Does Psychological Resilience Moderate the Relationship between Chronological Age, Threat Appraisal, Number of Traumatic Events and Trauma Type and Posttraumatic Stress Symptoms?

Vigdís Ásgeirsdóttir

Lokaverkefni til MS gráðu í klinískri sálfræði
Sálfræðideild
Heilbrigðisvísindasvið
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Lokaverkefni til MS-gráðu í klínískri sálfræði
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Ritgerð þessi er lokaverkefni til MS-gráðu í klinískri sálfæði og er óheimilt að afrita ritgerðina nema með leyfi rétthaf.

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Abstract

Posttraumatic stress disorder (PTSD) is a common and severe psychiatric disorder. Despite high prevalence of trauma exposure, only a small portion of individuals, subsequently develop PTSD. Research has shown that chronological age, threat appraisal, number of traumatic events experienced, and type of trauma robustly predict PTSD severity. Conversely, there are also known protective factors, such as resilience, that can bolster victims of trauma for subsequent PTSD. Resilience refers to the ability to maintain or regain normal psychological and physical functioning after experiencing adversity. In the current study, we examined the moderating effect of resilience on identified risk factors for PTSD (i.e., chronological age, threat appraisal, the number of traumatic events, and type of trauma) and PTSD severity in a large epidemiological sample of 29,666 Icelandic women (22% of the population; $M_{\text{age}} = 44.5$). Via an online questionnaire, participating women provided detailed socio-demographic information and were assessed for lifetime exposure to traumatic events, including the number of traumatic events experienced, perceived threat to life or humiliation/rejection during the worst traumatic event and trauma type (e.g., exposure to natural disaster, physical or sexual assault), and current levels of resilience and PTSD symptoms. Consistent with previous findings, our analyses revealed greater perceived threat to life and rejection/humiliation during the traumatic event and exposure to a higher number of traumatic events and experiencing a physical or sexual assault (compared to a natural disaster exposure) was associated with higher PTSD symptoms, whereas higher chronological age was associated with lower PTSD symptoms. Higher levels of resilience were also significantly associated with lower PTSD symptoms. Resilience did not moderate the relationship between chronological age and PTSD symptoms. However, resilience moderated the relationship between threat appraisal, number of traumatic events, type of worst event and PTSD symptoms. Although, the effect size of the interaction term was very small (Cohen’s $f^2 < 0.002 – 0.005$). These findings may have important clinical implications for the treatment
and prevention of PTSD in that promoting resilience among traumatized women - in particular those with high threat appraisal of the traumatic event, exposed to a higher number of traumatic events or experienced a physical or sexual assault - may help to protect them against subsequently developing PTSD.

*Keywords*: Posttraumatic stress disorder (PTSD), trauma, protective factors, resilience.
**Trauma and Posttraumatic Stress Disorder**

Posttraumatic stress disorder (PTSD) is characterized by re-experiencing symptoms, avoidance, negative cognition and mood, and hyperarousal following exposure to one or more traumatic events. The fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5; American Psychiatric Association, 2013) defines trauma as “exposure to threatened death, serious injury, or sexual violence” (p. 271, Criterion A). Traumatic events, as defined by the DSM-5, seem to be characterized by exposure to imminent threat to life, with the exception that sexual violence does not always involve an obvious life-threat.

Experiencing a traumatic event is common with population studies reporting that over 70% of the respondents had experienced at least one trauma event in their lifetime (Benjet et al., 2016). Despite the high prevalence of trauma exposure, only a small portion of individuals subsequently develops PTSD. Lifetime prevalence of PTSD is thought to be between 1.3%-8.8% (Atwoli, Stein, Koenen, & MLAughlin, 2015) and a 12-month prevalence of just under 4% (Kessler, Chiu, Demler, & Walters, 2005; Kessler, Petukhova, Sampson, Zaslavsky, & Wittchen, 2012). Women have a nearly two-fold higher prevalence of PTSD than males (Ditlevsen, & Elklit, 2012).

**Risk and Resilience**

Research has identified numerous robust risk factors that contribute to the development of PTSD. Among risk factors of relevance to the current study are biological sex, chronological age, threat appraisal, prior trauma, number of trauma events and trauma type, that have shown to contribute to PTSD symptoms (Carlson et al., 2016; Reynolds, Pietrzak, Mackenzie, Chou & Saree, 2015; Rosen & Lilienfeld, 2008; Friedman, Resick, Bryant, & Brewin, 2011; Kessler et al., 2017).

Protective factors have received lesser attention than risk factors in prior studies, and most studies to date infer protective factors with the absence of known risk factors. However, in recent years there has been a shift in research with more emphasis on identifying factors,
which can help to protect individuals against PTSD. Among protective factors, resilience has received increased attention. The concept of resilience refers to the ability to maintain or regain normal psychological and physical functioning in the face of adversity and is often conceptualized as a constellation of adaptive personality traits, beliefs, attitudes and coping strategies (Wolf et al., 2017).

Numerous studies have been conducted in the last decade focused on understanding the mechanisms underlying resilience at various phenotypic, genetic and neurobiological levels (for recent review, see Elbau, Cruceanu, & Binder, 2019). The concept has moved from being understood as a personality trait to being considered a dynamic process (Bryant, 2015). Genetic factors play an important role in an individual’s response to stress and trauma (Southwich, & Charney, 2012). Developmental risk and protective factors have an impact on brain development, which regulate future responses to stress and adversity. Studies have shown that repeated exposure to uncontrollable or overwhelming stress can lead to long lasting effects on an individual’s emotional, behavioral and, HPA-axis (hypothalamic pituitary adrenal axis) responsiveness to future stressors (Hunter, Gray, & McEwen, 2018). However, mild to moderate stressors that are controlled and mastered can have a stress-inoculating effect, with the individual developing an adaptive stress response and therefore becoming more resilient to future stressors (Southwich, & Charney, 2012).

Since resilience refers to a complex process, it can be difficult to measure it adequately. Masten, & Obradovic (2006) note that a few precautions must be taken into account when studying resilience: 1) The concept is a complex group of terms that require careful conceptual and operational definitions; 2) it is neither a single trait nor a process but rather a mixture of both; 3) and there are multiple pathways to the concept of resilience. Lays and colleagues (2018) note that there are a variety of measurements available, with different factor solutions (1 to 6 factors), which highlights the imprecision of the theoretical framework. However, the available measures usually relate to the individuals, their social and
family environments and the notion of acceptance, as well as describing the individual ability to overcome trauma. As a result, most of these scales focus on cognitive and behavioral strategies and measure the ability of the individuals to build social networks; to rely on their family and friends; to find the capacity to plan their future; to have a better perception of themselves; to accept what has happened to them and to restructure their lives following a traumatic event. Although we have ways to measure resilience, at least aspects of it, the vast majority of evidence concerning resilience is inferred from studies comparing people with and without psychiatric disorders after trauma (Bryant, 2015), without actually measuring the construct directly.

**PTSD risk Factors, PTSD symptoms and Resilience**

Chronological age has been linked to both trauma exposure and PTSD. Research has shown that increasing age is associated with fewer trauma exposures, less severe PTSD profiles, including lower rates in individuals meeting full diagnostic criteria for PTSD and generally fewer PTSD symptoms, and lower prevalence of psychiatric comorbidity (Reynolds, Pietrzak, Mackenzie, Chou and Saree, 2015). Research suggests that older adults are capable of high resilience irrespective of socioeconomic background, personal experiences, and declining health. Resilience has also been associated with positive outcomes such as successful aging, lower depression and longevity. Older women seem to be more resilient than younger women, even after the loss of a spouse. Biological sex also seems to be a factor, with women appearing to be generally more resilient than men (MacLeod, Musich, Hawkins, Alsgaard, & Wicker, 2016). Although studies have shown an association between chronological age, resilience and PTSD, it remains unclear whether resilience moderates the relationship between age and PTSD. In the current project we want to further explore the relationship between resilience, PTSD symptoms and the association between the two.

How a traumatic event is perceived may be another factor influencing the relationship between PTSD symptoms and resilience. There has been a longstanding debate on the general
objective definition of a traumatic event and what types of experiences can be considered traumatic, and lead to PTSD symptoms and diagnosis (i.e., the Criterion A debate; Weathers & Keane, 2007). Interestingly, several studies have found no significant relationship between severity of trauma and later PTSD symptoms, when using objective measures (Zatzick et al., 2002; Chiu, deRoon-Cassini, Brasel, 2011). However, subjective indicators of trauma severity, such as perceived life threat, have been found to be significantly associated with later PTSD (Ozer, Best, Lipsey, Weiss, 2003; Ehring, Ehlers, & Glucksman, 2008). Several studies show that people often report symptoms meeting full PTSD criteria following a negative life event that is not a DSM Criterion A traumatic event, and without an imminent threat to life (see Rosen & Lilienfeld, 2008, for a review). Other retrospective studies, using either self-report measures or structured clinical interviews, have also found similar results indicating that a non-Criterion A event can produce PTSD symptoms (Bodkin, Pope, Detke, & Hudson, 2007; Long et al., 2008; Mol et al., 2005; Van Hooff, McFarlane, Baur, Abraham, Barnes, 2009); while others have not (Boals & Schuettler, 2009; Kilpatrick, Resnick, Acierno, 2009). A prior study using the cohort used in the current study found evidence that a substantial portion of women report a traumatic social event as their worst traumatic experience (i.e., bullying, public ridicule or humiliation on media, adultery or rejection by spouse). These traumatic social events were associated with high scores of PTSD symptoms and a high percentage of these women were likely to meet diagnostic criteria for PTSD and social anxiety disorder, as defined by established cutoffs (Skúlason, 2018). To our knowledge the relationship between perceived threat during the traumatic event, resilience and PTSD has not been examined. In the current project we want to explore to what extent two types of threat; threat to life and social threat, the latter defined as involving severe humiliation and rejection; affect resilience, PTSD and the association between the two.

Research suggests that pre-trauma risk factors such as adverse childhood environment, prior trauma and pre-trauma life stress, increases the risk of PTSD diagnosis. Adverse
childhood circumstances and maltreatment has been associated with PTSD after trauma in adults and prior exposure to trauma has been associated with higher rates of PTSD following exposure to a subsequent trauma (Carlson et al., 2016).

Trauma type has also been linked to greater risk of later PTSD symptoms. Research has shown that victims of sexual and physical assault have higher rates of PTSD than individuals who experience a natural disasters (Friedman, Resick, Bryant, & Brewin, 2011; Kessler et al., 2017). Research has also shown that reduced lifetime trauma, better mental and physical health prior to sexual assault, are associated with increased resilience after the traumatic event (Witkemper et al., 2018). Furthermore, has interpersonal violence been associated with lower resilience (Portnoy et al., 2018). Although studies have shown an association between prior trauma, trauma type, and PTSD, it remains unclear whether resilience moderates the relationship. In the current study we want explore further how number of types of trauma and worst trauma (physical/sexual assault and natural disaster) affect resilience, PTSD symptoms and the association between the two.

**Aims of the Present study**

Expanding upon previous findings, the current study aims to examine the moderating effect of resilience on the relationship between chronological age, threat appraisal, number of trauma events, type of worst event and PTSD symptoms. Towards this end, we leveraged a population-based sample of 29,666 Icelandic women with self-reported trauma exposure, PTSD symptoms and resilience. We hypothesized that resilience would moderate the relationship between established risk factors for PTSD and PTSD symptoms. Namely, high risk groups (e.g., younger women, those who endorsed higher threat appraisal during the traumatic event, and a greater number of traumatic events experienced or endorsed being physically or sexually assaulted) with higher resilience would report fewer PTSD symptoms following a traumatic event, compared to women with lower levels of resilience.
Specific aims:

1) To assess the relationship between resilience and PTSD symptoms in trauma-exposed women.

2) To examine the relationship between resilience and posttraumatic stress symptoms by 1) chronological age, 2) threat appraisal, 3) number of trauma types experienced, and 4) type of worst event experienced (physical/sexual assault and natural disaster) in trauma exposed women.

Method

Participants

All women, 18 years and older, currently living in Iceland ($N = 134,770$, according to Statistics Iceland, January 1st, 2019) were invited to participate in the study, which was a self-administered, web-based questionnaire. The study was voluntary, and no compensation was offered for participation. The questionnaire was only available in Icelandic and, thus, all participants were required to be capable of reading and understanding Icelandic to participate. Upon data export for this preliminary analysis of results on March 18th, 2019, a total of 29,666 women (response rate 22% of the population) had completed the questionnaire and submitted their response. However, the study is still ongoing and is expected to run until July 2019, with more women expected to participate in the coming months. For the current study, women with no self-reported prior trauma experiences were excluded from the study, which left 26,304 women in the sample for the analysis.

Measures

Background information was assessed with questions about chronological age, employment status, highest education completed, income, employment status and sick leave.

The Life Events Checklist for DSM-5 (LEC-5) is a self-report questionnaire that screens for lifetime exposure to potentially traumatic events (Weathers et al., 2013). The
LEC-5 contains 17 items, 16 of which inquire about Criterion A trauma (e.g., natural disasters, physical or sexual assault, sudden accidental or violent death, life-threatening illness or injury, and explosions or transportation accidents) and 1 item on other stressful experiences that are not captured by the listed items. For each item, participants reported whether they experienced the event themselves, witnessed it, learned about it happening to a family member or a friend, or had not experienced this type of event.

To expand beyond Criterion A traumatic events, 6 additional items that assess potentially traumatic social events, in particular bullying, discrimination, public ridicule/humiliation, separation/divorce, adultery or rejection by a spouse, and 6 items concerning difficult experiences related to childbirth were administered in the study. For these items, women reported whether they had experienced it themselves or not.

In the current study, the LEC-5 was used to determine if women had experienced a traumatic event and the number of types of traumatic events experienced, both Criterion A and social trauma events. All events, irrespective of direct or indirect exposure, were used in the analyses. A total or composite score was generated to group women by number of traumatic events experienced. Psychometric properties have been evaluated on an earlier version of the LEC, and it has been found to be psychometrically sound, particularly with regard to convergent validity and temporal stability (Gray, Litz, Hsu & Lombardo, 2004). The instrument was translated to Icelandic by Berglind Guðmundsdóttir, Ingunn Hansdóttir, Agnes B. Tryggvadóttir, and Guðlaug Friðgeirsdóttir (unpublished translation). Psychometric properties for the Icelandic version have not yet been evaluated.

Appraisal of Threat to Life and Social Threat. After answering this adapted version of the LEC-5, participants were asked to select the traumatic event they considered the worst in that it had the most negative effect on them presently. This was also done to identify women that had reported assault (physical or sexual) or a natural disaster as their worst trauma experience. These follow-up items included questions about the degree of threat to life and
the degree of social threat the participant experienced when the event occurred. With regards to threat to life, participants first responded to an item indicating whether they believed someone’s life was in danger at the time of their worst trauma. If so, they responded to a second item estimating the degree of threat to life they experienced using the response options “Severe”, “Substantial”, or “Minimal”. The follow-up questions were only administered when the following experiences were selected as the worst: Natural disaster; fire, explosion, transportation accident or serious accident at work, home, or during recreational activity; physical assault or assault with a weapon; sexual assault; other unwanted or uncomfortable sexual experience; combat or exposure to a war-zone; captivity; life-threatening illness or injury; sudden violent death of another; harm or death of another person; any traumatic social event; losing custody of a child; giving birth to a child with severe physical or mental disability; other stressful birth experience and other stressful experience.

Regarding social threat, only one item was used whereby participants estimated the degree of rejection and/or humiliation they experienced during their worst trauma using the response options “Yes, severe”, “Yes, substantial”, “Yes, minimal”, “No, none” and “Does not apply”. The question concerning experienced social threat was not displayed for all events on the LEC-5. Also, this item was added to the study protocol after the study had been ongoing for 4 months. Consequently, the item is not available for the whole sample. The question concerning experienced social threat was displayed when the following events were selected as the worst: Physical assault or assault with a weapon; sexual assault; other unwanted or uncomfortable sexual experience; combat or exposure to a war-zone; captivity; serious injury, harm or death of another person; the 6 social events added to the LEC-5; loosing custody of a child; and other stressful experience. In the current study, only women with available data on both items concerning threat to life and social threat were used for the analysis.
The Posttraumatic Stress Disorder Checklist for DSM-5 (PCL-5) is a 20 item self-report questionnaire that assesses symptoms of PTSD according to DSM-5 (Weathers et al., 2013). As previously noted, participants were asked to determine the worst traumatic event they have experienced based on their endorsed items on the LEC-5 and answer the PCL-5 according to that particular trauma. Participants were asked how much each symptom has bothered them for the past month and each item was rated on a 5-point Likert-scale, ranging from 0 ("not at all") to 4 ("extremely"). A total symptom severity score (0-80) was yielded by summing the scores for each of the 20 items, with higher scores indicating more severe symptoms. The PCL-5 has been shown to be a psychometrically sound instrument (Blevins, Weathers, Davis, Witte & Domino, 2015; Bovin et al., 2016; Wortmann et al., 2016). The instrument was translated by Berglind Guðmundsdóttir, Agnes B. Tryggvadóttir, Guðlaug Friðgeirsdóttir and Ingunn Hansdóttir (unpublished translation). In the present study, the measure had excellent internal consistency (Cronbach α = 0.95).

The Connor-Davidson Resilience Scale-10 (CD-RISC-10-ICE) is a 10-item unidimensional self-report questionnaire that measures the ability to cope with adversity over the past month. The measure is comprised of items reflecting personality characteristics, beliefs, and attitudes (Windle, Bennett, & Noyes, 2011). Items on the measure reflect the ability to tolerate experiences such as change, personal problems, illness, pressure, failure, and painful feelings (e.g., “Dealing with stress can make me stronger”). Participants rate items on a 5-point Likert-scale, ranging from 0 (“not true at all”) to 4 (“true nearly all the time”) (Campell-Sills and Stein, 2007). The total score ranges from 0-40, with higher scores reflecting greater resilience (Connor & Davidson, 2003). The CD-RISC-10 has been found to have adequate psychometric properties (Campell-Sills and Stein, 2007). The instrument was translated to Icelandic by Elín D. Gunnarsdóttir and Kristín M. Jóhannsdóttir (unpublished translation). In the present study, the measure had excellent internal consistency (Cronbach α = 0.90).
Procedure
Recruitment for this population-wide study involved media advertisements (e.g., local newspapers, Facebook, Instagram), text messages were sent to every adult woman with a registered phone number, and postcards were sent to women’s homes. In order to participate, women had to log in using either Íslykill supplied by the National Register of Iceland or by using an electronic ID. Once registration was completed, participants received a link through SMS or email directing them to a web-based questionnaire (containing the measures described above and other measures as well). Before answering the questionnaire, participants had to provide informed consent. The participants reported detailed background and socio-demographic data along with clinical measures, medical history, and lifetime history of traumatic experiences. Overall, this questionnaire took about 30 to 60 minutes to complete and upon completion, participants were given information on where to seek help regarding any of the problems disclosed in response to questions. The study was approved by the National Bioethics Committee (grant nr. VSNb2017110046/03.01).

Design and Data Analysis
This study was retrospective and based on self-report data with a cross-sectional design. Analyses for the current study were based on data from the beginning of the study until March 18th, 2019. Initially, the data set was screened for significant deviations from normality, obvious outliers, and missing data for all variables of interest. Women with no prior trauma experience were excluded from the analysis. For the first aim, mentioned above, Pearson’s correlation coefficients were calculated between scores of the Posttraumatic stress symptom checklist (PCL-5) and the Connor-Davidson Resilience Scale-10 (CD-RISC10-ICE) among women who endorsed at least one traumatic event on the LEC-5 (N = 26,304, 87% of the total sample).

As previously noted, the purpose of the study was to examine the moderating effect of 1) chronological age, 2) degree of threat to life experienced and degree of social threat
experienced, 3) number of trauma types experienced, and 4) type of worst event experienced (natural disaster and physical/sexual assault) on the relationship between resilience and PTSD symptoms. In the chronological age analyses, women were divided into three age groups with approximately an even number of participants in each group, 18 - 36 (32.1%; \(N = 8,442\)), 37 - 52 (35.5%; \(N = 9,327\)) and 53 - 95 years (32.4%; \(N = 8,525\)). For the threat to life and social threat measures, valid responses to the items relating to both threat to life and social threat at the time of worst trauma were used to define threat to life trauma and social threat. Participants’ combination of high (i.e. “severe” or “substantial”) and low (“minimal” or “none”) responses to these questions were used to divide them into four groups irrespective of the type of traumatic event they considered their worst: 1) Overall low (combination of low threat to life and low social threat) \((N = 963)\); 2) Primarily threat to life (combination of high threat to life and low social threat) \((N = 89)\); 3) Primarily social threat (combination of low threat to life and high social threat) \((N = 5,154)\); 4) Overall high (combination of high threat to life and high social threat) \((N = 1,042)\). Only women that answered both questions were included in the analysis. For the number of trauma type variable, women were divided into three approximately even groups, 1 to 4 types of traumatic events (32.6%; \(N = 8,563\)), 5 to 7 types of traumatic events (33.7%; \(N = 8,862\)) and 8 to 20 types of traumatic events (33.8%; \(N = 8,879\)). For the worst event experienced, women were divided into two groups. Women who selected physical or sexual assault as their worst trauma were combined into one group (assault group; \(N = 5,023\), 19.1% of total sample) and women who selected natural disaster as their worst trauma (natural disaster group; \(N = 454\), 1.7% of the total sample) represented the other group.

Using multivariate regression models, two models were applied to for each moderating variable: 1) the main effect of the CD-RISK10-ICE and the risk factor (e.g., chronological age) on the PCL-5, and 2) the interaction model (CD-RISK10-ICE x risk factor) on the PCL-5. Analysis of variance (ANOVA) model comparison was used to
determine whether the interaction model added explanatory value to the main effect model (i.e., the model without interaction comparison). Models that significantly differed from the reduced model were interpreted. Cohen’s $f^2$ was calculated to assess effect size of the difference in variance between models.

Statistical analyses were carried out using the Statistical Package for the Social Sciences (SPSS) version 25, and an $\alpha < 0.05$ was considered statistically significant for all the analyses.

**Results**

The total sample of women was 29,666 women with 26,304 women (87% of the total sample) reporting a traumatic event in their lifetime. As Table 1 displays, was mean age in the sample 44.5 years ($SD = 14.0$). The vast majority of the women in the sample were employed (70.8%) and highly educated, with most women having completed an undergraduate degree or higher (52.9%). Most of the women report being married, cohabitating, or in a relationship (73.7%), although almost 22% reported being single. Preliminary analysis showed that socio-demographic characteristics of participants in the study represent the Icelandic population of women quite well.
Table 1. Socio-demographic characteristics of participants

<p>| | |</p>
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Age, M(SD)</td>
<td>44.5 (14.0)</td>
</tr>
<tr>
<td><strong>Employment status n (%)</strong></td>
<td></td>
</tr>
<tr>
<td>Working</td>
<td>21,011 (70.8)</td>
</tr>
<tr>
<td>Student</td>
<td>4,309 (14.5)</td>
</tr>
<tr>
<td>On disability compensation</td>
<td>2,842 (9.6)</td>
</tr>
<tr>
<td>Retired on pension</td>
<td>1,595 (5.4)</td>
</tr>
<tr>
<td>Working at home / parental leave</td>
<td>1,432 (4.8)</td>
</tr>
<tr>
<td>Sick leave, longer than 2 months</td>
<td>893 (3.0)</td>
</tr>
<tr>
<td>Unemployed / looking for work</td>
<td>718 (2.4)</td>
</tr>
<tr>
<td>Unable/prefer not to say</td>
<td>234 (0.8)</td>
</tr>
<tr>
<td><strong>Highest education completed n (%)</strong></td>
<td></td>
</tr>
<tr>
<td>Grade school</td>
<td>4,467 (15.5)</td>
</tr>
<tr>
<td>Junior college</td>
<td>5,524 (19.2)</td>
</tr>
<tr>
<td>Multi-craft trade skill</td>
<td>1,700 (5.9)</td>
</tr>
<tr>
<td>College or university</td>
<td>15,244 (52.9)</td>
</tr>
<tr>
<td>Other</td>
<td>1,881 (6.5)</td>
</tr>
<tr>
<td>Unable/prefer not to say</td>
<td>133 (0.4)</td>
</tr>
<tr>
<td><strong>Marital status n (%)</strong></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>13,470 (45.4)</td>
</tr>
<tr>
<td>Cohabitating</td>
<td>6,167 (20.8)</td>
</tr>
<tr>
<td>In a relationship, not cohabitating</td>
<td>2,218 (7.5)</td>
</tr>
<tr>
<td>Single</td>
<td>6,450 (21.7)</td>
</tr>
<tr>
<td>Widow</td>
<td>657 (2.2)</td>
</tr>
<tr>
<td>Unable/prefer not to say</td>
<td>155 (0.5)</td>
</tr>
<tr>
<td><strong>Resilience, M(SD)</strong></td>
<td>27.4(7.5)</td>
</tr>
<tr>
<td><strong>PTSD symptoms, M(SD)</strong></td>
<td>21.5(17.4)</td>
</tr>
</tbody>
</table>

**Post-traumatic stress symptoms and resilience**

Mean score on the PTSD symptoms (as measured by the PCL-5) in the total sample was 21.5 (SD = 17.4, N = 23,691). Mean resilience score (as measured by the CD-RISK10-ICE) in the total sample was 27.5 (SD = 7.5, N = 23,681). PTSD symptoms and resilience were significantly correlated (r = -0.491, p < 0.001). Regression analyses showed that resilience significantly predicted PTSD symptoms (β = -1.139, p < 0.001, R² = 0.241), with higher resilience being associated with lower PTSD symptoms.

**Chronological Age**

PTSD symptoms decreased by chronological age, youngest group (M = 24.55, SD = 18.2), middle group (M = 21.07, SD = 17.2) and the oldest group (M = 18.80, SD = 16.3).
Conversely, resilience was lowest in the youngest group \((M = 25.49, SD = 7.8)\) compared to the middle group \((M = 27.64, SD = 7.4)\) and the oldest group \((M = 28.53, SD = 7.1)\). Mean differences between groups were all significant \((p < .001)\).

In the main effect model, both resilience \((\beta = -1.119, SE = .013, CI = p < .001)\) and age groups \((\beta = -1.111, SE = .125, p < .001)\) were significant predictors of PTSD symptoms \((F(2, 23670) = 3810.153, p < .001, R^2 = .243)\), with both higher resilience and chronological age being associated with lower PTSD symptoms (see Figure 1). The addition of the interaction term between resilience and age group did not significantly improve the model \((p = .207)\).

![Figure 1. The relationship between PTSD symptoms and resilience by chronological age.](image)

*Note. Age cut-offs, youngest group (18 – 36 year old), middle group (37 – 52 year old) and oldest group (53 – 95 year old).*
Threat Appraisal

PTSD symptoms were higher in “overall high” group ($M = 36.23$, $SD = 19.0$), compared to the “primarily social threat” group ($M = 22.61$, $SD = 16.8$), “primarily life threat” group ($M = 20.11$, $SD = 16.7$), and the “overall low” group ($M = 11.85$, $SD = 12.7$). Conversely, resilience was lowest in the “overall high” group ($M = 24.93$, $SD = 8.2$) compared to the “primarily social threat” group ($M = 27.10$, $SD = 7.7$), the “primarily life threat” group ($M = 28.25$, $SD = 7.6$) and with the “overall low” group scoring the highest ($M = 29.40$, $SD = 6.9$). Mean differences between groups were all significant ($p < .001$).

In the main effect model, both resilience ($\beta = -1.088$, $SE = .025$, $CI = p < .001$) and threat appraisal ($\beta = -1.705$, $SE = .167$, $p < .001$) were significant predictors of PTSD symptoms ($F(2, 6578) = 1016.620$, $p < .001$, $R^2 = .236$), with higher resilience and lower threat appraisal being associated with lower PTSD symptoms (see Figure 2). Addition of the interaction term did significantly improve the model ($p < .001$). Resilience ($\beta = -1.506$, $SE = .071$, $p < .001$), threat appraisal ($\beta = -5.129$, $SE = .574$, $p < .001$) and resilience x threat-appraisal ($\beta = .129$, $SE = .021$, $p < .001$, $R^2 = .241$) were all significant predictors of PTSD symptoms. The effect size of the interaction term was very small (Cohen’s $f^2 = 0.005$)

These results suggest a substantial difference in scores on PTSD symptoms and resilience in the “overall high” and “overall low” group, with women scoring substantially lower on PTSD symptoms with higher resilience in the “overall low” group. However, the confidence intervals of the linear regression in “primarily life threat” overlap with all the other groups. We can therefore not conclude that there is a difference between the “primarily life threat” and “primarily social threat” groups in the current sample.

Figure 2 shows the relationship and the confidence interval between PTSD symptoms and resilience in the four threat appraisal groups.
Figure 2. The relationship between PTSD symptoms and resilience by groups of threat appraisals (degree of threat to life; degree of social threat).

Note. Appraisal groups: Overall high (high threat to life and high social threat), overall low (neither threat to life nor social threat), primarily life threat (high threat to life and low social threat) and primarily social threat (low threat to life and high social threat).

Number of types of traumatic event

PTSD symptoms were highest in the “8 to 20 types of traumatic events” group ($M = 30.52, SD = 17.8$), compared to “5 to 7 types of traumatic events group” ($M = 20.95, SD = 16.0$) and “1 to 4 types of traumatic events” group ($M = 12.93, SD = 13.5$). Conversely, resilience was lowest in the “8 to 20 types of traumatic events” group ($M = 25.70, SD = 7.9$) compared to the “5 to 7 types of traumatic events group” ($M = 27.20, SD = 7.4$) and “1 to 4 types of traumatic events” ($M = 28.90, SD = 7.0$). Mean differences between groups were significant ($p < .001$).

In the main effect model, both resilience ($\beta = -1.004, SE = .012, CI = p < .001$) and number of types of trauma ($\beta = 7.194, SE = .114, p < .001$) were significant predictors of PTSD symptoms ($F(2, 23678) = 6394.190, p < .001, R^2 = .351$), with higher resilience and lower number of types of trauma being associated with lower PTSD symptoms (see Figure 3). Addition of the interaction term did significantly improve the model ($p < .001$). Resilience ($\beta$
= -.714, SE = .034, p < .001), number of types of trauma (β = 11.029, SE = .430, p < .001) and resilience X number-trauma (β = -.139, SE = .015, p < .001, \( R^2 = .353 \)) were all significant predictors of PTSD symptoms. The effect size of the interaction term was very small (Cohen’s \( f^2 = 0.002 \)).

Figure 3 shows the relationship and the confidence interval between PTSD symptoms and resilience in the groups of different numbers of types of trauma. As Figure 3 indicates, women score significantly higher on PTSD symptoms and lower on resilience with more types of traumatic events experienced.

![Figure 3](image.png)

Figure 3. The relationship between PTSD symptoms and resilience by groups of number of types of trauma experienced.

**Type of trauma (physical/sexual assault and natural disaster)**

PTSD symptoms were considerably higher in the “assault” group (\( M = 28.75, SD = 18.7 \)) compared to the “natural disaster” group (\( M = 9.18, SD = 11.2 \)). Similarly, resilience was lower in the “assault” group (\( M = 25.62, SD = 8.1 \)) compared to the “natural disaster” group (\( M = 29.18, SD = 6.8 \)). Mean differences between groups were significant (\( p < .001 \)).
In the main effect model, both resilience ($\beta = -1.211, SE = .028, p < .001$) and trauma groups ($\beta = 15.371, SE = .798, p < .001$) were significant predictors of PTSD symptoms ($F(2, 4851) = 1246.238, p < .001, R^2 = .339$), with higher resilience and having experienced a natural disaster being associated with lower PTSD symptoms (see Figure 4). Addition of the interaction term did significantly improve the model ($p < .001$). Resilience ($\beta = -.806, SE = .113, p < .001$), number of types of trauma ($\beta = 27.928, SE = 3.490, p < .001$) and resilience X trauma-type ($\beta = -.431, SE = .117, p < .001$) were all significant predictors of PTSD symptoms. The effect size of the interaction term was very small (Cohen’s $f^2 = 0.002$). Although there is a negative relationship between resilience and PTSD symptoms in both groups, the results suggest that women have significantly higher PTSD symptoms and lower resilience after a physical/sexual assault compared to a natural disaster.

![Figure 4](image_url)

Figure 4. The relationship between PTSD symptoms and resilience by groups with either a physical/sexual assault or a natural disaster experienced.
Discussion

The current study examined resilience as a moderator of the relationship between established risk factors for PTSD and self-reported PTSD symptoms. Our results show that there is a significant relationship among psychological resilience and PTSD symptoms, and women’s threat appraisal, number of types of trauma and trauma type is moderated by resilience.

Resilience and PTSD

In line with previous studies, we found that higher resilience was associated with fewer PTSD symptoms. These results suggest that finding ways to increase resilience in women might function as preventive for PTSD. However, due to the cross-sectional design of this study, causality cannot be determined. Some women may have been highly resilient prior to the traumatic event and some women may have developed higher resilience following the traumatic event. Prior studies have shown that repeated exposure to uncontrollable or overwhelming stress can lead to long lasting effects on the individual (Hunter, Gray, & McEwen, 2018), whereas, mild to moderate stressors can have a stress-inoculating effect, as the individual develops an adaptive stress response and becomes more resilient to future stressors (Southwich, & Charney, 2012). Research has also shown that some individuals display a positive psychological change following traumatic events, with individuals re-assessing their goals and priorities, gaining improved social relations and having greater appreciation of life (for further review, see Xiaoli et al., 2019). This has been referred to as posttraumatic growth (PTG). One might expect a positive correlation between PTG and resilience. Perhaps some of the women in the sample perceived their trauma within tolerable levels, and therefore developed high levels of resilience and possibly PTG after the trauma exposure. Of note, the measure of resilience (CD-RISK10-ICE) used in the current study assessed resilience over the past month, and therefore were data concerning pre-trauma or lifetime resilience not available, and we did not have any measure on PTG. This might be of interest for future studies.
Resilience, PTSD and risk factors

The aim of the study was to investigate if the relationship between resilience and PTSD symptoms differed by chronological age, threat appraisal, number of types of trauma and worst trauma (physical/sexual assault and natural disaster). Our results were in accordance with previous finding in terms that chronological age being associated with lower PTSD symptoms (Reynolds, Pietrzak, Mackenzie, Chou & Sareen, 2015) and greater perceived threat (Rosen & Lilienfeld, 2008), higher levels of trauma exposure (Carlson et al., 2016) and having experienced a physical or sexual assault compared to a natural disaster as the worst trauma (Kessler et al., 2017) were associated with higher PTSD symptoms. Additionally, chronological age was associated with higher levels of resilience (MacLeod, Musich, Hawkins, Alsgaard, & Wicker, 2016) and greater perceived threat, higher levels of trauma exposure and having experienced assault as worst trauma was associated with lower levels of resilience.

In terms of the interaction between risk factors for PTSD and resilience, the models of resilience moderating the relationship between women’s threat appraisal, number of types of trauma and worst traumatic event and PTSD symptoms, were significant.

In the case of all the interaction term results, the difference and the effect size between the models was very small and the size of the sample involved was large, and may explain the significance in all cases. Due to the aforementioned factors, should results be interpreted with caution. Therefore, may our results concerning the moderating affect of resilience on our risk factors, not be of much clinical relevance.

Women’s chronological age

Our results showed that resilience increases, whereas PTSD symptoms decrease by chronological age. One possible explanation for the current results, in line with MacLeod, Musich, Hawkins, Alsgaard, & Wicker (2016), is that resilience increases over women’s lifetime after having had to face adversity and endured stressful events earlier in life, perhaps
also due to posttraumatic growth. Other factors, such as the time passed since the traumatic experience and severity of the trauma when it happened, were not included in the analysis but would be of interest for further research.

The interaction model was not significant and the relationship between resilience and PTSD symptoms does not seem to be affected by chronological age. This was also perhaps due to the small group difference in resilience and PTSD symptoms in general.

Concerning the chronological age analyses were women older than 69 years old not especially recruited for the study, although they were welcome to participate. The sample for women older than 69 years was therefore smaller than for the younger age groups. Also, the fact that there are fewer women alive in the older population has to be taken into account. For the purpose of the analysis, the groups were divided into approximately equal sized groups, and therefore did the oldest age group span a range of 42 years compared to 15 and 18 years in the youngest and middle groups. Future research should explore the relationship in groups with a narrower age range in a study where women of all ages are recruited equally.

**Women’s threat appraisal**

Our result concerning women’s threat appraisal showed that women with high threat appraisal (high life threat and high social threat) are least resilient and have more PTSD symptoms. Also the relationship between resilience and PTSD symptoms seems to be affected by threat appraisal. In terms of the interaction model, there seems to be a small difference in the relationship between resilience and PTSD symptoms in the threat appraisal groups, with the relationship showing a slightly different pattern depending on the primary threat appraisal involved in each group. The difference in the relationship between resilience and PTSD symptoms in the threat appraisal groups seems to mainly come into account among women in the primarily life threat and primarily social threat groups. However, we are not able to conclude a difference between the primarily life threat and primarily social threat groups in the sample.
Women appraise their trauma very differently and overall did 85% of women report their worst traumatic event, as been primarily a social threat, or a combination of both a high life threat and a high social threat. The two groups with primarily life threat and neither life threat nor social threat appraisal, only accounted for 15% of the sample, which indicates that women certainly appraise distressing social events as being traumatic. Furthermore, is it noteworthy that only women in the combination of high life threat and high social threat had a mean score above the 33-point cut-off score on the PCL-5, which indicates a PTSD diagnosis. Other groups had mean scores substantially under the cut-off score. Difference in resilience in the groups was slighter, although the combination of high life threat and high social threat had the lowest resilience score.

These results certainly indicate, and by that add to the Criterion A debate, that if women´s appraisal of their worst trauma includes a combination of a life threat and a social threat, women are more likely to develop subsequent PTSD and being less resilient. Moreover, PTSD symptoms certainly seem to be affected by women´s resilience, irrespective of threat appraisal. Some factors should be taken into account. For the study is cross-sectional, only past month data were available on resilience and PTSD symptoms. One consideration is that perhaps do resilient women prior to the trauma appraise their trauma differently then less resilient women. A further consideration is that posttraumatic growth is possibly also moderated by threat appraisal and therefore affects resilience after trauma.

**Women´s number of types of trauma**

Our results concerning women´s number of types of trauma revealed that women´s resilience decreases, whereas, PTSD symptoms increase with higher numbers of types of traumatic events experienced. Also the relationship between resilience and PTSD symptoms seems to be affected by numbers of types of traumatic events experienced.

In terms of the interaction model, there was a small difference in the relationship between resilience and PTSD symptoms in the groups of women with different numbers of
traumatic events experienced. The difference seems to come into account in the group with
the lowest number of types of trauma. There, the relationship was weaker between resilience
and PTSD symptom, although slightly.

The analyses in the current study concerned number of types of trauma, not the
number of traumatic events ever experienced. It could be feasible in future research to
examine both variables, number of types of trauma and number of traumatic events
experienced. One could hypothesize that women that have experienced trauma types such as
physical or sexual assault connected to domestic violence have higher numbers of traumatic
events experienced than women that have experienced a natural disaster. Nonetheless the
current results do surely indicate that higher numbers of types of traumatic events
experienced, predicts lower resilience and increased risk of PTSD.

Another consideration is that for the purpose of the analysis were the groups
approximately equal in size. Therefore, the group with the highest number of types of
traumatic events experienced did have the widest range, i.e. 13 types of trauma, compared to
4 and 3 types in the other groups. It may be of interest in future research to study the
relationship in smaller groups with a narrower range of types of trauma with the addition of
exploring the severity of the traumatic events.

**Women’s type of trauma**

Our results concerning women’s type of trauma, physical/sexual assault or a natural disaster,
revealed that women who have experienced assault were less resilient and had higher PTSD
symptoms than women who experienced a natural disaster. Also the relationship between
resilience and PTSD symptoms seems to be affected by women’s type of trauma.

In terms of the interaction model, the difference in the relationship between resilience
and PTSD symptoms in the groups of women with either a physical/sexual assault or a natural
disaster experienced was significant. The relationship between resilience and PTSD
symptoms in the group of women that experienced a natural disaster seems to be weaker than in the group of women that have experienced a physical/sexual assault, but also slightly.

A consideration for the current results concerning women’s type of worst trauma is that perhaps does severity of the trauma and the number of traumatic events explain this difference between groups. As mentioned above, women that have endured a physical/sexual assault may have higher total numbers of traumatic events experienced than women that have endured a natural disaster. Appraisal of the threat might also be a factor, being in a relationship or living in a household where women can expect abuse is perhaps less tolerable than experiencing a onetime natural disaster and perhaps is more likely to be appraised as both a high social and life threat.

Living in Iceland, “The land of fire and ice”, makes women quite exposed to natural disasters. However, Icelanders watch them, in most cases, from a certain distance and with interest or curiosity as in the case of most volcano eruptions. Earthquakes are quite common but few cause big concerns. Snow avalanches are not common in populated areas, but can be very dangerous. Therefore, the risk of experiencing a severe natural disaster repeatedly is quite unlikely in Iceland, whereas women in abusive relationships can expect subsequent abuse. Perhaps is resilience therefore also less affected due to distance to the trauma, severity of the trauma and number of the traumatic events experienced when concerning natural disasters. These circumstances should possibly be taken into account in future research concerning natural disasters when comparing results of other studies when it comes to appraisal of traumas, severity of traumas and number of traumatic events in relation to resilience, PTSD symptoms and types of traumatic events.

The clinical implications of these finding suggest that by finding solutions and establishing ways to promote resilience, especially in younger age groups, among women with high threat appraisal, high numbers of types of traumatic events and physical or sexual
abuse as their worst traumatic event, may help to protect them against subsequent PTSD diagnosis following trauma.

Although the literature has not reached a full consensus on how to measure the term resilience, there has been, in the current study, a unique opportunity to measure self-reported resilience on a large scale, as a concept reflecting personality characteristics, beliefs, and attitudes, in a substantial sample of Iceland’s female population in relation to PTSD symptoms, and the aforementioned moderating variables. A longitudinal study should be considered for future research to gather further information on the relationship between resilience and PTSD, along with possible moderating or mediating variables, with regard to the individual pre- and post-trauma. This could work as a meaningful effort to validate the relationship between resilience and PTSD.

**Limitations**

There are some limitations to the current study that should be considered. First, a volunteer sampling method was used, and it is plausible that women with a history of trauma and associated psychiatric problems felt more compelled to take part. Therefore, the sample might have overrepresented trauma survivors and women who developed psychiatric symptoms following the trauma. Also, women older than 69 years old were not especially recruited but welcome to participate. Second, the study was cross-sectional in nature. Some participants may have developed PTSD at some point in response to a traumatic event but have later recovered, perhaps with treatment or time passed. PTSD symptoms were only assessed for the previous month although traumatic event measures concerned women’s lifetime. Resilience was also assessed over the previous month, which leaves out any information about lifetime resilience. This introduces significant bias in the evaluation of the lifetime impact of trauma on PTSD symptoms and resilience, which may be of interest for future studies. Third, the psychometric properties of the Icelandic translations of the instruments used in the study have not been investigated or valid cut-off scores for the general population. Fourth, the question
concerning social threat was only displayed if certain types of events were present in the early stages of the study. This was changed later in the study so that women with more varied types of trauma were administered the question. Only women with answers on both degree of threat to life and degree of social threat were included in the analysis, which means that women who participated early on in the study were excluded from the appraisal analyses. It is possible that this may have resulted in selection bias. Fifth, this study was retrospective, and participants had to rely on their memory to answer questions in the study, with some events happening a long time ago and some information may have been forgotten. Lastly, when women were divided into primarily threat to life trauma, primarily social trauma, neither, nor both, resulted in vastly different group size. This was also the case when dividing women according to their worst trauma (a physical/sexual assault and a natural disaster). This may have impacted the results.

**Conclusion**

In conclusion, resilience is a robust protective factor against PTSD following a traumatic event. Resilience moderated the relationship between threat appraisals, number of types of traumatic events, worst traumatic event and PTSD symptoms. The clinical implications of these findings underscore that by finding fruitful ways to promote resilience in the population may help to protect women against PTSD following a traumatic event, particularly women with high threat appraisal of the traumatic event, women that have been exposed to a higher number of traumatic events and women that have experienced a physical or a sexual assault.
References


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