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Risk and resiliency factors in posttraumatic stress disorder

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Abstract

Background: Not everyone who experiences a trauma develops posttraumatic stress disorder (PTSD). The aim of this study was to determine the risk and resiliency factors for this disorder in a sample of people exposed to trauma.

Method: Twenty-five people who had developed PTSD following a trauma and 27 people who had not were asked to complete the Posttraumatic Stress Diagnostic Scale, the Coping Inventory for Stressful Situations, and the State-Trait Anxiety Inventory. In addition, they completed a questionnaire to provide information autobiographic and other information.

Analysis: Five variables that discriminated significantly between the two groups using chi-square analysis or t-tests were entered into a logistic regression equation as predictors, namely, being female, perceiving a threat to one's life, having a history of sexual abuse, talking to someone about the event, and the "intentionality" of the trauma.

Results: Only being female and perceiving a threat to one's life were significant predictors of PTSD. Taking base rates into account, 96.0% of participants with PTSD were correctly classified as having the disorder and 37.0% of participants without PTSD were correctly classified as not having the disorder, for an overall success rate of 65.4%

Conclusions: Because women are more likely than men to develop PTSD, more preventive measures should be directed towards them. The same is true for trauma victims (of both sexes) who feel that their life was in danger

Background

It was not until the publication of the DSM-III [1] that the term posttraumatic stress disorder (PTSD) was officially acknowledged as a unique and valid disorder that could result in long-term psychological difficulties. Although the majority of studies related to PTSD have focused on veterans and warfare, DSM-III-R [2] noted that PTSD might arise from any unusual distressing event such as rape, natural disasters (floods, earthquakes), accidental disasters (plane or car crashes), and deliberate trauma

(bombing, torture). However, since the publication of the DSM-III-R, it has been noted that in fact traumatic events such as rape and car crashes are not unusual and occur quite frequently [3]. Therefore, DSM-IV [4] changed the definition of traumatic events to any event that involves "actual or threatened death or serious injury, or a threat to the physical integrity of self or others... the person's response involves intense fear, helplessness, or horror" (p. 427). The three major symptom clusters associated with PTSD are re-experiencing symptoms, avoidance and

numbing symptoms, and symptoms of increased arousal [4].

The most recent epidemiological study [5] estimates that about 90% of citizens in the US are exposed to at least one traumatic event during their lives, with many being exposed to more than one trauma throughout their life. Despite this high incidence, in recent years it has become evident that PTSD does not occur in everyone who is exposed to traumatic events. Severity of the traumatic event has been implicated as one of the most salient predictors of PTSD [6]. Results of the National Comorbidity Survey indicated that traumatic events such as torture and sexual assault were associated with the highest rates of chronic PTSD, whereas lower magnitude events such as motor vehicle accidents and life-threatening illness were associated with lower rates of trauma [7]. However, even among those who are exposed to very severe traumatic events, only a fraction of those individuals go on to develop PTSD [5,6]. Therefore, it is important to determine why some individuals exposed to traumatic events develop PTSD and others do not. The observation that trauma per se is not a sufficient determinant of PTSD raises the possibility that there may be particular risk factors that make an individual vulnerable towards developing a disorder [8]. Risk factors can be divided into two main categories: severity and type of traumatic event, and predisposing personal characteristics such as personality and gender [9].

Sex Differences

In general, women are more at risk than men for PTSD following exposure to traumatic events. Research indicates that although women are less likely to be violently assaulted than men (such as being beaten up or mugged), they are much more likely to be sexually assaulted, including being raped. Men, on the other hand, are more likely to have been in serious accidents (such as car crashes) and to have witnessed acts of violence. The conditional risk of PTSD associated with *any kind of trauma*, however, is double in women – 13% as opposed to 6% – demonstrating that the higher rates of PTSD in women are not due solely to their more frequent exposure to rape. Although women do experience rape more often than males, this accounted for only a part of the sex difference in the conditional risk of PTSD. In other words, women are more vulnerable to PTSD following any kind of physical assault, sexual or otherwise [10].

Multiple Risk Factors

A number of studies [11–17] have examined the effects of various risk factors acting together to promote the development of PTSD. For example, one study [11] examined the following combination of risk factors to predict who developed chronic PTSD: age of exposure to the traumatic event, family history of psychiatric disorders, a history of

prolonged childhood separation from parents, personality factors, and sociodemographic characteristics. In this study, being female, separation from parents in childhood, and family and personal history of psychopathology were significant predictors of PTSD.

Coping Factors

Coping has been defined as the processes that individuals use to modify adverse aspects of their environment as well as to minimize internal threat induced by stress [18]. Previous research has suggested that the way people process and interpret traumatic events and its consequences may play a role in the development or maintenance of PTSD [15,19,20].

For instance, victims of a boating accident who displayed avoidant behaviour and who spent less time attempting to work through their experiences manifested traumatic symptoms, somatic symptoms and fears eight months after the accident. This finding implies that the kind of coping strategy used by those exposed to traumatic events affects the development of the disorder [20].

Another study [21] examining the role of cognitive processes in the development of PTSD investigated the attributions of responsibility of motor vehicle accident (MVA) victims. Most of the 152 participants attributed the responsibility of the MVA to someone else as opposed to themselves (64% v. 9%). Among the 62 participants who were initially diagnosed with PTSD, 66% attributed responsibility for the accident to someone else whereas only 8% of those with PTSD attributed responsibility to themselves. This study supports the notion that those victims who accept the responsibility or blame for their trauma cope better with the aftermath than those who blame someone or something else. Identical conclusions were drawn from the results of similar study into PTSD and MVAs [22]. However, taking responsibility for one's actions is only therapeutic when one has control over the traumatic events; when events are beyond one's control, self-blame is destructive [23]. These findings can only be generalized to those who experienced a MVA; therefore, more research to determine whether these findings of attribution of responsibility hold for other types of trauma such as rape or torture is needed.

Purpose

The purpose of the present study was to determine the risk and resiliency factors for PTSD by comparing a group of people who experienced a traumatic event and developed PTSD with a group of individuals exposed to trauma who did not develop the disorder. The inclusion of a group of trauma-exposed participants without PTSD greatly enhances the information that can be obtained from cross-sectional studies [9]. If premorbid differences are

uniformly present in individuals with PTSD but are absent from traumatized individuals without PTSD, then the disorder is not due to exposure to the traumatic event alone; it must be a product of both stress and predisposing factors such as heightened sensitivity or inability to cope [9]. In addition, to our knowledge, there are no studies which have examined the role attributions of responsibility in those experiencing traumatic events other than MVAs, and few studies have examined the relationship between coping style and PTSD.

Method

Sample

Fifty-two individuals of both genders who had been exposed to traumatic events were recruited from the University of Calgary and the Calgary fire stations, and through the media (i.e., newspaper advertisements and radio announcements). Volunteers were included if they were between the ages of 18 and 65 and had experienced a traumatic event. Informed consent was obtained from all the participants who could then either make an appointment to complete the measures in person or have the questionnaires mailed to their homes. The measures took approximately 15 to 25 minutes to complete.

The diagnosis of PTSD was made utilizing the Posttraumatic Stress Diagnostic Scale (PDS) which has an acceptable diagnostic utility, with a sensitivity of .82, a specificity of .77, and a kappa of .59 [24].

Measures

Posttraumatic Stress Diagnostic Scale [24]

The PSD is a 49-item self-report instrument that measures all six criteria for PTSD in the DSM-IV [4]. The scale comprises a 13-item checklist of possible traumatic events, and respondents are required to indicate which events they have experienced. They then rate which traumatic event was most stressful for them and, subsequently, this event is the one that is assessed. A diagnosis of PTSD is made only if all six DSM-IV criteria are met (4).

Coping Inventory for Stressful Situations [25]

The CISS is a 66-item multidimensional measure that assesses task-oriented coping, emotion-oriented coping, and denial. Respondents are asked to indicate how much they engage in various types of activities when they encounter a difficult, stressful, or upsetting situation on a 5-point scale ranging from not at all to very much.

State-Trait Anxiety Inventory [26]

This inventory has two separate self-report scales, one for measuring state anxiety and another for measuring trait anxiety. For the purposes of the present study only the S-Anxiety scale was utilized. The S-Anxiety scale contains twenty statements that evaluate how respondents feel

"right now, at this moment" with respect to feelings of apprehension, tension, nervousness, and worry. The S-Anxiety scale may also be used to evaluate how respondents felt at a particular time in the recent past, which is *how this measure was used in the present study*. To obtain a measure of the degree of stress or anxiety at the time of the traumatic event, participants were asked to answer the inventory in terms of *how they felt during their traumatic event*.

Ad Hoc Questionnaire

A questionnaire was designed especially for the purpose of this study to assess vulnerability and resiliency factors identified in the literature such as gender, education level, child abuse, personal and familial history of psychopathology, early separation from parents, attribution of responsibility, severity of the trauma, and social support. The full questionnaire may be found in an Appendix (see additional file 1).

Analysis

Chi-square and t-tests were conducted to determine which variables differentiated significantly between the two groups. These variables were then included as predictor variables in a logistic regression analysis. It should be noted that in order to avoid capitalizing on chance, the rule of thumb recommended by most statisticians is for there to be a minimum of ten subjects for each predictor variable in the equation [27].

Results

Of the 52 participants who were exposed to traumatic events, 48% met DSM-IV criteria for current PTSD. There were more women (n = 31) than men (n = 21) in the sample and average age of the sample was 36.8 (9.76) years.

In descending order of frequency, the types of trauma reported were physical assault (n = 14), accident (n = 10), sexual assault (n = 9), combat (n = 5), sudden death of family member (n = 4), suicide of family member (n = 4), and life threatening illness (n = 3). More females (76.0%) developed PTSD than males (24.0%), a difference that was found to be statistically significant, chi-square = 5.37, df = 1, p = .02. Those with PTSD had a higher frequency of being unmarried than those without PTSD (56.0% vs. 29.6%) but this finding was not significant. Those without PTSD seemed better educated than those with PTSD although the difference was not statistically significant. There was also no significant difference between the two groups at the time since the traumatic event occurred. Refer to Table 1 for complete information on demographic characteristics.

Approximately equal numbers of participants with PTSD (88.0%) and without PTSD (88.9%) reported having experienced at least one other traumatic event during their

Table 1: PTSD and Demographic Factors

	Total	PTSD (n = 25)	No PTSD (n = 27)
Sex			
Male	21 (40.4%)	6 (24.0%)	15 (55.6%)
Female	31 (59.6%)	19 (76.0%)	12 (44.4%)
Marital Status			
Married	30 (57.7%)	11 (44.0%)	14 (51.9%)
Not Married	22 (42.3%)	14 (56.0%)	8 (29.6%)
Education			
Some high school	6 (11.5%)	5 (20.0%)	1 (3.7%)
High school diploma	6 (11.5%)	3 (12.0%)	3 (11.1%)
Some college	12 (23.1%)	5 (20.0%)	7 (25.9%)
College degree	12 (23.1%)	4 (16.0%)	8 (29.6%)
Trade certificate	8 (15.4%)	5 (20.0%)	3 (11.1%)
Post-Graduate degree/Professional	8 (15.4%)	3 (12.0%)	5 (18.5%)

Table 2: PTSD and Early Environmental Factors

	PTSD (n = 25)	No PTSD (n = 27)	p-values
History of previous trauma	22 (88.0%)	24 (88.9%)	1.000
History of sexual abuse	14 (56.0%)	6 (22.2%)	.022
History of physical abuse	10 (40.0%)	5 (18.5%)	.127
Family history of mental illness	18 (72.0%)	15 (55.5%)	.219
Personal history of mental illness	8 (32.0%)	5 (18.5%)	.212
Child separation from parents	7 (28.0%)	7 (25.9%)	1.000

lifetime. Although not statistically significant, those with PTSD (40.0%) were more than twice as likely as those without PTSD (18.5%) to have had a history of physical abuse as a child. Participants with and without PTSD had similar frequencies of family history of mental illness, personal history of mental illness, and being raised by someone other than their parents for at least four months prior to the age of 16 (see Table 2). Having a history of sexual abuse as a child was found to be more common in those with PTSD (56.0%) than those without PTSD (22.2%), a statistically significant finding, chi-square = 6.26, df = 1, p = .02.

Both those with and without PTSD had similar frequencies for receiving physical injuries as a result of their trauma, having to be hospitalized due to the event, and witnessing the death or severe injury of another person (see Table 3). A significant difference was found, however, depending on whether they were the victims or the witnesses of a traumatic event – 84.0% of participants with PTSD were victims whereas 44.4% of those without PTSD were witnesses, chi-square = 8.76, df = 1, p = .004.

The results from the S-Anxiety scale revealed no significant differences between those with and without PTSD on the degree of anxiety experienced while the traumatic event was occurring: 68.40 (13.03) vs. 64.41 (12.55). Again, there was no significant difference between those with and without PTSD on the reported severity of injuries they received as a result of the trauma: 3.48 (1.56) vs. 4.00 (1.57). However, significant differences were found between participants on the extent to which they felt that their life was in danger, those with PTSD reporting a higher mean score than those without PTSD: 3.84 (1.52) vs. 2.44 (1.40), t (50) = 3.45, p = .001. Significant differences were also found on the extent to which participants felt that their traumatic event was the result of an intentional act, those with PTSD reporting a higher mean score than those without PTSD: 3.92 (1.53) vs. 2.81 (1.90), t (50) = 2.30, p = .026. There were no significant differences to the extent to which participants with or without PTSD reported obtaining professional support to deal with their traumatic event or having prior training in dealing with traumatic events (see Table 4 for frequency counts).

There were no differences found between groups on attribution of responsibility for the traumatic event – those

Table 3: PTSD and Severity of Trauma

	PTSD (n = 25)	No PTSD (n = 27)	p-values
Physical injuries	16 (64.0%)	10 (37.0%)	.095
Hospitalization required	9 (36.0%)	6 (22.0%)	.362
Witness death or severe injury	9 (36.0%)	16 (59.3%)	.107
Direct experience of trauma	21 (84.0%)	12 (44.4%)	.004

Table 4: PTSD and Social Support and Coping

	PTSD (n = 25)	No PTSD (n = 27)	p-values
Persons available to talk to about trauma	10 (40.0%)	22 (81.5%)	.004
Professional support	13 (52.0%)	14 (51.9%)	1.000
Training in dealing with trauma	2 (8.0%)	6 (22.2%)	.252
Self-blame for trauma	0 (0.0%)	1 (3.1%)	.391
Blame others for trauma	14 (43.8%)	17 (53.1%)	.332
Problem-oriented coping	3 (12.0%)	9 (33.0%)	.077
Emotion-oriented coping	14 (56.0%)	7 (25.9%)	.057
Avoidance-oriented coping	8 (32.0%)	11 (40.7%)	.480

with and without PTSD were both more likely to blame others for their traumatic event as opposed to blaming themselves. Those with PTSD were more likely to use emotion-oriented coping in dealing with stressful events than those without PTSD. This finding approached significance, chi-square = 5.74, $df = 1$, $p = .06$. Significant differences were found between groups depending on whether or not someone was available to talk to about their trauma. Of those with PTSD, only 40.0% reported having someone available to talk to in contrast to 81.5% of those without PTSD, chi-square = 9.44, $df = 1$, $p = .004$. Similarly, the groups differed on the extent to which they talked about their traumatic event with others – those with PTSD, on average, spoke less about their traumatic event with others than those without PTSD: 2.32 (1.38) vs. 3.33 (1.14), $t(50) = -2.90$, $p = .006$.

A direct logistic regression analysis was performed using the five variables that significantly discriminated between the two groups as the variables that would in combination best predict the probability of having PTSD. These variables were:

- gender
- having a history of sexual abuse
- the extent to which one felt one's life was in danger

- the extent to which one felt that the traumatic event was the result of a deliberate act

- whether or not there was someone to talk to about the traumatic event.

According to the Wald criterion, gender and the extent to which participants felt their lives were in danger reliably predicted PTSD, $z = 2.20$, $p < .05$ and $z = 2.04$, $p < .05$. Females were 7.6 times more likely to have PTSD than males and a one-unit increase in the extent to which participants felt their life was in danger multiplied the odds of having PTSD 1.7 times. Using the default cut point of .5, prediction success was above chance with 72.0% of participants with PTSD correctly classified as having the disorder and 81.5% of participants without PTSD correctly classified as not having the disorder, for an overall success rate of 76.9%.

Because the prevalence rate of PTSD varies depending on the type of trauma experienced, another analysis was conducted using a cut point of .17, which is the average prevalence rate for PTSD across several studies reported in the literature. Consistent with the previous results, this analysis also found that gender and the extent to which one felt their lives were in danger reliably predicted the presence or absence of PTSD, $z = 2.20$, $p < .05$ and $z = 2.04$, $p < .05$. However, using this cut-point of .17, 96.0% of participants with PTSD were correctly classified as having the disorder and only 37.0% of participants without PTSD

were correctly classified as not having the disorder, for an overall success rate of 65.4% which was lower than when the cut-point used was .5.

Discussion

A weighted combination of the five independent variables correctly predicted 81.5% of traumatized individuals who developed PTSD, well above chance values. This percentage increased even further to 96.0% when base rate information was used. However, the percentage of false negatives also increased, reducing the overall success rate from 76.9% to 65.4%. But from a therapeutic point view, it could be argued that it is more important to classify correctly those cases likely to develop PTSD than to misclassify those cases who are not. The two key findings of the logistic regression analysis were that being female significantly increased the risk of developing PTSD after exposure to a traumatic event and that the more one felt that their life was being threatened, the more likely they were to develop PTSD.

The finding of a sex difference in the development of PTSD is supported by previous studies that have documented a higher prevalence of PTSD in females than males [7,17,28–30]. To date, this finding has received little scientific attention. Several reports have concluded that the higher prevalence of females reflects a greater vulnerability to the PTSD effects of traumatic events based on the findings that the sex difference remains even when the type of trauma is controlled [7,28]. The sex difference in PTSD is not due to females being more frequently exposed to rape as this accounts for only part of the sex difference [10]. For example, more women than men develop PTSD after exposure to other traumatic events such as witnessing an injury [7]. In the present study, no significant differences were found between type of trauma, gender, and PTSD. However, with one exception, all women reported incidences of sexual assault.

Currently there is no consensus regarding an explanation for the higher rates of PTSD in women than in men. One suggestion is that women have a *generalized vulnerability* to the disorder [10]. However, the reasons for this vulnerability remain unknown. Perhaps women and men have different strategies or methods of coping with the aftermath of trauma. This area of study obviously needs further research.

Severity of the traumatic event is considered to be one of the most salient predictors of PTSD [5]. However, at present there is no standard measure to assess the severity of a trauma across traumatic events. Green [31] delineated eight generic stressor dimensions hypothesized to cut across different types of traumatic events. One of these stressor dimensions was threat to one's life or bodily in-

tegrity. Our study yielded support for this particular dimension because those individuals with PTSD felt that their life was in greater danger than those without PTSD. Davidson and Smith [16] also found that the PTSD group in their sample of psychiatric outpatients was more likely to feel that their life was endangered. These findings support the validity of this stressor dimension as a significant predictor of PTSD and as a plausible measure of severity of a trauma across different events.

The variables "having a prior history of sexual abuse", "the availability of someone to talk to about the traumatic event", and "whether the traumatic event was the result of a deliberate act" were not significant predictors of PTSD. Apart from the few reports on the effects of childhood trauma as a risk factor for later developing PTSD, little is known about the influence of previous exposure to trauma on PTSD. In a large study of 1,922 participants, the results indicated that those who reported any previous trauma were significantly more likely to experience PTSD than those with no previous exposure to trauma [32]. The risk of PTSD varied depending on the type of trauma: violent assault was associated with the highest risk for developing PTSD after exposure to a second trauma. A history of two or more traumatic events involving violent assault in childhood was also associated with a high risk of PTSD from trauma in adulthood. In the case of adult female rape victims, assaults in childhood often involved sexual abuse. However, childhood sexual abuse alone was not a significant predictor of current PTSD symptoms [33], a finding that is consistent with the results from the present study. Nevertheless, because PTSD is probably one of the most frequently cited disorders associated with a history of child abuse; further research is needed to replicate these results.

The *intentionality* of the traumatic event is another stressor dimension hypothesized to cut across different traumatic events. Green et al. [31] proposed that events such as a natural disaster would be at the low end of the severity continuum; technological accidents, where the harm was unintentional, would be in the middle; and at the high end of severity would be acts of intentional harm such as rape or torture. In the present study, the logistic regression analysis failed to support this variable as a significant predictor of PTSD. It is possible that the present sample did not include enough participants who experienced acts of deliberate harm (26.9%) to detect significance. It is also possible that this dimension is not in fact an important predictor of PTSD. More research is needed to examine the validity of this stressor dimension. Finally, the logistic regression analysis failed to support the hypothesis that having someone to talk to about the traumatic event was a significant predictor of PTSD, confirming the finding by Davidson and Smith [16]. However, having someone *available* to talk to about the traumatic event is not the

same as actually talking to that person about the event. In the present study, a significant chi-square test indicated that 40.0% of those with PTSD were less likely to report having someone available to talk with about the trauma than those without PTSD (81.5%). Again, it is possible that the sample size was not large enough for the logistic regression analysis to detect significance of this variable. There are studies that have found that social support enhances recovery [15,34]. Perhaps the capacity to make use of available social support depends on the nature and intensity of the traumatic experience and may be hindered by the negative consequences of PTSD symptomatology such as avoidance behaviour.

Relationship Between PTSD and Early Environment

The present study found no relationship between PTSD and having a history of previous trauma, physical abuse, family history of mental illness, personal history of mental illness, or being separated from parents during childhood. These nonsignificant results are in conflict with findings from previous research [11,16,17,29,32], which have investigated one or more of these risk factors. It is possible that the present study lacked sufficient power to detect significant findings.

PTSD and Physical Trauma

No significant associations between PTSD and the occurrence of physically injuries or the need for hospitalization were found. This finding is in contrast to Davidson and Smith [16] who found that those with PTSD were more likely to have been physically injured and hospitalized after a traumatic event. However, Davidson and Smith's study was flawed as they included past cases of PTSD as well as current cases of the disorder. Receipt of intentional injury is another of the stressor dimensions identified by Green [31] thought to influence the severity of a trauma. Another possible explanation for the conflicting findings with Davidson and Smith's research may be the fact that their sample had higher occurrences of deliberate traumatic events that could result in intentional injury such as assaults. Perhaps the presence of physical injuries after trauma is a risk factor for PTSD only for those events in which the injuries were deliberately inflicted.

To measure the degree of subjective stress at the time of the trauma, participants were asked to complete the S-Anxiety scale. The results indicated that there was no significant difference in the mean anxiety scores between those with and those without PTSD. This contrasts with previous research that has found that the higher the subjective ratings of the stressfulness of the trauma the greater the symptomatology [15]. Those with PTSD did not report being any more stressed or anxious during the traumatic event than those without PTSD, implying that the

perception of the stressfulness of the trauma was equally distressing for both groups of participants.

Finally, those participants who directly experienced a traumatic event as opposed to witnessing a trauma were more likely to have PTSD. This finding is consistent with those epidemiological studies which have shown that events involving interpersonal victimization, such as sexual assault or torture, are associated with the highest rates of chronic PTSD, whereas less intense events, such as death of a loved one or witnessing injury, are associated with lower rates of PTSD [7,30].

PTSD and Coping

Obtaining professional support did not protect those with PTSD from developing the disorder. However, the time when professional help is sought may be an important factor in influencing outcome since a few participants in the present study indicated that they did not seek professional help until years after the occurrence of the traumatic event. Perhaps those who do not develop PTSD are more likely to seek treatment immediately after their traumatic event. On the other hand, a recent meta-analysis of controlled studies involving single-session debriefing after trauma aimed at preventing the development of PTSD failed to show that the intervention was effective [35].

Both those with and without PTSD were more likely to blame someone else for their traumatic event rather than themselves, although this result was statistically insignificant. This trend is consistent the findings from previous research [21,22] which found that drivers were more likely to blame others for their car accidents than themselves. However, Hickling et al. [21] also found that four months after the MVAs, those with PTSD who blamed others were less likely to have remitted and experienced greater symptomatology than those who blamed themselves. It was concluded, therefore, that those who accept the responsibility for their trauma cope better with the aftermath than those with PTSD who blame someone else. The coping literature suggests that behavioural self-blame, as opposed to characterological self-blame, invokes beliefs about control and is an adaptive attributional strategy [36]. The average amount of time elapsed since the trauma occurred in this study was over five years and no differences in attribution of responsibility were found between groups. This suggests that the findings by Hickling et al. [21] may be limited to traumatic events involving MVAs. Perhaps blaming oneself for a traumatic event is only adaptive when one can have control over the traumatic event. For example, a MVA driver whose accident was the result of speeding can decide to reduce his driving speed in the future and thereby regain a sense of control and safety. In contrast, a victim of a sexual assault may feel that she has fewer options in terms of what she can do to prevent the

recurrence of such an event, and may continue to feel vulnerable.

No significant differences were found between groups on the utilization of coping strategy in dealing with stressful situations although those with PTSD tended to use emotion-oriented coping more than those without PTSD. Previous research suggests that some methods of coping are more effective for some people or for some situations, while others seem to work better for other people or for other situations [18]. Collins et al. [18] found that those participants dealing with the Three Mile Island incident who reported greater use of emotion-oriented coping experienced fewer symptoms of emotional disturbance and stress than those participants using problem-oriented coping and denial, which is a form of avoidance. Hence, when stress is chronic, and the sources of stress are not easily changed, reappraisal-based emotional management appears to be the most effective strategy in reducing the psychological and behavioural consequences of stress. Future research should compare traumatic events that differ on degree and perceptions of controllability (e.g., natural disaster vs. MVA) on the type of coping strategy used. It seems likely that those traumatic events (perceived to be) under one's control would be more amenable to problem-oriented strategies whereas those that are not are probably more amenable to emotional-oriented and avoidant strategies such as denial.

Finally, it should be noted that in the analysis no attempt was made to adjust the alpha level to control for what some people might consider to be Type I errors. Bonferroni adjustments have, at best, limited applications in clinical research, and should not be used when assessing evidence about specific hypotheses [38]. Furthermore, controlling for Type I errors inflates the chances of finding no significant differences when in fact they do exist (Type II error).

Conclusions

Many of the variables previously identified in the literature as predictors of PTSD were not supported in the present research. Those that did were being female and perceiving a threat to one's life. However, because of the limited size of the sample, it was not possible to include all potential predictors in the logistic regression analysis. Consequently, this study needs to be replicated on another sample that is larger in size.

Meanwhile, the current findings have potential implications for mental health workers and those interested in the prevention of PTSD. First, assessing the extent to which trauma victims feel that their life was in danger during the traumatic event could help identify people who are at a higher risk for developing PTSD. Second, it is clear

that women are more prone than men to develop PTSD after exposure to trauma. Meanwhile, the current findings have potential implications for mental health workers and those interested in the prevention of PTSD. First, assessing the extent to which trauma victims feel that their life was in danger could help identify people who are at a higher risk for developing PTSD. Second, it is clear that women are at a greater risk than men for developing PTSD after exposure to trauma. This finding suggests that early detection and treatment may prevent PTSD from developing. What is less clear is whether or not early intervention can prevent the development of PTSD [35,37]. Although there is no firm evidence to suggest that brief intervention prevents PTSD from developing, most studies have examined the effectiveness of single session debriefing on all traumatized individuals, regardless of risk. Perhaps such intervention only has a beneficial effect on those who are at risk for developing PTSD [35,37]. In addition, perhaps single session interventions are not enough to have a beneficial effect [35]. Thus, the continued identification of risk factors for PTSD is important as it will help to facilitate research aimed at examining the efficacy of preventative treatment in at risk individuals. These two factors could help identify the people who have the greatest need for early intervention.

Competing interests

None declared.

Authors' contributions

This article is based upon a master's thesis produced by the first author under the supervision of the second.

Additional material

Additional File 1

Data on gender, education level, child abuse, personal and familial history of psychopathology, early separation from parents, attribution of responsibility, severity of the trauma, and social support

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