidal ideation, but also includes other cognitions related to perceptions and motivations toward suicide. It is further divided into two components in the IPTS model: perceived burdensomeness and thwarted belongingness. Perceived burdensomeness is the belief that one's death will be worth more than one's life to family, friends, and society. Thwarted belongingness is characterized by a sense of social alienation and loneliness due to lack (or perceived lack) of community ties and interaction in social circles and other relationships. These factors have been demonstrated to correlate significantly with suicidal ideation in both clinical (Joiner et al., 2002) and non-clinical samples (Van Orden, Witte, Gordon, Bender, & Joiner, 2008). Suicidal desire is most predictive of suicide attempts when both components are present. Research has shown that the combination of the two components is more predictive of the severity of suicidal ideation than either construct alone (Van Orden, Witte, James, et al., 2008).

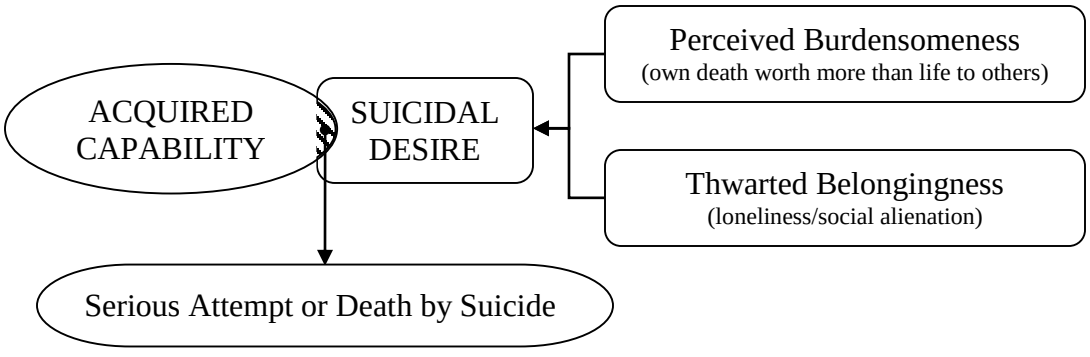


*Figure 1*. Diagram of the IPTS

Motive toward suicide alone, however, is not enough. Joiner, Van Orden, Witte, and Rudd (2009) propose the presence of a powerful self-preservation instinct. The ability to engage in self-injury, termed acquired capability, overcomes this instinct. The repeated exposure to experiences of pain and fear can cause habituation towards those feelings and contribute to learning this readiness. Over time, one develops a high pain tolerance and fearlessness about death. This too is positively and significantly associated with suicide (Franklin, Hessel, & Prinstein, 2011; Van Orden, Witte, Gordon, et al., 2008). While acquired capability alone will not create a sufficient condition for severe risk of suicide, when combined with both components of suicidal desire, research suggests that the three-component construct is highly predictive of suicidal behavior (Joiner, Van Orden, Witte, Selby, et al., 2009).

**Trauma and suicide.** One potential variable that may create the conditions encompassed by the IPTS is trauma exposure. Studies consistently find that trauma exposure predicts suicide, particularly physical and sexual interpersonal traumas (Belik, Cox, Stein, Asmundson, & Sareen, 2007; Wiederman, Sansone, & Sansone, 1998). This research has held in cases of childhood trauma (Joiner et al., 2007; Molnar, Berkman, & Buka, 2001; Roy & Janal, 2005) and trauma experienced in adulthood (S. E. Bruce et al., 2001; Seedat, Stein, & Forde, 2005). In fact, recent studies proposing a diathesis-stress model between trauma and gene expression show that childhood trauma interacts with genes to predict suicide risk later in life – via the hypothalamic-pituitary-adrenal axis (McGowan et al., 2009; Roy, Gorodetsky, Yuan, Goldman, & Enoch, 2010), and the serotoninergic system (Perroud et al., 2008). Research also shows that exposure to multiple traumatic events, as well as multiple types of trauma, both have a cumulative

effect (Belik et al., 2007). While trauma significantly predicts suicide compared to no trauma, trauma in addition to a PTSD diagnosis predicts suicide significantly more strongly than just trauma alone (S. E. Bruce et al., 2001). These findings extend to the military where suicide rates are higher among those whom have experienced active duty, with even higher rates among those who experienced injury and other physical trauma, frequently as a result of combat exposure (M. L. Bruce, 2010).

**Anxiety Sensitivity (AS)**

AS is the fear of arousal-related sensations arising from beliefs that they have adverse consequences, such as death, insanity or social rejection (Taylor, 1999). It is considered a trait characteristic distinguishable from trait anxiety (the tendency toward fearful responding to stimuli), in that it is a fear of the symptoms instead of the stimuli themselves (McNally, 1989). According to the *Yerkes-Dodson Law* (Yerkes & Dodson, 1908), a reasonable amount of anxiety or fear is adaptive; it improves performance by focusing the organism's attention. However, as anxiety increases beyond the optimal arousal point, severe reactions interfere with functioning and begin to degrade performance. Sensitivity to anxiety compounds the original stimulus response by compelling an individual to react further to the anxiety sensations themselves, causing a domino effect, which can rapidly increase total anxiety experienced to extreme levels. It is this aspect of the nature of AS that makes it useful in understanding and predicting disordered behavior.

The original measure of AS, the Anxiety Sensitivity Index (ASI; Reiss, Peterson, Gursky, & McNally, 1986), was created to help predict the development of anxiety disorders, and formulated AS as a unitary construct. The ASI and other measures of AS

are predictive of a host of anxiety disorders, including: SAD (e.g., Rapee & Heimberg, 1997), GAD (e.g., Rodriguez, Bruce, Pagano, Spencer, & Keller, 2004), OCD (e.g., Zinbarg, Barlow, & Brown, 1997), specific phobias (e.g., Cisler, Reardon, Williams, & Lohr, 2007), PTSD (e.g., Keogh, Ayers, & Francis, 2002), and panic disorder (e.g., Schmidt, Lerew, & Jackson, 1997).

Since AS demonstrated predictive power with anxiety disorders, researchers began to investigate its potential in the prognostication of other psychological problems. The scope of AS studies was broadened to include mood disorders (in particular MDD; e.g., Taylor, Koch, Woody, & McLean, 1996), substance use disorders (see Morissette, Tull, Gulliver, Kamholz, & Zimering, 2007, for a review), eating disorders (e.g., Anestis, Holm-Denoma, Gordon, Schmidt, & Joiner, 2007), hypochondriasis (e.g., Olatunji et al., 2009), chronic pain (see Ocañez, McHugh, & Otto, 2010, for a review), and most recently suicide (e.g., Capron, Fitch, et al., 2012). However, as more and more disorders were examined, criticisms of AS as a unitary construct accumulated until somewhat of a consensus developed that a multidimensional construct would be more accurate and useful.

Lilienfeld, Turner, and Jacob (1993) were the first to propose a structural revision of AS. Their contribution led to the development of the Anxiety Sensitivity Index-Revised (ASI-R; Taylor & Cox, 1998), and eventually the Anxiety Sensitivity Index-3 (ASI-3; Taylor et al., 2007). The ASI-3 formalized a multidimensional model of AS (Figure 2) with a stable factor structure including three subscales that assessed distinct categories of concern: (1) *physical concerns* (physical AS): for instance, the fear that heart palpitations will lead to cardiac arrest; (2) *cognitive concerns* (cognitive AS): the

worry that difficulties concentrating are precursors of insanity; and (3) *social concerns* (social AS): the concern that publicly observable anxiety will elicit social ridicule and rejection.

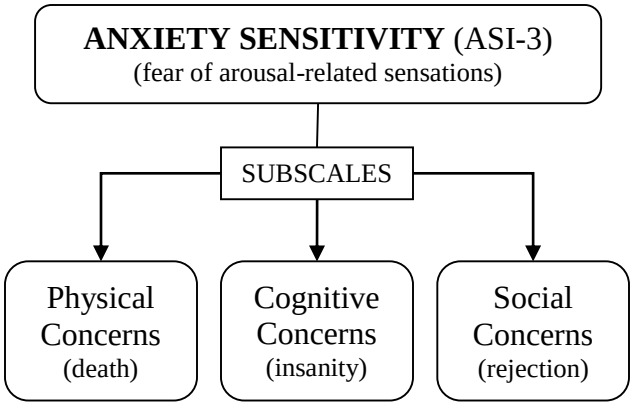


*Figure 2.* The ASI-3's Subscales: A Multidimensional Model of AS

This new model exhibits better fit to theoretical and data driven investigations with a range of disorders (Taylor et al., 2007**)**. One recent line of research that is directly applicable to the present study examines the relationship between AS and suicidal ideation in the hopes of improving the prediction and prevention of premature death by suicide.

**Linking AS and Trauma to Suicide**

A series of recent studies (Capron, Blumenthal, et al., 2012; Capron, Cougle, et al., 2012; Capron, Fitch, et al., 2012; Capron, Gonzalez, et al., 2012) examined potential parallels between the IPTS and the multidimensional model of AS in a moderately-severe outpatient sample (Capron, Fitch, et al., 2012), in samples of heavy smokers and smokers seeking treatment (Capron, Blumenthal, et al., 2012), in a sample of HIV positive adults (Capron, Gonzalez, et al., 2012), and in an outpatient sample with PTSD symptomology

(Capron, Cougle, et al., 2012). They found that the two risk factors for suicide in the IPTS significantly correlated with the sub-factors represented in a three-factor model of AS: low levels of physical AS predicted acquired capability necessary for a serious suicide attempt (as they are both theoretically correlated with habituation to pain), and high levels of cognitive AS predicted intensified catastrophic cognitions leading to suicidal desire via a positive feedback model (Katz, Yaseen, Mojtabai, Cohen, & Galynken, 2011). While not part of their primary hypotheses, Capron, Fitch, et al. (2012) also found that physical AS and social AS interacted: social AS was strongest as a predictor of suicidal behavior at low levels of physical AS. They noted that high levels of social concerns could relate to the thwarted belongingness factor within the IPTS. A fear of rejection could cause a person to avoid or withdraw from relationships and group situations, creating a social void and fulfilling one of the three criteria in the IPTS for serious risk of suicide: thwarted belongingness. Using these results together, parallels can be drawn between the IPTS and the multi-dimensional model of AS (Figure 3 shows a visualization of these relations). The present study sought to expand upon these investigations by examining whether potential trauma caused by combat exposure predicts similar patterns of relationships between the facets of AS and suicide in a military sample.

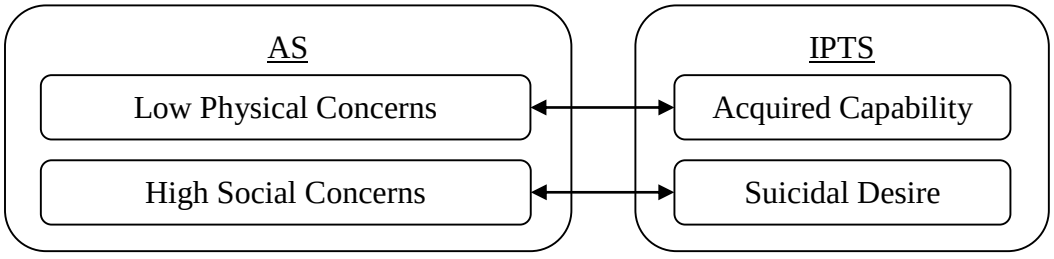


*Figure 3*. Visualization of the Potential Links Between AS and the IPTS

**AS and suicide in the military population.** Some research has begun applying the IPTS to the military population. Bryan, Morrow, Anestis, and Joiner (2010) were the first to apply the IPTS directly to a military sample. Compared to non-military undergraduates, active duty U.S. Air Force members had lower perceived burdensomeness, higher acquired capability, and similar levels of thwarted belongingness. Similarly, another study found heightened acquired capability for suicide among military personnel deployed in Iraq when comparing baseline data taken from a non-clinical sample to data from clinical members who were engaging services at a forward-deployed (in-theater) clinic (Bryan, Cukrowicz, West, & Morrow, 2010). This study further showed that a greater range of combat experiences predicted higher levels of acquired capability (but not elevated perceived burdensomeness or thwarted belongingness), even when controlling for other common risk factors of suicide.

These results are consistent with the IPTS, and somewhat presumed given the circumstances of deployment. It is expected that feelings of belonging would be roughly similar to a general population, with unit cohesion compensating for distanced relationships back home; that a sense of duty and responsibility created by being part of a unit in an operational environment would prevent any impressions of being a burden; and that combat would expose those members to violence, aggression, and death; desensitizing them to pain and fear, increasing their acquired capability. Overall – based on the IPTS – one would not assume substantially higher rates of suicide in deployed personnel compared to the general population, as deployment has some protective characteristics, such as lower perceived burdensomeness, compensating for its other, more harmful effects (e.g., higher acquired capability).

However, many of the protective aspects of service in a combat zone fluctuate more frequently or have faded away due to the nature of modern military service, particularly for members who are garrisoned at a military installation in a foreign land, reserve forces members, and veterans returning home (Selby et al., 2010). In these situations, time away from the unit can decrease the sense of belonging (particularly if former home relationships have deteriorated in their absence), creating a stark contrast to the intense camaraderie experienced when deployed. One study found a relationship between separation or divorce and higher rates of suicide among military members (Hyman et al., 2012). Feelings of importance, codependence, and usefulness present in combat settings can quickly turn into perceived burden when members transition to garrison posts or back to civilian life, especially if employment is difficult to obtain. For instance, a similar reduction in feelings of pride in purpose – via reductions in military rank – were found to increase suicide rates among active duty members (Hyman et al., 2012).

From a broader, historical perspective, acquired capability has also likely increased over time within the military, due to the ever-higher standards placed on members of the armed forces. This is true even for soldiers who have not been deployed or seen combat, as training protocols have increased in rigor: troops experience discomfort, pain, and fear at levels far beyond that of a typical person's life, from the first day of boot camp. This repeated contact can increase pain tolerance and dull the fear of death substantially (Bryan, Kanzler, et al., 2010); with higher levels of injury, death and violent experiences associated with higher acquired capability (Bryan & Cukrowicz,

2011). In sum, all three risk factors for suicide can be present at disconcerting levels among members of the U.S. military today, in particular among its veterans.

**Potential mechanisms for suicide.** If the posited connection between AS and the IPTS is extended further to also consider the research on trauma, PTSD, and suicide, there are logically at least two possible paths of operation: (1) that suicide and AS both come from the stress of trauma, or (2) that AS is a trait factor which predisposes those experiencing trauma to have more severe reactions, up to and including suicidal behavior. There are two studies which, taken together, would seem to indicate the latter mechanism is the more likely of the two. The first was a study examining the relationship between AS and trauma in those with PTSD (Feldner et al., 2006) and found that AS moderated the relationship between trauma exposure frequency and PTSD symptom severity – specifically that greater trauma frequency was associated with high PTSD symptom severity in those with high AS levels. The second study compared two groups: those with trauma to those with trauma and PTSD (Olatunji, Armstrong, Fan, & Zhao, 2012); they found that those with trauma and PTSD reported significantly higher levels of AS than those with just trauma exposure. Rearranged and considered in a different causal order, this could indicate that trauma is a necessary but insufficient condition (that is, it must be combined with high levels of AS) for severe pathology like PTSD to emerge. The combination of these studies and the literature supporting PTSD as a predictor of suicide points at two possibilities: (1) the relationship between trauma (such as that caused by combat exposure) and PTSD is moderated by physical AS; and (2) the relationship between trauma and suicide is mediated by PTSD. These two potential

relations, when taken together, could help explain how trauma can contribute to pathology such as PTSD and suicide.

**The Present Study**

It is clear that suicide is an issue of growing concern within the military. Initial studies viewing this issue through the lens of the IPTS have shown promise in helping to explain the phenomenon and its causes. The latest models of AS may aid in predicting suicidal ideation, with one recent cluster of studies suggesting that multidimensional models of AS are consistent with the IPTS. Additional research areas propose that one mechanism for the creation of severe pathology may be AS moderating the relationship between trauma and severe pathology, including PTSD and suicidal behavior. Studies further show that those with both trauma and PTSD have higher rates of AS – and that the combination is more predictive of suicide – compared to trauma alone.

If these relationships are confirmed, the benefits of such research are substantial. For example, assessment of suicide risk can be done without directly asking potentially difficult questions about suicidal behavior (instead asking questions related to symptoms of AS). Perhaps most importantly, once a potential risk of suicidal behavior has been identified via high levels of AS, studies have shown AS itself to be amenable to treatment (see Smits, Berry, Tart, & Powers, 2008, for a review). Empirically-supported amelioration methods even include single session interventions that were effective in reducing AS levels immediately, with those reductions being maintained at a two-year follow-up (Keough, Riccardi, Timpano, Mitchell, & Schmidt, 2010; Schmidt et al., 2007).

## Hypotheses

1. Physical AS would moderate the relationship between combat exposure and PTSD (Figure 4); specifically among those low in physical AS, combat exposure will significantly predict PTSD.

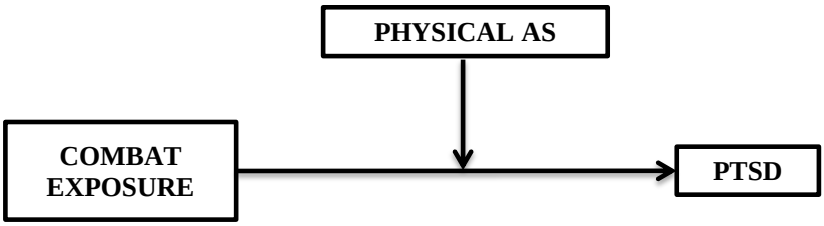


*Figure 4.* Visualization of the Moderation Model of Hypothesis 1

2. PTSD would partially mediate the relationship between combat exposure and suicidal behavior (Figure 5); specifically, PTSD (symptom severity) would predict suicidal behavior itself, and account for part of the relationship between combat exposure and suicidal behavior. Further, these relationships would hold after accounting for the prediction of suicidal behavior by the control disorders.

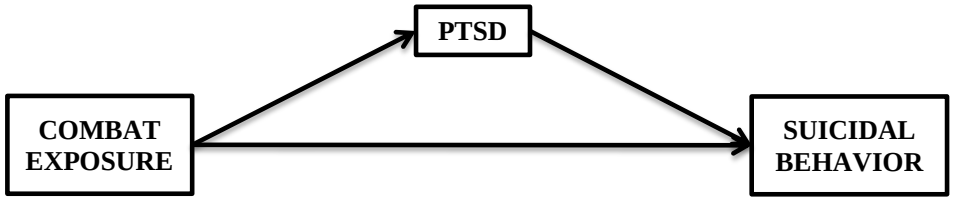


*Figure 5.* Visualization of the Mediation Model of Hypothesis 2

3. Elevations in social AS would significantly predict increases in suicidal behavior, independently from the prediction of suicidal behavior by the control disorders.

## Method

### Participants

The present study utilized participants from a database of veterans who previously registered for services at the Ann Arbor Veterans Affairs (VA) Healthcare System and completed an evaluation with the PTSD Clinical Team. The Ann Arbor VA primarily serves current and former military members in greater South-central and Southeastern Michigan. The sample of 254 participants ranged in age from 23 to 82 years old ($M$ = 53.2, $SD$ = 14.7). They were comprised mainly of married or divorced Caucasian men who had completed at least 12$^{th}$ grade and were not employed (including retirees) at the time of intake (complete non-military related sample demographics are summarized in Table 1).

Table 1

*Non-Military Sample Demographics*

| Variable | Frequency | Percentage |
|---|---|---|
| Gender | | |
| Male | 229 | 90.2% |
| Female | 19 | 7.5% |
| Age | | |
| 20-29 | 24 | 9.4% |
| 30-39 | 36 | 14.2% |
| 40-49 | 38 | 15.0% |
| 50-59 | 24 | 9.4% |
| 60-69 | 123 | 48.4% |
| 70-79 | 7 | 2.8% |
| 80-89 | 1 | 0.4% |
| Race/Ethnicity | | |
| White, not Hispanic | 211 | 83.1% |
| Black, not Hispanic | 19 | 7.5% |
| Hispanic, White | 7 | 2.8% |
| American Indian/Alaskan Native | 2 | 0.8% |
| Marital Status | | |
| Married | 118 | 46.5% |
| Separated | 3 | 1.2% |
| Divorced | 56 | 22.0% |
| Remarried | 23 | 9.1% |
| Widowed | 2 | 0.8% |
| Never Married | 39 | 15.4% |
| Education Completed | | |
| Less than 12th Grade | 7 | 2.8% |
| 12th Grade | 110 | 43.3% |
| More than 12th Grade | 103 | 40.6% |
| Employment | | |
| None | 162 | 63.8% |
| Part-time | 16 | 6.3% |
| Full-time | 50 | 19.7% |

*Note.* Percentages totaling <100% are due to missing data

The majority of the sample was veterans who served in the Army or Marines during either Vietnam or the OEF/OIF/OND eras (full military demographic characteristics of the sample are summarized in Table 2).

Table 2

*Military Sample Demographics*

| Variable | Frequency | Percentage |
|---|---|---|
| Service Status | | |
| Veterans | 209 | 82.3% |
| Active Duty | 4 | 1.6% |
| Reserves | 8 | 3.1% |
| National Guard | 5 | 2.0% |
| Service Era | | |
| Korea | 3 | 1.2% |
| Korea-to-Vietnam | 0 | 0.0% |
| Vietnam | 124 | 48.8% |
| Post-Vietnam | 15 | 5.9% |
| Persian Gulf | 17 | 6.7% |
| OIF/OEF/OND | 53 | 20.9% |
| Multiple | 42 | 16.5% |
| Branch (during service) | | |
| Army | 151 | 59.4% |
| Navy | 11 | 4.3% |
| Air Force | 10 | 3.9% |
| Marines | 40 | 15.7% |
| National Guard | 5 | 2.0% |
| Reserves | 5 | 2.0% |
| Coast Guard | 0 | 0.0% |
| Multiple | 10 | 3.9% |

*Note.* Percentages totaling <100% are due to missing data

The severity of PTSD symptoms in the sample was examined using multiple diagnostic criteria. Based on the binary method of the structured clinical interview of the

PTSD module of the Mini-International Neuropsychiatric Interview (M.I.N.I.), 82.7% of the sample met criteria for PTSD diagnosis. This diagnosis rate is relatively consistent with that obtained by using a cutoff score of 45 on the CAPS total score (85.8%) – a more liberal threshold considered by Weathers, Ruscio, and Keane (1999). Not unexpectedly, the diagnosis rate is significantly lower (51.2%) when utilizing the more severe cutoff of 65 for diagnosis with the CAPS. This generally indicates a relatively less severe sample. If the sample was severe (as was expected given that the sample was the part of those referred to a PTSD clinic who screen high for PTSD symptoms) there would have been a smaller difference in diagnosis rates using the 45 and 65 CAPS cutoffs. The sample's suicidality (assessed by the M.I.N.I.) was also relatively low for a clinical sample, with 73.6% of participants indicating zero risk (no items endorsed in the past month). Of the 26.4% of the sample endorsing at least some suicide risk, most (19.7% of the total sample) endorsed one or only a few items, such as feelings of hopelessness, self-injurious behaviors, or suicidal ideation – indicating a low risk level. Only 5.1% reported medium risk and 1.6% indicated high risk, which indicate endorsement of a number of more severe items, such as having a suicide plan or having a history of one or more past suicide attempts.

**Design**

The present study was a single-group, correlational design examining a cross-sectional sample. It tested the viability of three models of suicidal behavior using a sample of veterans and active duty service members of the military by utilizing existing clinical data. The three models are: (1) a moderation model investigating the moderating effect of physical AS concerns on combat exposure in predicting PTSD symptom

severity; (2) a mediation model examining the mediating effect of PTSD on combat exposure in predicting suicidal behavior; and (3) a simple regression model considering whether social AS concerns would predict suicidal behavior. The second and third models also included controls for suicide risk factors supported by the military literature (MDD, panic disorder, GAD, and alcohol/substance abuse/dependence) that showed significant correlation with suicidal behavior.

**Procedures**

The present secondary data analysis study utilized archival data from intake sessions of patients seen at the Ann Arbor VA Healthcare System's PTSD Clinical Team (PCT) from 2007-2012. Specifically the study analyzed a small portion of patients' intake assessments for the PTSD clinic. All data were part of the standard care process: no new procedures took place for the present study and all patient information remained confidential.

**Intake process.** All military members referred to the PCT at the Ann Arbor VA first receive an extensive self-report intake packet consisting of basic patient information for medical records including medical history, demographic information such as age, sex, and race, as well as additional background information such as military deployments and types of trauma experienced; screeners for spirituality, learning preferences, pain, nutrition, and safety; a personal evaluation including questions about preferred activities, cultural identifications, experiences with violence and abuse, current financial and living situations, and social support; a background questionnaire including treatment history, substance use, head injuries, sleeping issues, allergies, work and family history, and family mental health history, including suicidality; a motivational survey appraising

readiness for treatment; a substance use screener; the Combat Exposure Scale (CES; Keane et al., 1989); the Life Events Checklist (LEC; Blake, et al., 1995); the PTSD Checklist – Civilian Version (PCL-C; Weathers, Litz, Herman, Huska, & Keane, 1993); the Depression Anxiety Stress Scales 21 (DASS21; Lovibond & Lovibond, 1995); the Brief Pain Inventory-Short Form (BPI-SF; Cleeland, 1989); a subjective scale describing impairment based on symptoms; the Posttraumatic Cognitions Inventory (PTCI-36; Foa, Ehlers, Clark, Tolin, & Orsillo, 1999); a questionnaire indicating sources of social support; the Connor-Davidson Resilience Scale (CD-RISC; Connor & Davidson, 2003); the ASI-3 (Taylor et al., 2007); an exercise questionnaire; the State-Trait Anger Scale (Spielberger, Jacobs, Russell, Crane, 1983); the Patient Health Questionnaire 9 (PHQ-9) querying depressive symptoms (Kroenke, Spitzer, & Williams, 2001); 12 (of the 15) items from the Patient Health Questionnaire 15 (PHQ-15) asking about pain symptoms (Kroenke, Spitzer, & Williams, 2002); the Impact of Event Scale-Revised (IES-R; Weiss & Marmar, 1997); the Dissociative Experiences Scale (DES; Bernstein & Putnam, 1986); and a military sexual trauma questionnaire.

In addition to completing the self-report intake packet upon their first visit, patients are also interviewed by a clinician using the M.I.N.I. (Sheehan et al., 1998). If the results of the M.I.N.I. and the intake packet indicate a likelihood of a given patient having PTSD, a follow-up assessment appointment is scheduled one to two weeks later, during which the Clinician-Administered PTSD Scale (CAPS; Blake, et al., 1995) is administered by a VA clinician, who then begins treatment planning.

**Confidential data sampling and analysis operation.** In order to access the PCT's data, a person must complete a rigorous process, including a full background

check. This includes VA data administrators, as well as the study researcher. Patient intake data for the present study's sample were extracted from the PCT database by a VA data administrator. Only those who completed the CAPS were included in the final sample. Additional participants were excluded if they did not have least partial data for all other measures used in the analyses. In order to ensure patient confidentiality, all personal information was removed from the study sample dataset before providing it to the researcher for analysis.

**Measures**

**Anxiety Sensitivity Index-3 (ASI-3).** The ASI-3 is an 18-item self-report scale designed to measure the respondent's fear arising from beliefs that anxiety-related sensations will have negative consequences like death, insanity, or social rejection (Taylor et al., 2007). Participants respond to items on a 5-point scale from 0 (*very little*) to 4 (*very much*), with no reverse scored items. The ASI-3 is composed of three 6-item subscales: physical concerns, cognitive concerns, and social concerns; with a higher score on a given scale indicating a greater concern of that type. Scores on the physical concerns subscale are associated with expectations that heart/chest, throat or stomach sensations will lead to serious illness or death. The cognitive concerns subscale assesses the extent to which the participant believes difficulties in thinking or concentrating will become mental illness or insanity. The social concerns subscale indicates the extent to which the individual thinks observable anxiety reactions, such as trembling, blushing, or appearing nervous, will elicit social ridicule or rejection. Depending on the application, the total score of the three subscales combined represents an overall level of AS.

Internal consistency reliability of the ASI-3 subscales showed robust alpha values, with ranges of α = .76 to .86, .79 to .91, and .73 to .86, for the physical, cognitive and social concerns subscales, respectively (Taylor et al. 2007). Many studies utilizing the ASI-3 since its creation demonstrate strong internal consistency reliability: for instance McDermott, Tull, Gratz, Daughters, and Lejuez (2009), obtained subscale values of α = .93, .91, and .86 (for physical, cognitive and social subscales, respectively) for crack/cocaine users with PTSD.

The creators of the ASI-3 did not, however, confirm its test-retest reliability – the only available study to date confirming this showed a satisfactory value of $r$ = .64 with a Turkish sample utilizing the Turkish translation of the ASI-3 (Mantar, Yemez, Alkın, & Dergisi, 2010). These Turkish researchers also confirmed the internal consistency of the ASI-3 with the Turkish sample, finding an overall alpha value of α = .93; with alpha values of α = .89, α = .88, and α = .82, for the physical, cognitive, and social subscales, respectively.

**M.I.N.I.** The M.I.N.I. is a structured diagnostic interview designed to be a brief tool (taking roughly 15 minutes to administer) for identifying psychiatric diagnoses classified by the Diagnostic and Statistical Manual of Mental Disorders (DSM) and the International Statistical Classification of Diseases and Related Health Problems (ICD). The M.I.N.I. is for epidemiological and clinical research, as well as direct clinical work (Sheehan et al., 1998). The most recent version, the M.I.N.I. 6.0, includes 22 modules each designed to assess one of the major Axis I diagnoses: 17 modules probe a primary disorder (e.g., bulimia nervosa), while the other 5 modules are used to differentiate a dimension or type of one of the primary disorders (e.g., anorexia nervosa, binge

eating/purging type). Each module has a series of questions specific to each disorder: the great majority of which are scored dichotomously yes or no. These answers– according to instructions, which mirror the diagnostic criteria in the DSM and ICD – confirm or deny the presence of a diagnosis for that given disorder.

Concordance analyses between the M.I.N.I. and the Structured Clinical Interview for DSM Disorders Patient Edition (SCID-I/P; First, Spitzer, Gibbon, & Williams, 2002) supported it as able to reliably and validly extract symptom information (Sheehan et al., 1998). For all modules, kappa values were good to very good, sensitivity values were .45 and above, specificity values were .85 and above, negative predictive values were .85 and above, and positive predictive values were acceptable to very good. Of the modules of the M.I.N.I. being used for the present study, the range of kappa values were $\kappa = .43$ (substance dependence) to $\kappa = .84$ (MDD); the sensitivity range was .45 (drug dependence) to .96 (MDD); the specificity range was .86 (GAD) to .96 (substance dependence). The negative predictive value range was .95 (panic disorder) to .98 (alcohol dependence); and the positive predictive value range was .50 (substance dependence) to .87 (MDD). Comparison of the M.I.N.I. and the Composite International Diagnostic Interview (CIDI; WHO, 1990) resulted in similar psychometric outcomes.

The same researchers also confirmed the test-retest and interrater reliabilities of the M.I.N.I. (Sheehan et al., 1998). They showed robust interrater reliability, with the lowest kappa value being $\kappa = .79$. The interrater reliability range for the modules utilized for the present study was $\kappa = .88$ (substance abuse) to $\kappa = 1.00$ (MDD). Similarly, test-retest reliability results were strong, with 61% of the kappa values being above .75. The

modules being employed in the present study had test-retest kappa values ranging from κ = .78 (GAD) to κ = .96 (substance dependence).

The Suicidality module of the M.I.N.I. was used as the primary dependent variable (DV) in the present study. This module includes questions about direct suicidal behaviors in the past month including ideation ("Did you think about suicide") and attempt ("Did you attempt suicide"), as well as thoughts and behaviors surrounding these, such as making a plan, hoping to be rescued during an attempt, or expecting to die from an attempt. The M.I.N.I.'s nine suicidality item weightings range from 0 to 10, with a total score of 0 denoting *no risk for suicide,* and 1-8, 9-16, and greater than 17 indicating *low*, *medium* and *high risk for suicide,* respectively. The researcher for the present study coded this data dichotomously for the main set of analyses: a "no risk" group, including only those who endorsed no items; and a "some risk" group, including those that endorsed any items. The researcher also developed an ordinal scale – no, low, medium, and high groups – for additional, exploratory analyses.

**Combat Exposure Scale (CES).** The CES is a 7-item, single factor, retrospective, self-report measure of frequency and duration of exposure to a variety of combat circumstances (e.g., firing at or being fired upon by an enemy; Keane et al., 1989). Scoring is from 1 to 5 with variable response coding, but with a higher score on each item indicating more exposure (i.e., no reverse scored items). Response coding for items 5, 6, and 7 are identical, ranging from 1 (*Never*) to 5 (*51 or more*), while the other four items' coding are distinct, both from each other as well as from the last three questions of the measure.

Raw total scores range from 5 to 35 with each response weighted differently to take into account the unequal levels of experience severity that exists between items; for example, "How often did you see someone hit by incoming or outgoing rounds" is weighted more than "How often did you fire rounds at the enemy". After the weighting procedure, total scores can range from 0 – indicating no exposure to the types of situations surveyed – to 41. The CES final total scores range from *light* (0-8), *light-moderate* (9-16), *moderate* (17-24), *moderate-heavy* (25-32), or *heavy* (33-41) combat exposure.

Internal consistency reliability of the CES yielded a coefficient alpha of $\alpha = .85$, with item-remainder total score correlations ranging from .64 to .83 in samples of Vietnam Veterans (Keane et al., 1989). A principal-components analysis yielded a single factor model. One week test-retest reliability of the CES was $r(29) = .97$. In their third psychometric study, the developers of the CES compared two groups of Vietnam combat veterans – one that had no psychiatric history, and another who received PTSD diagnoses – showing significantly different CES scores between groups. Finally, a more recent study showed that the psychometric robustness of the CES could also be extended to older, long-term care veterans (Cook et al., 2005). Their results were similar to the original, including a coefficient alpha of $\alpha = .84$.

**Clinician-Administered PTSD Scale (CAPS).** The CAPS is a 30-item structured interview used to diagnose PTSD, and assess associated symptoms and the impact of symptoms on functioning (Blake et al., 1995). Items are scored from 0 to 4 and assess both the frequency (from *never* to *daily or almost every day*) and severity (from *none* to *extreme*) of symptoms, with "present" symptoms having a frequency of 1 or

higher and an intensity of 2 or higher. In this manner, 17 items are used to confirm diagnosis, while another eight items probe associated symptoms (e.g., guilt), and the remaining five assess symptom severity, change in symptoms since a previous measurement, the effect of the symptoms on functioning, and the validity of the responses. Administration of the full interview by a trained professional generally takes 45-60 minutes.

The psychometrics of the CAPS, including internal consistency, test-retest reliability, sensitivity and specificity, have consistently been shown to be robust, (Blake et al., 1995). Test-retest reliability of the CAPS has ranged from .77 to .98. Similarly, internal consistency of the measure has been high, ranging from $\alpha = .85$ to $\alpha = .94$. Finally, when compared to a Structured Clinical Interview for DSM-IV PTSD diagnosis, the CAPS had a $\kappa = .78$, with excellent specificity: .95 and good sensitivity: .84. The strength of the CAPS's psychometric properties has helped to make it the gold standard in PTSD assessment.

## Results

### Missing Data

The data gathered from the VA database were missing 3.9% of all values used for analysis across 18.9% of the participants. Because of this, t-tests were used to compare cases that were missing one or more values to cases that were complete, for each of the three measures used as independent variables (IVs). The tests for the CES: $t(252) = .80$, $p = .42$, the CAPS: $t(252) = .88$, $p = .38$, and the ASI-3: $t(252) = .09$, $p = .93$, all failed to show significant differences in M.I.N.I Suicidality scores between the cases missing data

and the cases with complete data. Therefore, data were considered missing at random on the DV; as such, statistical analyses involved listwise deletion for missing data.

**Assumptions of the Models**

Evaluation of the assumptions of linear regression for the model for the first hypothesis included linearity, normality, no multicollinearity, and homoscedasticity. The data for combat exposure and physical AS both exhibited linear relationships with PTSD symptom severity, with data points clustering well around a diagonal line. Similarly, combat exposure, physical AS, and PTSD symptom severity all exhibited normal distributions with skewness coefficients of -.24 (*SE* = .16), .28 (*SE* = .16), and -.16 (*SE* = .15) respectively. The model for the first hypothesis also exhibited low multicollinearity with VIF values ranging from 1.06 to 2.20. Finally, the data used in the model displayed a homoscedastic pattern: a plot of the residuals displayed an evenly dispersed scatter of the data about the zero horizontal.

Logistic regression used in the models for the second and third hypotheses, by contrast, does not make any assumptions of linearity, normality, or homogeneity of variance. Multicollinearity for all variables used in the logistic regression models was low, with VIF values ranging from 1.06 to 1.75.

**Controls for the Models**

Prior to completing analyses regarding the hypothesized relationships, examination of bivariate correlations between all variables occurred (Table 3). Only six of the 12 potential controls (predictors of suicide for the military population supported in the literature) showed significant correlation with suicidality: Substance Abuse, Panic

Disorder with Agoraphobia (Current), Recurrent Major Depressive Episode (MDE), Current MDE, Alcohol Dependence, and Panic Disorder without Agoraphobia (Current).

Table 3

*Bivariate Correlation Matrix of Study Variables*

| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Suicide Risk (Dichotomous) | — | -.15* | .20** | .20** | .05 | .09 | .14* | .19** | .18** | .17** | .14* | -.03 | .17** | -.01 | .04 | -.06 | .14* | .04 | .05 |
| 2 | CES Total | | — | .13 | -.02 | -.01 | -.04 | -.03 | -.04 | -.12 | .11 | -.01 | .03 | .01 | -.02 | -.07 | -.04 | -.04 | .08 | -.04 |
| 3 | CAPS Total | | | — | .35** | .27** | .30** | .37** | .06 | .13* | .06 | .11 | .02 | .10 | .07 | .06 | -.01 | .03 | -.08 | .04 |
| 4 | Cognitive AS | | | | — | .67** | .60** | .90** | .09 | .09 | .02 | .08 | .13* | .06 | .12 | .04 | .02 | .07 | -.03 | -.10 |
| 5 | Physical AS | | | | | — | .54** | .86** | .09 | -.02 | -.09 | .01 | .03 | .01 | .04 | .13* | .05 | .09 | .02 | -.08 |
| 6 | Social AS | | | | | | — | .82** | -.05 | .02 | .06 | .08 | .02 | .05 | .09 | .18** | -.01 | .08 | -.05 | -.04 |
| 7 | Total AS | | | | | | | — | .05 | .03 | -.01 | .08 | .06 | .05 | .10 | .13* | .02 | .10 | -.02 | -.09 |
| 8 | Recurrent MDE | | | | | | | | — | .18** | -.07 | .05 | -.02 | .03 | .02 | -.01 | -.08 | .10 | .08 | -.03 |
| 9 | Panic w/ Agoraphobia (Current) | | | | | | | | | — | -.04 | .01 | .12 | .09 | .07 | .07 | -.07 | -.05 | .11 | -.04 |
| 10 | Substance Abuse | | | | | | | | | | — | .03 | .07 | .22** | -.03 | -.05 | -.06 | .08 | -.02 | .11 |
| 11 | Current MDE | | | | | | | | | | | — | -.03 | .05 | -.03 | .08 | -.17** | .01 | .02 | .06 |
| 12 | Alcohol Abuse | | | | | | | | | | | | — | -.04 | -.04 | -.07 | -.08 | -.05 | -.03 | -.04 |
| 13 | Alcohol Dependence | | | | | | | | | | | | | — | .27** | -.08 | -.02 | .03 | .03 | -.01 |
| 14 | Substance Dependence | | | | | | | | | | | | | | — | .03 | .01 | .07 | -.03 | -.03 |
| 15 | GAD | | | | | | | | | | | | | | | — | -.11 | .07 | .06 | -.06 |
| 16 | Past MDE | | | | | | | | | | | | | | | | — | .05 | .04 | .01 |
| 17 | PD w/o Agoraphobia (Current) | | | | | | | | | | | | | | | | | — | .11 | -.04 |
| 18 | PD w/o Agoraphobia (Lifetime) | | | | | | | | | | | | | | | | | | — | -.03 |
| 19 | Agoraphobia w/o PD (Current) | | | | | | | | | | | | | | | | | | | — |

*Note*. *$p < .05$; **$p < .01$

A stepwise regression analysis considered the covariation of these six correlates of suicide in order to determine which shared the most unique variance with the DV (suicidality). The regression indicated that a model with Recurrent MDE, Substance Abuse, Panic Disorder with Agoraphobia (Current), and Current MDE explained 10.8% of the variance in suicidality ($R$ = .33, $F(1,249) = 4.20$, $p$ = .04). None of the other correlates incrementally improved the model's accounting of unique variance in suicidality significantly (Table 4).

Table 4

*Stepwise Regression Model for Controls of Suicidal Behavior*

| Step/Variable | *B* | *SE B* | β |
|---|---|---|---|
| Step 1 | | | |
| (Constant) | .21 | .03 | |
| Recurrent MDE | .18 | .06 | .19* |
| Step 2 | | | |
| (Constant) | .19 | .03 | |
| Recurrent MDE | .19 | .06 | .20* |
| Substance Abuse | .50 | .16 | .19* |
| Step 3 | | | |
| (Constant) | .18 | .03 | |
| Recurrent MDE | .16 | .06 | .17* |
| Substance Abuse | .51 | .16 | .19* |
| Panic Disorder with Agoraphobia (Current) | .34 | .13 | .16* |
| Step 4 | | | |
| (Constant) | .15 | .04 | |
| Recurrent MDE | .16 | .06 | .17* |
| Substance Abuse | .50 | .16 | .19* |
| Panic Disorder with Agoraphobia (Current) | .34 | .13 | .16* |
| Current MDE | .11 | .06 | .12* |

*Note.* $R^2$ = .04 for Step 1 ($p < .01$); $\Delta R^2$ = .07 for Step 2 ($p < .01$); $\Delta R^2$ = .10 for Step 3 ($p$ =.01); $\Delta R^2$ = .11 for Step 4 ($p$ =.04); *$p < .05$

A series of four logistic regressions were conducted in which each of these four individual controls was also run separately to better understand their comparative predictive strength. Each respective M.I.N.I. score was run as the first and only step in its own logistic regression model to predict dichotomous M.I.N.I. suicidality (Table 5).

Table 5

*Individual Results for Control Variables Used to Predict Suicidal Behavior*

| Predictor | *B* | *SE B* | Wald's $\chi^2$ (*df* =1) | *p* | $e^B$ |
|---|---|---|---|---|---|
| Recurrent MDE | .86 | .29 | 8.64 | <.01 | 2.37 |
| Substance Abuse | 2.01 | .85 | 5.60 | .02 | 7.46 |
| Panic Disorder with Agoraphobia (Current) | 1.68 | .64 | 6.76 | .01 | 5.34 |
| Current MDE | .64 | .30 | 4.77 | .03 | 1.90 |

**Primary Analyses**

**Hypothesis 1.** A moderation model was planned to examine whether physical AS would moderate the effect of combat exposure on PTSD symptom severity. Before moderation could be investigated, each component analysis was conducted. Specifically, linear regression models were tested to assess the relationship between combat exposure and PTSD and physical AS and PTSD (Table 6). For physical AS, the model included physical AS subscale score on the ASI-3 entered on the first and only step of the model. Physical AS was a significant predictor of PTSD. For combat exposure, the model included CES total score entered on the first and only step of the model. Combat exposure was not a significant predictor of PTSD. Because there was no support for this more foundational relationship between combat exposure and PTSD, moderation was

impossible, and the full moderation model (with CES total score and physical AS subscale score on the ASI-3 in the first step and the interaction term of those two on the second step of a linear regression model predicting CAPS total score) was not evaluated.

Table 6

*Moderation Model Component Predictors of PTSD Symptom Severity*

| Predictor | *B* | *SE B* | *t* | *df* | *p* |
|---|---|---|---|---|---|
| Combat Exposure | .19 | .10 | 1.86 | 213 | .07 |
| Physical AS | .72 | .17 | 4.37 | 240 | <.01 |

**Hypothesis 2.** A mediation model was planned to evaluate whether PTSD would mediate the relationship between combat exposure and suicide. Before the full mediation model was run, each component analysis was confirmed: logistic regression models were conducted to test the relationship between combat exposure, PTSD symptom severity, and suicidal group membership (no risk or some risk; Table 7). For combat exposure, the model included CES total score entered on the first and only step of the model. Combat exposure was significantly predictive of group membership. A second logistic regression analysis examined the same relationship and also controlled for the following covariates: Recurrent MDE, Substance Abuse, Panic Disorder with Agoraphobia (Current), and Current MDE. After controlling for these covariates, combat exposure remained a significant predictor of group membership. PTSD symptom severity was evaluated as a predictor of suicidal behavior in the same manner, with an initial logistic regression analysis assessing the relationship between PTSD and suicide group membership, followed by a second logistic regression analysis which added the same controls in the

first block prior to PTSD in the second block. In both analyses, PTSD was a significant predictor of suicide group membership.

Table 7

*Mediation Model Component Predictors of Suicidal Behavior*

| Predictor | *B* | *SE B* | Wald's $\chi^2$ (*df* =1) | *p* | $e^B$ |
|---|---|---|---|---|---|
| Combat Exposure | | | | | |
| Without Controls | -.03 | .01 | 4.51 | .03 | .97 |
| With Controls | -.03 | .01 | 4.55 | .03 | .97 |
| PTSD | | | | | |
| Without Controls | .03 | .01 | 9.53 | <.01 | 1.03 |
| With Controls | .02 | .01 | 6.41 | .01 | 1.03 |

While these initial analyses found that both the IV (combat exposure) and the potential mediator (PTSD) were significant predictors of suicide group membership, combat exposure did not predict PTSD symptom severity. Consequently, the full mediation model could not be tested.

**Hypothesis 3**. A simple logistic regression model was conducted to evaluate whether social AS would predict suicidal group membership. Social AS subscale score was entered on the first and only step of the model. The social AS subscale score was not a significant predictor of suicide group membership: $b = .03$, $\chi^2(1) = 1.90$, $p = .17$.

**Additional Analyses**

Beyond the hypothesized relations, additional analyses addressed some planned comparisons, as well as other questions in response to the results. Recent literature examining relationships between AS and suicidality looked at AS as both a unitary and a multidimensional construct; so in addition to social AS, the other dimensions of AS were also investigated as individual predictors of suicidal behavior. Logistic regression analyses were run separately for physical, cognitive, and total AS (Table 8). For physical AS, the model included the physical AS subscale score entered on the first and only step of the model. Physical AS was not a significant predictor of suicide group membership. Because the uncontrolled model was non-significant, a controlled model was not examined. For cognitive AS, the model included cognitive AS subscale score entered on the first and only step of the model. Cognitive AS was a significant predictor of suicide group membership. A second logistic regression analysis was conducted, which included the following covariates in the first step: Recurrent MDE, Substance Abuse, Panic Disorder with Agoraphobia (Current), and Current MDE M.I.N.I. scores, followed by cognitive AS subscale score in the second block. Cognitive AS remained a significant predictor of suicide group membership after controlling for these potential confounds. The models for total AS were run in the same way, substituting ASI-3 total score for the cognitive AS subscale score. The uncontrolled model also supported total AS as a significant predictor of suicide group membership. However, after controlling for potential confounds, the total AS score was no longer a significant predictor of suicide group membership.

Table 8

*Components of AS as Predictors of Suicidal Behavior*

| Predictor | *B* | *SE B* | Wald's $\chi^2$ (*df* =1) | *p* | $e^B$ |
|---|---|---|---|---|---|
| Physical AS | | | | | |
| Without Controls | .02 | .02 | .49 | .48 | 1.02 |
| Cognitive AS | | | | | |
| Without Controls | .06 | .02 | 9.26 | <.01 | 1.07 |
| With Controls | .06 | .02 | 6.69 | .01 | 1.06 |
| Total AS | | | | | |
| Without Controls | .02 | .01 | 4.41 | .04 | 1.02 |
| With Controls | .02 | .01 | 3.49 | .06 | 1.02 |

Another set of analyses examined the relationships between demographic variables and suicide group membership. Service status was not examined due to the low representation of all categories other than veterans. Chi-square tests compared the proportions (no suicide risk to some suicide risk) of each category pairwise within a demographic to each other category in that same demographic to see if they were significantly different from one another (Table 9 and Table 10 have contingency tables of non-military and military demographic variables, respectively). Only two categories were significant after controlling for alpha inflation using the Bonferroni method. Participants in the Persian Gulf service era had significantly higher risk than other eras. Those in the Navy also had significantly higher risk than other branches. While both showed statistically significantly higher suicide risk than other categories in their demographic, some caution is warranted given the small number of cases in each group. Finally, membership in the suicide risk level groups was unrelated to age (Table 11).

Table 9

*Non-Military Demographic Variables by Suicide Risk Level*

| | Risk Level (*n* [% of demographic]) | |
|---|---|---|
| Demographic | No Risk | Some Risk |
| Gender | | |
| Male | 172 [75.1%] | 57 [24.9%] |
| Female | 12 [63.2%] | 7 [36.8%] |
| Race/Ethnicity | | |
| White, not Hispanic | 156 [73.9%] | 55 [26.1%] |
| Black, not Hispanic | 14 [73.7%] | 5 [26.3%] |
| Hispanic, White | 5 [71.4%] | 2 [28.6%] |
| American Indian/Alaskan Native | 1 [50.0%] | 1 [50.0%] |
| Marital Status | | |
| Married | 90 [76.3%] | 28 [23.7%] |
| Separated | 2 [66.7%] | 1 [33.3%] |
| Divorced | 42 [75.0%] | 14 [25.0%] |
| Remarried | 14 [60.9%] | 9 [39.1%] |
| Widowed | 1 [50.0%] | 1 [50.0%] |
| Never Married | 31 [79.5%] | 8[20.5%] |
| Education Completed | | |
| Less than 12th Grade | 6 [85.7%] | 1 [14.3%] |
| 12th Grade | 85 [77.3%] | 25 [22.7%] |
| More than 12th Grade | 72 [69.9%] | 31 [30.1%] |
| Employment | | |
| None | 126 [77.8%] | 36 [22.2%] |
| Part-time | 11 [68.8%] | 5 [31.3%] |
| Full-time | 32 [64.0%] | 18 [36.0%] |

*Note* . Overall sample: No Risk = 187 [73.6%]; Some Risk = 67 [26.4%]

Table 10

*Military Demographic Variables by Suicide Risk Level*

| | Risk Level (*n* [% of demographic]) | |
|---|---|---|
| Demographic | No Risk | Some Risk |
| Service Era | | |
| Korea | 3 [100.0%] | 0 [0.0%] |
| Vietnam | 91 [73.4%] | 33 [26.6%] |
| Post-Vietnam | 10 [66.7%] | 5 [33.3%] |
| Persian Gulf* | 9 [52.9%] | 8 [47.1%] |
| OIF/OEF/OND | 43 [81.1%] | 10 [18.9%] |
| Multiple | 31 [73.8%] | 11 [26.2%] |
| Branch (during service) | | |
| Army | 113 [74.8%] | 38 [25.2%] |
| Navy* | 5 [45.5%] | 6 [54.5%] |
| Air Force | 7 [70.0%] | 3 [30.0%] |
| Marines | 32 [80.0%] | 8 [20.0%] |
| National Guard | 4 [80.0%] | 1 [20.0%] |
| Reserves | 5 [100.0%] | 0 [0.0%] |
| Coast Guard | 0 [n/a] | 0 [n/a] |
| Multiple | 9 [90.0%] | 1 [10.0%] |

*Note* . Overall sample: No Risk = 187 [73.6%]; Some Risk = 67 [26.4%]

* differs significantly from other categories in the demographic at the .05 level

Table 11

*Age by Suicide Risk Level*

| Group | Statistics (in years) | |
|---|---|---|
| | *M* | *SD* |
| No Risk (*n* =187*) | 53.1 | 15.2 |
| Some Risk (*n* =67) | 53.4 | 13.3 |
| Full Sample (*n* =254*) | 53.2 | 14.7 |

*Note* . *One participant did not report their age

## Discussion

The current study failed to support the hypothesized relationships between combat exposure, PTSD, AS, and suicidal behavior in a military sample. Surprisingly, even some well supported relationships, such as the relationship between combat exposure and PTSD (e.g., Bryan, Cukrowicz, West, & Morrow, 2010), were not present in these data. While it certainly is possible there is a flaw in the application of the conceptual model utilized in this study, the unexpected fundamental results may be at least partially explained by the fact that the primary IV was combat exposure rather than combat-exposure-induced-*trauma*. If an event is considered traumatic when the distress of the experience is significant enough to cause some ongoing, psychologically-based reduction in quality of life, then exposure to *potentially* traumatic events – even when frequent or intense – is not the same as trauma. There is a considerable body of literature indicating that there are substantial individual differences in response to traumatic or potentially traumatic events. For instance, Kessler, Sonnega, Bromet, Hughes, and Nelson (1995) investigated the varying prevalence rates of trauma and PTSD in the general population and found that even among men who indicated combat exposure as their most upsetting event, only 38.8% developed PTSD. The present study did not have a methodological or statistical control for the fact that some participants with combat exposure may have experienced it as traumatic and others not. Future studies interested in the same research questions should attempt to exclude or control for those who did not indicate combat exposure as traumatic.

It is also possible that the relationship between combat exposure and PTSD was weakened by the composition of the sample in the present study. While the data were

normally distributed on the CAPS total score, the normal diagnostic thresholds are not near the mean of such a distribution, which causes a relative shift towards the more severe end of the spectrum. This shift results in a sample that has more severe PTSD symptoms than the general population or even a representative sample of the military population. While this is expected when sampling from participants presenting at a VA PTSD clinic, it can bias the data and make statistical significance less likely.

While combat exposure did not predict PTSD, it did significantly predict suicidal risk, and it did so after controlling for the other predictive pathologies. Like combat exposure, PTSD was again supported as a predictor of suicide as in previous studies (Black et al., 2011; Hyman et al., 2012; Pfeiffer et al., 2009); even above and beyond other predictive disorders.

The hypothesized relationship between social AS and suicidality was not supported by the present study. Cognitive AS, however, was a predictor of suicide even when accounting for the controls (as was total AS, though this is likely due to the highly significant relationship between cognitive AS and suicide). This result corroborates a recent series of studies (Capron, Blumenthal, et al., 2012; Capron, Cougle, et al., 2012; Capron, Fitch, et al., 2012; Capron, Gonzalez, et al., 2012) that showed the cognitive component of AS was a better predictor of suicide than total AS, as well as having the strongest correlation among the three components of AS. Therefore, while the application of the IPTS to the military population by focusing on physical and social AS may be inconclusive based on the current study, further investigation into cognitive AS appears warranted in both the military and other populations, based on the current study and other recent study results.

Some researchers have proposed theories to help explain the relationship between symptoms of cognitive AS and suicide. One example comes from a recent study by Katz and colleagues (2011), who examined a community sample of participants who met criteria for a MDE in the past year. They found that catastrophic cognitions such as thoughts of going insane or losing control were significantly more strongly associated with suicide attempt than other panic attack symptoms. These observations led Katz and colleagues to propose a positive feedback model, built upon on the work of Barlow (2002) and others, where catastrophic cognitions in an initial loop with limbic autonomic activation eventually leads to suicide attempts. Given the recent trend of support for cognitive AS as a predictor of suicidal behavior, additional examination of this or some other conceptualization is necessary to understand how AS may contribute to suicide.

In parallel with more theoretical investigations, more work can be done now with the treatment of AS. Multiple studies have found that AS is linked to a range of pathologies (e.g., Keogh, Ayers, & Francis, 2002) and is amenable to direct intervention (e.g., Schmidt et al., 2007). Because the mechanisms of AS treatments are not well understood (see Smits, Berry, Tart, & Powers, 2008, for a review), this and other recent studies suggest new treatment research for those at risk of suicide should consider whether interventions targeting cognitive AS would be more effective. These recent results may also aid the development and improvement of treatments for those at risk of suicide by directing them towards catastrophic thoughts and other, more cognitive elements of AS.

Demographic differences observed in suicide risk level within the present sample conflict with broader data. Participants in the Navy were at higher suicide risk than

participants from other branches of the military. These findings are inconsistent with larger studies which indicate that the Army is the branch with the highest suicide rates (Harrell & Berglass, 2011). Similarly, participants serving during the Persian Gulf War exhibited higher suicide risk than those serving in other eras. Data again contradicts this somewhat, showing an increasing trend over time (Thompson, 2010); so the expectation would be that the OEF/OIF/OND cohort would be the highest among all service eras. However, caution is warranted based on the sample from the present study, as many demographic groups (including most branches and service eras) are substantially underrepresented, with only a few participants in each group. Such small group sizes cannot reliably be used to draw conclusions.

**Additional Limitations**

The nature of cross-sectional research makes causality impossible to confirm. While longitudinal studies can be difficult and expensive, particularly with a low-rate behavior such as suicide, it may be necessary in order to understand the nuances of the mechanisms which result in suicidal behavior. While much of the data were clinician rated, which is less prone to bias, AS and combat exposure measures were self-report, and are more likely influenced by bias. This bias may be one of over-reporting symptoms in order to receive treatment, or under-reporting symptoms due to stigma. Consequently, it is unclear what effect it may have had on the results of this study.

While the present study utilized a more detailed and comprehensive measure of suicidal behavior (the Suicidality module of the M.I.N.I.) than other recent studies, the exact, weighted total for each participant was unavailable; instead only the severity category was available. This meant a considerable loss of detail regarding the severity of

suicidal behavior. This loss in data fidelity had important implications for planned analyses. Because the data lacked that detail, one of the expected advantages of the present study over the existing literature was diminished, and the resulting DV (membership in a no suicide risk group vs. membership in a some suicide risk group) was much more similar to the majority of recent studies (which typically use a single dichotomous, yes or no question about suicidal ideation). The available data did still consider more suicidal behavior than just ideation, including making plans and previous attempts; but because individual participant responses from the Suicidality module were also unavailable, the researcher's ability to understand the suicidality of the sample in more detail was limited. For instance, if one participant only endorsed feelings of hopelessness their score would appear the same as another participant who endorsed feelings of hopelessness, self-injurious behavior, and suicidal ideation because they would both fall in the low risk category of scoring on the Suicidality module (according to the instructed weighting of responses). While the original clinician for each participant was able to gather detailed information about that person's suicidality; the data available for the present study were already weighted and were much coarser. This restriction did not allow for more detailed investigations or comparisons of levels or types of suicidality within the sample, and so the impact and correlations of differing suicidal behaviors is unclear.

Finally, because the sample was not evenly distributed across a number of demographic variables, some useful controls and interesting comparisons were impossible. For example, the imbalance in men and women, while expected, resulted in a small number of female participants, making any comparative analyses based on gender

far less meaningful. This prevented leveraging the existing literature on suicide risk based on demographic factors, as well as limited purposeful comparison investigations of demographic groups. In addition to gender, other demographic variables of interest such as race/ethnicity, education completed, and service status had overrepresentation by one or a few sub-groups, resulting in many cases with minority groups only being represented by a few participants. Because the military population in the U.S. is not comprised of equal representation across demographic variables (such as race and gender), future studies examining this population should attempt to obtain a much larger sample size than the primary statistical analyses alone require. This will allow for additional meaningful investigations, such as comparisons between active duty service members and veterans.

## Conclusion

While all three hypothesized relations failed to show statistical significance, PTSD, combat exposure, and many of the other predictors supported in the literature *did* significantly predict suicide in the military sample of the present study. Further, cognitive AS was also shown to be a significant predictor of suicide supporting other recent studies with non-military samples. One key limitation of the study was that combat exposure (rather than combat-exposure-based-trauma) was used as the foundational predictor. Another limitation was that the expected, full detail level of suicidal behavior data was not available, resulting in more coarse analyses and fewer meaningful investigations regarding the suicidality of the sample than originally planned. Future research examining the IPTS and AS in a military population should seek to be able to differentiate trauma from combat exposure and should utilize a detailed and

continuous measure of suicidality, if possible. Additionally, investigations should be done into the apparent connection between cognitive AS and suicide; and prospective AS treatment studies should consider the accumulating, recent evidence of this relationship.

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## Appendix A VA IRB Approval Letter

**Department of Veterans Affairs**

# Memorandum

Date: January 29, 2013

From: ACOS, Research Service (11R)

Subj: Approval of New Project Submission

To: Katherine E. Porter, PhD

Re: RO#: 2012-090597 VA#: Pend RCMS#: 2314
*Anxiety Sensitivity as a Mediator for Trauma Exposure in Predicting Suicidal Ideation in a Military Sample*
SAS Approval: N/A
HSC Approval: October 11, 2012
SRS Approval: October 18, 2012, with exemption from SRS continuation review
R&D Start Date: January 29, 2013

1. The above referenced New Project submission was fully approved by all required committees on the dates indicated above. **You are now authorized to begin work on this project.**

**YOU MUST CONTACT THE VA IRB COORDINATOR TO OBTAIN COPIES OF IRB APPROVAL LETTERS AND VA CONSENT FORMS BEFORE YOU OBTAIN CONSENT FROM RESEARCH SUBJECTS**

2. Please refer to the committee approval memos for details regarding approval expiration dates. The maximum duration of approval is one year. Continuation of this study beyond a stated expiration date will require committee review and approval prior to that date.

3. All material from this study that is submitted for presentation or publication must also be submitted to the R&D Committee for review. In addition, the VA must be acknowledged on all published materials. Failure to do so may result in the withdrawal of VA funds. The policy is available at: http://www1.va.gov/vhapublications/ViewPublication.asp?pub_ID=1766.

4. You are reminded that no changes or modifications may be made to this study until you have requested and received full approval from all applicable committees.

5. You are also reminded that all study personnel must remain current with all applicable training and compliance requirements. Non-compliant employees may not work on any project. Non-compliance by the principal investigator may result in study termination.

6. According to VHA Handbook 1200.05 (Sect 26, item h), all research records, including the investigator's research records and the IRB records, must be retained until disposition instructions are approved by the National Archives and Records Administration and are published in VHA's Records Control Schedule (RCS 10-1). Contact the R&D Records Liaison for more information.

Roger J. Grekin, MD

## Appendix B EMU IRB Approval Letter

EASTERN MICHIGAN UNIVERSITY

*Education First*

February 16, 2013

Barry Eye
Department of Psychology

Dear Barry:

The College of Arts and Sciences Human Subjects Review Committee (CAS HSRC) of Eastern Michigan University has reviewed and approved your proposal (#1161) titled, "Anxiety Sensitivity as a Moderator for Trauma Exposure in Predicting Suicide Risk in a Military Sample." The CAS HSRC has determined that the rights and welfare of the individual subjects involved in this research are carefully guarded. Additionally, the methods used to obtain informed consent are appropriate, and the individuals participating in your study are not at risk.

You are reminded of your obligation to advise the HSRC of any change in the protocol that might alter your research in any manner that differs from that upon which this approval is based. Approval of this project applies for one year from the date of this letter. If your data collection continues beyond the one-year period, you must apply for a renewal. Please specify in your consent form that approval is from 2/16/2013 to 2/15/2014.

On behalf of the Human Subjects Committee, I wish you success in conducting your research.

Sincerely,

Alissa Huth-Bocks

Alissa Huth-Bocks, Ph.D.
CAS Human Subjects Review Committee Chair

Note: If project continues beyond the length of **one** year, please submit a continuation request form by 2/15/2014.

cc: Ellen Koch, Ph.D.

University Human Subjects Review Committee · Eastern Michigan University · 200 Boone Hall
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