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## Social Support, World Assumptions, and Exposure as Predictors of Anxiety and Quality of Life following a Mass Trauma

Amie E. Grills-Taquechel<sup>1</sup>, Heather L. Littleton<sup>2</sup>, and Danny Axsom<sup>3</sup>

<sup>1</sup> 126 Heyne Building, Department of Psychology, University of Houston, Houston, TX 77204

<sup>2</sup> 104 Rawl, Department of Psychology, East Carolina University, Greenville, NC 27858

<sup>3</sup> Department of Psychology, Virginia Tech, Blacksburg, VA 24061-0436

### Abstract

This study examined the influence of a mass trauma (the Virginia Tech campus shootings) on anxiety symptoms and quality of life, as well as the potential vulnerability/ protective roles of world assumptions and social support. Pre-trauma adjustment data, collected in the six months prior to the shooting, was examined along with two-month post-shooting data in a sample of 298 female students enrolled at the university at the time of the shootings. Linear regression analyses revealed consistent predictive roles for world assumptions pertaining to control and self-worth as well as family support. In addition, for those more severely exposed to the shooting, greater belief in a lack of control over outcomes appeared to increase vulnerability for post-trauma physiological and emotional anxiety symptoms. Implications of the results for research and intervention following mass trauma are discussed.

### Keywords

anxiety; quality of life; post-trauma distress; social support; world assumptions; mass trauma; school violence

### 1. Introduction

Exposure to traumatic events has been linked with a myriad of adverse outcomes. Although most work has focused on posttraumatic stress disorder (PTSD) and depression, a smaller body of research has begun to explore other adverse outcomes, such as heightened posttrauma anxiety and the impact of traumatic events on individuals' quality of life. These latter areas may be of particular importance to study as they may be more relevant for the majority of individuals exposed to a trauma. Significant anxiety has been reported by those who experienced the traumas of the 9/11 attacks (e.g., Adams, Boscarino, & Galea, 2006; Lawyer et al., 2006), the Madrid Bombings (e.g., Gabriel et al., 2007), imprisoned/tortured refugees (e.g., Carlsson, Mortensen, & Kastrup, 2006) and displaced individuals from Ethiopia (e.g., Araya, Chotai, Komproe, & de Jong, 2007), traffic accidents/injuries (e.g., Mayou, Bryant, & Ehlers, 2001; Wang, Tsay, & Bond, 2005), and natural disasters such as

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Correspondence concerning this article should be addressed to: Amie E. Grills-Taquechel, Ph.D., University of Houston, Department of Psychology, 126 Heyne Building, Houston, TX 77204-5022, tel: 713.743.8600, fax: 713.743.8633, aegrills@uh.edu.

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hurricanes (e.g., Galea et al., 2007; Norris, Friedman, & Watson, 2002). Similarly, decreased quality of life (QOL) has been reported among victims following various traumatic events, including previously tortured refugees (Carlsson et al., 2006), displaced persons (Araya et al., 2007), and those injured in motor vehicle accidents (Wang et al., 2005).

Notably, in the case of mass traumas such as terrorist attacks, bombings, and shooting sprees, heightened symptomatology has been found not only in those directly exposed, but also in those more indirectly exposed (Ford, Adams, & Dailey, 2006; Gabriel et al., 2007; Hough et al., 1990; North, McCutcheon, Spitznagel, & Smith, 2002; North, Smith, & Spitznagel, 1994, 1997; Pfefferbaum et al., 2001; Schwarz & Kowalski, 1991; Silver, Holman, McIntosh, Poulin, & Gil-Rivas, 2002; Silver et al., 2004). For example, Gabriel and colleagues (2007) examined anxiety among those directly injured in a train bombing attack and those residing in the suburban area to which the trains were destined (Alcala). Prevalence rates of 2% (panic disorder), 9% (generalized anxiety disorder) and 11% (agoraphobia) were found for those residing in Alcala and 9, 13, and 24%, respectively, for those injured in the attack. Greater anxiety symptoms were also reported by residents living in areas surrounding Chernobyl, but not directly affected by the explosion, over six years after it (Havanaar et al., 1997). Likewise, Hough et al. (1990) reported significant trauma symptoms and distress among community members following a mass shooting, with approximately one-third reporting mild to severe PTSD symptoms. Finally, following the 9/11 attacks, a nationwide impact was revealed with long-term trauma symptoms reported by those who were not directly exposed but rather witnessed them, for example, via television (e.g., Silver et al., 2002, 2004). Findings such as these are what Silver and colleagues recently referred to as a myth of coping with a national trauma; that is, “the myth that psychological response to trauma requires direct, proximal exposure to the stressor...” (Silver et al., 2004).

Given the high rates of psychological distress reported following traumatic events and their far-reaching impact when involving whole communities, it is important to consider potential factors which might reduce their impact. One variable that has received considerable attention is social support. As addressed in psychosocial stress theory, social support is viewed as a protective factor against the physical and mental health difficulties that often arise following the strain of adverse life events such as mass traumas (Lazarus & Folkman, 1984; Thoits, 1991). Social support has been inversely related to distress following mass traumas, such as the September 11<sup>th</sup> attacks (Adams et al., 2006; Lawyer et al., 2006), hurricane Katrina (Galea, Tracy, Norris, & Coffey, 2008), and terrorist attacks in Israel (Hobfoll et al., 2008). Particular to the outcomes of interest in the current study, lack of social support has been found to predict greater anxiety and poorer quality of life among victims of traumatic events from domestic abuse to mass bombings (Araya et al., 2007; Carlsson et al., 2006; Gabriel et al., 2007; Mertin & Mohr, 2001). Nonetheless, following an extensive review of disaster research, Norris and colleagues (2002) concluded that findings for perceived social support varied by subgroup (e.g., gender, age, ethnicity) and timeframe; a finding that has continued to be true and suggests that more detailed understanding of this potential protective mechanism is necessary.

Another domain proposed to be affected by the experience of traumatic events is world assumptions. Janoff-Bulman (1989) described world assumptions as typically unquestioned and unchallenged views that are threatened by the experience of trauma. She categorized world assumptions into three domains with eight overall areas: 1) perceived benevolence of the world (i.e., benevolence of the impersonal world and of people); 2) meaningfulness of the world (i.e., distributional principles of justice, controllability of outcomes, and chance/randomness), and 3) worthiness of the self (i.e., self-relevant dimensions of self-worth, self-

controllability, and luck). It is believed that the experience of a traumatic event can result in a “shattering” of these previously held beliefs, which, in turn, may lead to greater psychological distress. Several studies have supported differences in the world assumptions of those who have and have not been exposed to traumatic events (Dekel et al., 2004; Foa, Ehlers, Clark, Tolin, & Orsillo, 1999; Janoff-Bulman, 1989; Magwaza, 1999; Solomon, Iancu, & Tyano, 1997). In addition, significant relations have been found among world assumptions and various negative psychological outcomes (e.g., anxiety, depression) in samples of trauma victims (e.g., Bodvarsdottir & Elklit, 2004; Elklit, Shevlin, Solomon, & Dekel, 2007; Foa et al., 1999; Goldenberg & Matheson, 2005; Matthews & Marwit, 2004; Pyevich, Newman, & Daleiden, 2003; Schwartzberg & Janoff-Bulman, 1991). Drawing from this literature, negative world assumptions were proposed to serve as vulnerability factors for increased anxiety and decreased quality of life in the present study.

### 1.1. The Virginia Tech Shooting

On April 16, 2007, the worst civilian mass shooting in U.S. history occurred on the Virginia Tech campus (Blacksburg, VA). At the conclusion, 33 individuals were dead, including the gunman, and an additional 17 individuals were seriously wounded (Virginia Tech Review Panel, 2007). Two shooting sprees were conducted by the same individual within a three hour timeframe on the Virginia Tech campus. The first occurred in a student dormitory where the assailant fatally shot two undergraduates and the second occurred in an academic building near the center of campus where 47 additional faculty and students were killed or seriously injured. During the shooting spree, the campus was placed on lock down, email and campus loud speaker messages alerted the community of the shootings, and extensive media coverage began that continued around the clock for weeks (see Virginia Tech Review Panel, 2007).

### 1.2. The present study

In the two semesters prior to the shooting (including the day before the shooting), our research team had collected data on negative sexual experiences and psychosocial adjustment from 843 female Virginia Tech students. Eight weeks after the shooting, data collection resumed regarding these women’s experience of the mass trauma, their adjustment, and related domains (e.g., social support, coping). The present study evaluated anxiety symptoms and quality of life among students who had varying levels of exposure to the mass shooting. The goals of this study were to add to a growing literature on these two lesser studied outcomes of trauma, as well as extend from previous studies by examining various aspects of these domains (rather than examining overall scores). In addition, the present study extended previous research, which has generally only examined the predictive role of these influences on post-trauma adjustment, by examining social support and world assumptions as potential protective and vulnerability factors (i.e., increasing/decreasing the likelihood of worse outcomes under adverse conditions; see Rose, Holmbeck, Coakley, & Franks, 2004).

Anxiety symptoms were expected to increase from pre- to post-shooting and quality of life levels were expected to be lower than that generally reported in normative samples, but not markedly so (not as low as levels reported by ill samples) given the number of resources and support available to the campus community following the shooting. Although all students were exposed to the trauma to some degree, some previous studies have revealed poorer adjustment for those with greater/closer exposure to a traumatic event (Johnson et al., 2002; Tucker et al., 2000). Therefore, the present study examined both the predictive and interactive role of exposure on anxiety and quality of life. While no significant change in social support was expected, support was hypothesized to serve as a protective factor, decreasing the likelihood of poor adjustment under greater exposure. In contrast, negative

world assumptions were expected to serve as vulnerability factors, increasingly the likelihood of poorer adjustment particularly for those reporting greater exposure to the shooting. Although previous studies examining the eight world assumptive scales have revealed varied findings, the benevolence, self-worth, and luck subscales have been particularly associated with distress and traumatic events (Bodvarsdottir & Elklit, 2004; Dekel et al., 2004; Elklit et al., 2007, Foa et al., 1999; Janoff-Bulman, 1989, Magwaza, 1999, Matthews & Marwit, 2004; Solomon et al., 1997). Therefore, these subscales were expected to emerge as significant in the present study.

## 2. Method

### 2.1. Participants

Participants were 298 college women ( $M = 19.4$  years;  $SD = 1.4$ ; range = 18–27 years) who were enrolled at Virginia Tech and had participated in a prior study in the Fall 2006 or Spring 2007 semester before the shooting (T1). Participants completed the post-shooting survey (T2) an average of 181 days after completing the initial survey ( $SD = 46.2$  days, range 61–247 days); however the time between assessments was unrelated to the other variables in this study (range of  $r_s = .00$ –.15). Consistent with the demographic makeup of the campus, the majority of participants were European American (87%), followed by Asian-American (6%), multi-ethnic (3%), African American (2%), Hispanic (1%), or did not report ethnicity (1%). As reported in a previous study (Littleton, Grills-Taquechel, et al., 2009), few meaningful differences were found for those women who completed this post-shooting survey and those who did not. To summarize, those who completed the post-shooting survey were slightly older,  $t(831) = 3.16$ ,  $p < .005$ ,  $d = .23$ , and reported slightly less social support,  $t(840) = 3.09$ ,  $p < .005$ ,  $d = .22$ , than those who did not.

### 2.2. Measures

**Exposure**—Participants completed a number of yes/no questions about their direct exposure to multiple aspects of the shooting. Specifically, they were asked if they were on campus during the shooting as well as if they were directly exposed to several aspects of the shooting (seeing police/security on campus, being in one of the buildings where the shootings occurred, hearing gunfire, seeing individuals who were wounded or killed, seeing the gunman, being fired upon, and being hurt in the shootings). Based on their responses, participants were placed into either a low (68%,  $n = 203$ ) or high (32%,  $n = 95$ ) exposure group. The low exposure group consisted of those who were not directly exposed to the most severe aspects of the shooting, whereas the high exposure group included those who were (in one of the buildings where the shootings occurred, heard gunfire, saw individuals who had been wounded or killed). No individuals reported being fired on or seeing the gunman fire upon others.

The *Four Dimensional Anxiety Scale* (FDAS, Bystritsky, Linn, & Ware, 1990) is a 35-item, self-report measure of anxiety that has subscales assessing affective, cognitive, behavioral, and physiological components. Items are rated with regard to the past week on a Likert scale bounded by 1 (*not at all*) and 5 (*extremely*), with higher scores reflecting greater anxiety. Prior research has found acceptable internal consistency and validity of the measure (Bystritsky et al., 1990; Stoessel, Bystritsky, & Pasnau, 1995). In the current study, this measure was completed at both time 1 and time 2 with excellent internal consistency found for each ( $\alpha_s = .81$ –.88 and .81–.86, respectively).

The *World Health Organization Quality of Life Scale-Bref* (WHOQOL; Skevington, Lotfy, & O'Connell, 2004; Trompenaars, Masthoff, Van Heck, Hodiament, & De Vries, 2005; WHOQOL Group, 1995, 1998) consists of two general items, followed by 24 items

representing four domains of quality of life: physical (QOL-P), psychological (QOL-PSY), social relationships (QOL-S), and environment (QOL-E). All items are rated on a 5-point Likert scale with higher scores reflecting greater life satisfaction. Acceptable internal consistency ( $\alpha_s = .66-.84$ ) has been demonstrated for these scales as has discriminant validity with significant differences found between ill and well groups (WHOQOL Group, 1998). This measure was completed at time 2 of the current study with acceptable internal consistency found ( $\alpha_s = .66-.80$ ).

The *Multidimensional Scale of Perceived Social Support* (Zimet, Dahlem, Zimet, & Farley, 1988) is a 12-item scale, with participants rating each item from 1 (*very strongly disagree*) to 7 (*very strongly agree*). This measure provides scores for perceived support from family, friends, and a significant other (“special person”), with higher scores reflecting more perceived support. Prior research supports the internal consistency and factor structure of the measure (Zimet et al., 1988). In the current study, this measure was completed at both time 1 and time 2 with excellent internal consistency found for each ( $\alpha_s = .91-.96$  and  $.94-.96$ , respectively).

The *World Assumptions Scale* (Janoff-Bulman, 1989) contains 32 items that are rated on a Likert scale bounded by 1 (*strongly disagree*) and 6 (*strongly agree*). The measure has eight subscales, with four items each: justice, randomness, controllability, benevolence of people, world benevolence, self-worth, self-control, and luck. This measure was administered at time 2 of the current study with internal consistency coefficients ( $\alpha_s = .64-.85$ ) similar to or higher than those previously reported ( $.66-.86$ , Dekel et al., 2004; Elklit et al., 2007; Janoff-Bulman, 1989).

### 2.3. Procedures

The current study consisted of participants who took part in two linked studies; the first was a study of negative sexual experiences and psychosocial adjustment in college women and was conducted in the six months prior to the shooting (T1-Fall 2006/Spring 2007). Two months following the mass trauma, an email was sent to all women who had completed that survey requesting their voluntary participation in a study examining risk and protective factors following traumatic events. Approximately 36% of the potential participants responded to the recruitment emails (298/820; 23 women could not be contacted because they did not have a valid email address). Participants were informed that their responses would be linked to those previously given and were provided an identification number and password for accessing the second online survey (T2). In the month of open-access to the survey, participants received up to five email reminders until they either completed the study, opted out of the study ( $n = 4$ ), or the access period ended. Participants who completed the study received \$20 in the form of either a gift certificate or a donation to a memorial fund for the shooting victims. All surveys were approved by the university institutional board and the post-shooting study was also approved by a university committee convened to ensure ethical conduct of post-shooting related research.

## 3. Results

Scale means and standard deviations are presented for the overall sample and by shooting exposure group in Table 1. One significant scale difference (using Bonferroni adjusted values of  $p < .01$ ) was noted between the low and high exposure group on the post-shooting cognitive anxiety scale. However this reflected a less than two-point scale difference and our participants’ anxiety scores all closely resembled those of the “normal” sample in the FDAS development study (Bystritsky et al., 1990). Similarly, quality of life scores were all in the upper ranges (transformed scores = 65–80, range 0–100) and did not differ across the

exposure groups, with all scores similar to/greater than those of previous well (versus ill) samples (WHOQOL, 1998).

Linear regression analyses were conducted to examine the predictive and moderating roles of world assumptions, social support, and exposure with the anxiety and quality of life scale scores as dependent variables. For analyses with each set of dependent variables (anxiety or quality of life scales), Bonferroni-corrected significance values were used ( $p < .013$ ) and the predictors were entered in blocks. For anxiety scale analyses, pre-shooting anxiety was entered into the first block of the regression, followed by exposure in the second block, the centered continuous predictors (i.e., the 8 world assumption or 3 social support subscales) in the third block, and finally the interactive terms (i.e., exposure\*world assumption or exposure\*social support scales) in the last block. Thus, a total of eight analyses were conducted for anxiety (four anxiety scales each examined with world assumptions and social support separately). For quality of life, eight separate analyses were also conducted in the same order as described for anxiety with the removal of block one since pre-shooting data was not collected on this measure. Following recommendations of Holmbeck (2002), reduced model analyses were then conducted with only significant predictor and interaction terms included. Collinearity statistics (i.e., VIF, tolerance, and Condition Indices/Proportion Variances) for all analyses were within the acceptable range and correlations among the predictors are shown in Table 2.

### 3.1. Anxiety

**3.1.1. World Assumptions**—For the analyses examining exposure and world assumptions on the anxiety scales, the  $R^2$  for the regression of post-shooting anxiety on pre-shooting anxiety was significant in all four instances ( $R^2 = .18-.34$ ,  $ps < .01$ ; see Table 3). Including exposure in the second block resulted in a non-significant  $R^2$  increase ( $\Delta R^2 = .00-.01$ ); with the addition of the world assumptions subscales in the third block, total  $R^2$  increased significantly for all anxiety scales ( $\Delta R^2 = .05-.11$ ). Finally, inclusion of the exposure\*world assumptions scale interactions in the final block resulted in small, but significant total  $R^2$  change ( $\Delta = .01-.02$ ) for the emotional and physiological scales. At block 3, the world assumptions-self worth subscale was a significant negative predictor of all anxiety scales. In addition, for emotional anxiety, randomness was a significant positive predictor and there was a significant exposure\*randomness interaction at block 4, whereas for physiological anxiety, the exposure\*self-controllability interaction was significant at block 4 (see Table 3). Post-hoc probing was next conducted (see Holmbeck, 2002) for these two significant interactions. The first indicated that greater belief in randomness (WAS-R) was associated with greater emotional anxiety for those in the high exposure group, while WAS-R was unrelated to emotional anxiety for the low exposure group (see Figure 1). Post-hoc probing of the latter interaction suggested that, holding all other variables constant, lesser beliefs of self-controllability was associated with greater physiological anxiety for those in the high exposure group and unrelated to anxiety for those in the low exposure group (see Figure 2).

**3.1.2. Social Support**—Following up on the first two blocks examining time 1 anxiety and exposure, pre-shooting social support was entered into the third block of the regression and resulted in a statistically significant increase in variance explained for all scales ( $\Delta R^2 = .02-.04$ ; see Table 3) except behavioral. Family support was the only significant block 3 predictor, and including the interaction term was not significant for any of the anxiety scales ( $\Delta R^2 \leq .01$ ).

## 3.2. Quality of Life

**3.2.1. World Assumptions**—Block 1, regressing quality of life (QOL) on exposure, was not significant (at  $p < .01$ ; see Table 4). Inclusion of the world assumption subscales led to a significant  $R^2$  change for all four QOL scales ( $\Delta R^2 = .20$ – $.50$ ,  $ps < .01$ ). Self-worth was a significant positive predictor of all the QOL scales and randomness a significant negative predictor of the QOL Physical and Psychological scales. The addition of the exposure-world assumptions interactions in block 3 resulted in a non-significant increase in the amount of variance predicted in all instances ( $\Delta R^2 = .01$ – $.03$ ).

**3.2.2. Social Support**—For the analyses including exposure and social support, the second block of the regression resulted in a statistically significant increase in variance explained for all four QOL scales ( $\Delta R^2 = .11$ – $.16$ ; see Table 4). Family support was a significant positive predictor of all QOL scales, while friend support was a significant positive predictor of the environmental QOL scale only. In block 3, the exposure-family support interaction was significant for the physical QOL scale. The addition of the exposure-social support interactions in block 3 resulted in a non-significant increase in the amount of variance predicted in all instances (all  $\Delta R^2 < .05$ ).

## 4. Discussion

The present study was conducted to expand extant research on mass traumas by examining the impact of a campus shooting on the psychosocial adjustment of college women, as well as by exploring the potential vulnerability/protective roles of world assumptions and social support.

### 4.1. Exposure

While those reporting more severe exposure to the shooting were expected to report greater post-shooting distress, a *significant* difference between those in the low and high exposure groups was not presumed given the community-wide impact of this trauma. Indeed, few findings emerged regarding exposure level. As shown in Table 1, only one statistically significant difference was found and in all cases the actual scale totals minimally differed (<2 points). Thus, these findings did not appear clinically meaningful as the scale scores also all remained within the typical ranges based on previous research with non-clinically anxious (Bystritsky et al., 1990; Stoessel et al., 1995) and healthy (WHOQOL, 1998) samples.

Likewise, examination of pre- to post-shooting changes for the anxiety and social support scales (i.e., the scales with pre- and post-shooting data) were not remarkable. As depicted in Table 1, all scale changes were within one point or less for the overall sample and each exposure group. These findings suggest that experiencing of the mass trauma did not generally alter the anxiety or social support reported by women in our sample. In contrast, we have found other signs of distress (PTSD and depression symptoms; Littleton, Axsom, & Grills-Taquechel, 2009; Littleton, Grills-Taquechel, et al., 2009) experienced by our sample in the immediate aftermath of the shooting. It may be that anxiety symptom increases are more often present in the immediate aftermath of a trauma. Since the present study was conducted 8–12 weeks after the mass trauma, symptoms may have already diminished in that timeframe. This appears to be important area for consideration in future studies of posttrauma anxiety.

Exposure was also not found to serve as a significant predictor of anxiety or quality of life in the subsequent regression analyses. These findings were not unprecedented as previous studies have also failed to find significant links between trauma exposure level and

psychosocial outcomes. As examples, research following the 9/11 attacks and Oklahoma city bombing showed exposure to be unrelated to post-trauma mental health outcomes (Adams et al., 2006; Tucker, Pfefferbaum, Nixon, & Dickson, 2000). In addition, we have previously reported that exposure levels were unrelated to PTSD symptoms and general distress following the VT shootings (Littleton, Axsom, et al., 2009; Littleton, Grills-Taquechel, et al., 2009). Despite the lack of main effects for exposure, in two instances exposure interacted with world assumptions to predict anxiety. In addition, consistent results were found for the predictive roles of the social support and world assumptions scales examined.

#### 4.2. Social Support

Pre-shooting family support was the most consistent predictor revealed, significantly predicting all anxiety and QOL scales except one (behavioral anxiety). There were no instances where family support interacted with exposure in these analyses. Thus, for the women in this study, the perception of greater family support prior to the shooting was related to better adjustment (lower anxiety, greater QOL) following this traumatic event, regardless of proximity to it. It may be that family support was particularly pertinent for this sample (college students) and traumatic event circumstances (occurring on campus, away from most students' family members). To illustrate, most traditional aged college students have only recently moved away from their childhood home and may have a greater continued reliance on family for support than the variability that would be seen in a broader aged community sample. In addition, since this mass trauma occurred at the students' university where many of their friends and significant others likely also resided, having the support of family members who were removed from the campus community may have been particularly beneficial. In addition to family support, perceived pre-shooting friend support also predicted environmental quality of life. The QOL-E scale is comprised of a broad variety of domains (e.g., safety, transportation, access to finances, leisure) to which friends (as well as family) may be especially likely to contribute for college students. Thus, the women in this study who felt strongly supported by their friends before the shooting may have subsequently had better access to these environmental resources, accounting for the association found.

Overall, these findings add to a growing body of literature indicating a complicated role for social support in predicting post-trauma outcomes. In general, past results regarding the protective role of social support on mental health and QOL following mass traumatic events have been inconsistently found. For example, whereas Adams et al. (2006) reported no significant associations for social support and physical or mental health following the 9/11 attacks, Araya and colleagues (2007) found social support to be related to quality of life but not general mental distress in displaced individuals. Likewise, Araya et al. did not find a significant trauma by social support interaction, while such an interaction was reported by Kaspersen and colleagues (2003) among UN and relief workers. As previously noted, these conflicting findings have led some to postulate that the importance of social support may vary by specific aspects of the sample and traumatic event (Araya et al., 2007; Norris et al., 2002). Our findings suggest that differences may emerge based on the measure of social support used as well. For instance, previous studies have tended to examine a more globally conceptualized variable for social support, while the current study examined perceived social support separately for family, friends, and significant others. In doing so, our findings highlighted a strong role for family but not other types of support, a finding that would not have necessarily been apparent if only a global/total support score had been examined.

### 4.3. World Assumptions

For the world assumptions scales, two clear themes emerged. First, self-worth beliefs emerged as the most consistent predictor, with a significant main effect evidenced for all anxiety and quality of life scales. Thus, women who reported lower post-shooting self-worth also reported worse post-shooting adjustment; a finding consistent with past research on associations of world assumptions and PTSD symptoms following traumatic events (e.g., Bodvarsdottir & Elklit, 2004; Dekel et al., 2004; Elklit et al., 2007; Solomon et al., 1997). It may be that having a strong self-perception of worth has a particularly valuable role. Indeed, self-worth has been implicated as a protective factor at high levels and risk/vulnerability factor at low levels in previous research ranging from depression and anxiety to eating disorders and conduct problems.

The second theme that emerged was regarding beliefs in a lack of control over outcomes or events that occur in one's life (i.e., self-controllability and randomness scales). The self-controllability scale taps into beliefs that individuals can engage in planned and precautionary behaviors to influence their outcomes in the world and that "in a controllable world, it is the individual whose behaviors are most exemplary who will be minimally vulnerable" (Janoff-Bulman, 1989). The randomness scale encompasses the notion that bad things can happen to anyone because they happen by chance alone and therefore no precautions can be made to prevent such negative events (Janoff-Bulman, 1989). In the present study, self-controllability emerged as a vulnerability factor, significantly interacting with exposure to predict physiological anxiety. Randomness was also found to be a vulnerability factor, interacting with exposure to predict emotional anxiety. Taken together, these findings suggest that women who reported stronger beliefs that precautionary behaviors cannot affect their outcome and who were more directly exposed to the shooting were particularly likely to report greater arousal and panic-like symptoms, such as those on the emotional (e.g., "feeling tense?", "feeling uneasy?") and physiological (e.g., "muscle tension?", "rapid heartbeat?") anxiety scales. This notion fits with current models indicating that the combination of a sense of lack of control and (triggering) life stressors serve as a pathway to anxiety development (e.g., Barlow & Durand, 2009; Chorpita, 2001). However, our findings also indicate that it may only be at greater levels of trauma exposure that these beliefs are related to such panic-like anxiety; a finding that should be further examined in future research.

In addition to this interaction, randomness was found to significantly predict two of the quality of life scales. Specifically, women who indicated stronger randomness beliefs also reported lower post-shooting physical and psychological quality of life, regardless of exposure level. It may be that poorer physical and mental health resulted for individuals whose beliefs were altered following the traumatic event from viewing the world/life events as predictable to unpredictable. However, as both the world assumptions and quality of life scales were given only at post-shooting, it is not possible to clearly delineate their temporal relationship. As this appears to be the first study to examine the association of these variables, future research would be especially useful to explore these relations over time and determine whether particular world beliefs place individuals at greater risk for poor outcomes following traumatic events.

## 5. Conclusion

It is important to note limitations of this study. First, our sample was restricted to female students at the university, thus limiting our generalizability to all individuals affected by the shooting and comparability of our findings with other work examining across males and females. Notably, our sample was likely representative of females at the university as the majority of participants were enrolled in a course that fulfills a general university

requirement and draws from across disciplines. A second limitation pertained to the exposure levels of the sample. While our “high exposure” group included individuals who heard gunshots or were in one of the buildings during the shootings, none of the participants reported seeing the gunman or being fired upon. Although it was unlikely that many individuals in the original sample were severely exposed to the trauma, given the small number of students overall who were severely exposed, it is possible that those with closer exposure or more extreme distress refrained from participation and that our findings would have differed had they been included. Nonetheless, previous studies of mass traumas that have not had these limitations have similarly revealed a lack of relationship between exposure level and psychosocial adjustment (e.g., Gabriel et al., 2007; Havanaar et al., 1997; Hough et al., 1990; Silver et al., 2002, 2004). Our findings may have also been influenced by the manner with which exposure level was classified. Although a variety of classification strategies have been utilized by past researchers, given the community-level impact of this traumatic event and the massive amount of media coverage and campus-wide memorial/vigil services that followed, it was believed that all students would have at least some exposure. Therefore, participants were considered to have low exposure even if they were not on campus or near the buildings at the time of the shooting and high exposure if they were located closer to the shootings (they were in one of the buildings or could hear gunfire). Future research may benefit from examining data at a more individualized level, for example through growth curve analyses, to determine whether particular aspects of the trauma were more likely to lead to negative post-trauma symptom trajectories. Also, only self-report data were collected potentially resulting in issues with shared method variance and the T2 data was not collected until 8–12 weeks post-shooting which may have influenced our findings as feelings may have changed from the immediate aftermath of the shooting to the assessment period. Finally, not all of the variables included in this study were collected at both pre- and post-shooting. For example, world assumptions were only assessed at T2 which limited examination of pre-shooting beliefs or changes in beliefs that occurred due to the shooting. Although this unfortunately limited our ability to draw inferences about temporal relations among some variables of interest, this study was unique in that pre-trauma data was available on most variables and had been collected so proximal to the trauma. Indeed, most previous work has been unable to examine symptom change relying instead on either retrospective reports or post-trauma assessments only (Parslow et al., 2006). Ideally pre-trauma information would be available for all variables; however, given the unexpected nature of events like this mass shooting this is not typically feasible.

Despite these limitations, a number of notable findings emerged from this study. First, our findings suggest that the experience of this mass trauma did not generally alter the anxiety levels of women enrolled at the university where it occurred. Although pre-shooting data was not available and *change* could not be examined for quality of life, all of the scales were comparable or higher than those previously reported for “healthy” individuals (Skevington et al., 2004; WHOQOL, 1998). Therefore, it appears that quality of life was also not severely affected. Nevertheless, greater belief in a lack of control over outcomes was significantly associated with increased physiological/emotional arousal anxiety symptoms for those more severely exposed to the shooting. Further, a consistent pattern emerged for randomness as a predictor of our outcomes; however this finding was not always statistically significant given the conservative significance values employed. Although in need of replication, these findings suggest that intervention efforts may benefit from attempts to address control beliefs and any affiliated maladaptive thoughts and symptoms. In addition, the present study revealed consistent positive roles for family support and self-worth. Self-worth has been purported as a protective or resiliency factor across a variety of domains (e.g., learning, weight loss, psychopathology) and our findings similarly show that, even after a traumatic event, those with higher self-worth beliefs tended to report better psychosocial adjustment. Social support appears to have a complicated role in post-trauma

adjustment and our findings support the notion that this variable may need to be examined more carefully by sample and event characteristics. Furthermore, our findings indicate that having the support of individuals not directly linked to the trauma (family in this case) may be especially beneficial for victims and this remains an area for future studies to explore.

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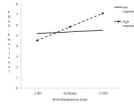
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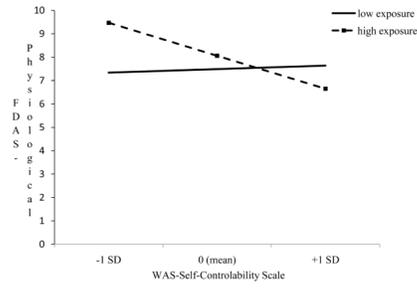
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**Figure 1.** Plotted conditional moderator analysis showing the significant interaction between exposure group (low/high) and the world assumption of randomness on the emotional anxiety scale.



**Figure 2.** Plotted conditional moderator analysis showing the significant interaction between exposure group (low/high) and the world assumption of self-controllability on the physiological anxiety scale.

**Table 1**

Raw total variable means (standard deviations) for overall sample and by exposure group

	Overall (n = 298)	Low Exposure (n = 203)	High Exposure (n = 95)
T1-FDAS-Emotional	10.7 (4.1)	10.5 (3.9)	10.9 (4.3)
T1-FDAS-Cognitive	13.5 (5.2)	13.0 (4.2)	14.5 (6.8)
T1-FDAS-Behavioral	21.8 (6.5)	21.5 (6.3)	22.6 (6.8)
T1-FDAS-Physiological	17.2 (6.7)	17.1 (6.3)	17.4 (7.4)
T1-Family Support	21.8 (6.3)	21.8 (6.1)	21.9 (6.8)
T1-Friend Support	23.3 (5.5)	23.4 (5.3)	22.9 (5.9)
T1-Significant Other Support	22.5 (6.5)	22.6 (6.7)	22.4 (6.2)
T2-FDAS-Emotional	10.8 (4.2)	10.6 (4.0)	11.2 (4.5)
T2-FDAS-Cognitive	14.3 (5.5)	13.7 (5.1) <sup>a</sup>	15.5 (6.1) <sup>b</sup>
T2-FDAS-Behavioral	21.5 (6.7)	20.9 (6.5)	22.9 (7.0)
T2-FDAS-Physiological	16.8 (6.2)	16.6 (6.0)	17.3 (6.7)
T2-Family Support	22.8 (5.7)	22.7 (5.6)	22.9 (5.8)
T2-Friend Support	23.4 (5.0)	23.4 (5.0)	23.4 (5.2)
T2-Significant Other Support	23.3 (6.0)	23.1 (6.2)	23.7 (5.7)
T2-WAS-Justice	12.4 (3.0)	12.3 (2.9)	12.6 (3.3)
T2-WAS-Benevolence of People	17.9 (2.9)	18.2 (2.8)	17.5 (3.0)
T2-WAS-Randomness	14.8 (3.2)	14.9 (3.2)	14.8 (3.3)
T2-WAS-Benevolence of World	16.5 (3.5)	16.6 (3.4)	16.4 (3.6)
T2-WAS-Self Worth	14.2 (2.9)	14.3 (2.8)	14.0 (3.1)
T2-WAS-Luck	15.8 (4.0)	15.9 (3.9)	15.6 (4.3)
T2-WAS-Control	12.1 (3.2)	12.0 (3.2)	12.4 (3.2)
T2-WAS-Self Control	12.6 (2.1)	12.6 (2.1)	12.7 (2.1)
T2-QOL-Psychological	22.2 (3.6)	22.4 (3.6)	21.7 (3.6)
T2-QOL-Physical	29.1 (3.7)	29.4 (3.6)	28.4 (4.0)
T2-QOL-Social Relations	11.3 (2.3)	11.4 (2.3)	11.3 (2.3)
T2-QOL-Environmental	31.8 (4.4)	31.9 (4.4)	31.7 (4.3)

Note: T1 = time 1 (pre-shooting); T2 = time 2 (post-shooting); FDAS = Four dimensional anxiety scale; WAS = World assumptions scale; QOL = Quality of life; differing superscripts (e.g., <sup>a/b</sup>) represent mean score differences significant at  $p < .01$ .

**Table 2**

Correlations among the World Assumptions and Social Support Subscales

	2.	3.	4.	5.	6.	7.	8.	10.	11.
1. Justice	.10	-.05	.23*	.06	.11	.61*	.27*		
2. Benevolence People		-.09	.70*	.43*	.33*	.01	.19*		
3. Randomness			-.11	-.07	.14	-.06	.10		
4. Benevolence World				.39**	.33**	.11	.21**		
5. Self-Worth					.27**	.07	.27**		
6. Luck						.10	.23**		
7. Controllability							.29**		
8. Self-Controllability									
9. Family Support								.49**	.36**
10. Friend Support									.34**
11. Significant Other Support									

\*  $p < .000$ .

**Table 3**  
 Summary of Hierarchical Regression Analyses for Exposure, World Assumptions, Social Support, and Anxiety

	B	SEB	$\beta$	t	B	SEB	$\beta$	t	B	SEB	$\beta$	T
<b>ANX-Emotional</b>												
<b>Block 1</b>	$R^2 = .26^{***}$											
T1-Anx	.52	.05	.51	10.21**	.54	.04	.58	12.22**	.44	.06	.42	8.06**
<b>Block 2</b>	$\Delta R^2$ (block 2) = .00											
T1-Anx	.52	.05	.51	10.17**	.54	.04	.58	12.19**	.43	.06	.41	7.77**
Exp	.44	.45	.05	.98	.56	.63	.04	.89	1.1	.62	.10	1.79
<b>World Assumptions</b>												
<b>Block 3</b>	$\Delta R^2$ (block 3) = .11**											
T1-Anx	.43	.05	.42	8.80**	.49	.04	.53	11.18**	.37	.06	.35	6.70**
Exp	.32	.41	.04	.78	.44	.62	.03	.71	1.0	.60	.09	1.75
SW	-.47	.07	-.32	-6.79**	-.42	.11	-.19	-3.93**	-.51	.10	-.27	-5.12**
RAN	.15	.06	.11	2.46*								
SC					-.02	.14	-.01	-.11				
<b>Block 4</b>	$\Delta R^2$ (block 4) = .01**											
T1-Anx	.43	.05	.41	8.75**	.49	.04	.53	11.29**				
Exp	.34	.41	.04	.82	.44	.61	.03	.73				
SW	-.47	.07	-.32	-6.75**	-.43	.11	-.20	-4.03**				
SC					.23	.17	.08	1.37				
RAN	.04	.07	.03	.57								
Ran* Exp	.32	.13	.14	2.55**								
SC* Exp					-.77	.29	-.15	-2.64**				
<b>Social Support</b>												
<b>Block 3</b>	$\Delta R^2$ (block 3) = .02**											
T1-Anx	.50	.05	.49	9.76**	.52	.04	.56	12.02**	.41	.06	.39	7.39**
Exp	.46	.44	.05	1.04	.60	.62	.05	.97	1.2	.61	.10	1.90
Fam	-.10	.03	-.15	-3.01**	-.19	.05	-.20	-4.22**	-.13	.05	-.15	-2.82**

Note: Data reported from reduced models with non-significant predictors and interactions removed; T1-Anx = Time 1 (pre-shooting) for each anxiety scale; SW = WAS Self-Worth Scale; RAN = WAS Randomness Scale; SC = WAS Self-Control Scale; Exp = Exposure; Fam = Family Support;

\*  $p < .05$

\*\*  $p < .013$ .

**Table 4**  
 Summary of Hierarchical Regression Analyses for Exposure, World Assumptions, Social Support, and Quality of Life Subscales

	B	SEB	$\beta$	t	B	SEB	$\beta$	t	B	SEB	$\beta$	T				
	<i>QOL-Physical</i>				<i>QOL-Psychological</i>				<i>QOL-Social</i>				<i>QOL-Environment</i>			
<b>Block 1</b>	$R^2 = .02^*$				$R^2 = .01$				$R^2 = .00$				$R^2 = .00$			
Exposure	-1.07	.46	-.14	-2.34*	-.73	.45	-.09	-1.62	-.10	.28	-.02	-.34	-.25	.54	-.03	-.47
<i>World Assumptions</i>																
<b>Block 2</b>	$\Delta R^2$ (block 2) = .15**				$\Delta R^2$ (block 2) = .46**				$\Delta R^2$ (block 2) = .15**				$\Delta R^2$ (block 2) = .13**			
Exposure	-.93	.42	-.12	-2.20*	-.46	.33	-.06	-1.39	.01	.26	.00	.02	-.08	.51	-.01	-.15
SW	.47	.07	.36	6.75**	.84	.05	.67	15.58**	.31	.04	.39	7.21**	.54	.08	.35	6.45**
RAN	-.15	.06	-.13	-2.50**	-.11	.05	-.10	-2.38**								
<i>Social Support</i>																
<b>Block 2</b>	$\Delta R^2$ (block 2) = .10**				$\Delta R^2$ (block 2) = .13**				$\Delta R^2$ (block 2) = .08**				$\Delta R^2$ (block 2) = .15**			
Exposure	-1.06	.43	-.13	-2.43*	-.76	.42	-.10	-1.81	-.11	.27	-.02	-.41	-.21	.50	-.02	-.42
Family	.15	.04	.26	4.05**	.21	.03	.36	6.70**	.10	.02	.28	5.01**	.18	.04	.26	4.30**
Friend									.15	.05	.19	3.07**				

Note: QOL = Quality of Life; SW = World Assumptions Self-Worth Scale; RAN = World Assumptions Randomness Scale; Exp = Exposure; Fam = Family Support;

\*  $p < .05$

\*\*  $p < .013$ .