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Original Research

Experience of Trauma and Pain in Women and Men: A Study in the General Population

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Abstract

Background: The relationship between trauma, post-traumatic stress and pain has been well-documented in psychological research, as well as the greater vulnerability of women to these conditions. However, there is limited knowledge available in the general population. The present study aims to analyze gender differences in the presence and impact of trauma, central sensitization, pain, sleep disturbances, and emotional distress in a Spanish community sample, as well as the relationship between these variables in men and women. **Methods**: A total of 1529 participants completed several self-report questionnaires and were distributed into three groups: Central sensitization syndrome (CSS), other pathology, and healthy. **Results**: Across all groups, women reported significantly higher levels in almost all evaluated measures when compared to men. Women (in all groups) suffered more interpersonal and continued trauma and showed a higher rate of diagnosis and symptoms of post-traumatic stress disorder (PTSD) than men. The link between PTSD symptomatology and pain was more pronounced in women than in men in both the CSS and healthy groups. **Conclusions**: These results support the contribution of trauma sequelae to the experience and chronification of pain, and suggest the need to address PTSD symptoms in pain management, especially in women.

Keywords: gender; trauma; post-traumatic stress; pain; central sensitization

Experiencia de Trauma y Dolor en Mujeres y Hombres: Un Estudio en Población General

Resumen

Antecedentes: La relación entre trauma, estrés postraumático y dolor ha sido bien documentada en la investigación psicológica, así como la mayor vulnerabilidad de las mujeres a estas condiciones. Sin embargo, hay un conocimiento limitado en la población general. El presente estudio tiene como objetivo analizar las diferencias de género en la presencia e impacto del trauma, sensibilización central, dolor, trastornos del sueño y malestar emocional en una muestra española, así como la relación entre estas variables en hombres y mujeres. **Métodos**: Un total de 1529 participantes completaron varios cuestionarios de autoinforme y se distribuyeron en tres grupos: síndrome de sensibilización central (SSC), otras patologías, y sanos. **Resultados**: En todos los grupos, las mujeres mostraron niveles significativamente más altos en casi todas las medidas en comparación con los hombres. Las mujeres (en todos los grupos) sufrieron más trauma interpersonal y continuo y mostraron una mayor tasa de diagnóstico y síntomas de trastorno de estrés postraumático (TEPT) que los hombres. El vínculo entre la sintomatología del TEPT y el dolor fue más pronunciado en mujeres que en hombres, tanto en el grupo de SSC como en el grupo sano. **Conclusiones**: Estos resultados apoyan la contribución de las secuelas del trauma a la experiencia y cronificación del dolor, y sugieren la necesidad de abordar los síntomas del TEPT en el manejo del dolor, especialmente en mujeres.

Palabras Claves: género; trauma; estrés postraumático; dolor; sensibilización central

1. Introduction

Life experiences that threaten the physical or psychological integrity of individuals are extremely widespread in the general population. Based on a sample of 68,894 individuals from 24 different countries, it was estimated that 70% of them had experienced a traumatic event in their lifetime, and 30.5% had been exposed to four or more traumatic events (Benjet et al, 2016). It is estimated that the prevalence of post-traumatic stress disorder (PTSD) in the general population is 6.1% (4.1% in men and 8% in women) (Goldstein et al, 2016). Among women, the most frequently identified traumatic events are repetitive and interpersonal in nature (e.g., child abuse, gender-based violence), which are more closely associated with the later development of PTSD (Liu et al, 2017).

Exposure to traumatic events has a major impact on a person's physical well-being (Jadhakhan et al, 2023). In this sense, Boals et al. (2013) suggest that it is not just the mere frequency of trauma symptoms that affect well-being but also the disruptive capability of these symptoms. In a study of 38,051 people from 14 countries, Scott et al. (2013) found that traumatic events are associated with pain conditions such as migraines, neck pain, and lower back pain. There are also gender-specific differences in the experience of pain, as it is observed that women suffer more frequently for chronic pain compared to men (Bimpong et al, 2022; Keogh, 2022).

Previous research points to the contribution of the phenomenon of central sensitization (CS) to the etiopathogenesis of chronic pain conditions, such as fibromyalgia, headaches, vulvodynia, and irritable bowel syndrome, among others (Yunus, 2015). CS is defined as the "increased responsiveness of nociceptive neurons in the central nervous system to normal or subthreshold afferent input" (International Association for the Study of Pain, 2011) and is associated with clinical phenomena such as hyperalgesia (increased sensitivity to pain) and allodynia (perception of pain in response to normally non-painful stimuli). Gender differences in vulnerability to CS have been identified (Smith et al, 2019) consistent with the higher risk of developing chronic pain in women (Fillingim, 2023). In addition, CS is related to traumatic events, as emotional memories associated with trauma activate the anterior cingulate cortex, which increases pain, and deactivate the dorsolateral prefrontal cortex, which decreases pain modulation (Schubiner and Betzold, 2019).

Several studies confirm the relationship between trauma/PTSD, CS, and pain. Smith et al. (2010) found that traumatic events were related to worse mental and physical health in fibromyalgia patients and that perceived stress partially mediated the effect of traumatic events on mental and physical health in this group. McKernan et al. (2019) observed in patients with chronic pain that both traumatic events and PTSD symptoms were significantly associated with clinical indicators of CS, such as pain intensity and severity. Miró et al. (2020) found that fibromyalgia patients reported higher trauma exposure than controls, along with more PTSD symptoms, many of which occurred in a significant number of cases before the diagnosis of fibromyalgia. A meta-analysis (Nanavaty et al, 2023) confirms a positive association between psychological trauma and increased pain sensitivity, a relationship moderated by CS. Likewise, a recent systematic review (Karimov-Zwienenberg et al, 2024) highlights the long-term and complex impact of cumulative childhood maltreatment on both PTSD and chronic pain in adulthood. It was also been reported that the likelihood of developing PTSD symptoms is four times higher in individuals with chronic pain compared to healthy individuals (Reyes-Pérez et al, 2020).

The comorbidity of PTSD and chronic pain has led to the formulation of several hypotheses (Otis et al, 2003), having raised the existence of a shared vulnerability and bidirectional relationships between both conditions. The shared vulnerability model (Asmundson et al, 2002) suggests that people with comorbid PTSD and chronic pain share common underlying mechanisms (e.g., anxiety sensitivity), predisposing them to develop one or both of these conditions. The mutual maintenance model (Sharp and Harvey, 2001) proposes that the cognitive, affective, and behavioral components of pain exacerbate and maintain PTSD, while the physiological, affective, and avoidance components of PTSD exacerbate and maintain pain. It has also been suggested that pain catastrophizing is a key factor in the maintenance of these syndromes, as it increases pain severity (Alschuler and Otis, 2012), and that insomnia, as well as depressive symptoms, partially mediate the relationship between PTSD and pain severity/interference (Lang et al, 2014; Morasco et al, 2013).

Understanding the relationship established between trauma/PTSD and pain is important not only in the context of CS pain conditions but also at the level of the general population. Zimmer et al. (2021) observed that exposure to war-related traumatic events was associated with poorer general health in the subsequent years. Recently, Schou-Bredal et al. (2022) documented that those women who had experienced sexual harassment had clinically significant symptoms of post-traumatic stress (25%) and also chronic pain (47.5%).

Although there is evidence on the comorbidity and mutual influence between chronic pain and PTSD, few studies have examined the gender differences in pain variables in relation to PTSD symptoms. Given the higher prevalence of chronic pain and PTSD in women, stronger relationships between these variables would be expected in women than in men. However, there does not seem to be a consensus on this matter and many of the previous studies were performed in military samples, in which comorbidity of both conditions (trauma and pain), is common. For example, in patients with chronic pain, McCall-Hosenfeld et al. (2014) examined potential mediators of the pathway

between trauma exposure and somatic symptom severity, and found that in women, depression mediated the pathway, and in men, substance abuse and depression mediated the pathway, but the pathways from trauma exposure to mental health outcomes were stronger for men. In veterans with chronic pain, Hadlandsmyth et al. (2024) observed that women had higher rates of multiple overlapping pain conditions (MOPC), and although PTSD and depressive disorders were strong risk factors for MOPC, the relation between PTSD and MOPC did not differ between women and men. In veterans with chronic pain, Friedman et al. (2024) reported that PTSD symptoms were associated with higher levels of pain catastrophizing, pain intensity and pain interference, but not evidence indicating gender differences in this association were found. In veterans and military with chronic pain, MacDermid et al. (2025) found that the military sexual trauma (MST) exposures were much more common among women, but the associations of MST with severe pain and health indexes were similar across genders.

Despite previous studies, there is still limited evidence available about the relationship between trauma, CS, and pain. In order to deepen the knowledge of this issue, the present study examines the links between CS, pain experiences, and post-traumatic emotional sequelae in the Spanish general population, identifying potential divergent trends according to gender. The following hypotheses will be examined: (1) women will exhibit more intense manifestations of CS, pain, sleep disturbances, anxiety, depression, and catastrophizing than men; (2) women will report more traumatic events (mainly of interpersonal and persistent in nature) than men; (3) women will present more severe PTSD symptoms than men; (4) the presence of PTSD (Diagnostic and Statistical Manual of Mental Disorders, DSM-5; American Psychiatric Association, 2013) will be higher in women than in men; (5) women and men will exhibit a specific (and/or more prominent) correlational pattern between variables (PTSD symptoms, CS, pain, sleep, anxiety, depression, and catastrophizing); and (6) predictors of pain experiences will differ between women and men. These trends will be more pronounced in participants with central sensitization syndrome (CSS).

2. Method

2.1 Participants

A sample of the general Spanish population was obtained involving 1542 people aged between 18 and 84 years (M = 31.79; standard deviation (SD) = 15.15). Of the participants, 69% were women, 31% were men, and 1% identified as non-binary. The sample was classified into three groups: individuals without any medical/psychological diagnosis were assigned to the "healthy" group (n = 861); those diagnosed with chronic fatigue syndrome, fibromyalgia, temporomandibular joint disorder, irritable bowel syndrome, multiple chemical sensitivity, migraine or tension headache, and chronic pain without medical cause in other areas such as back pain, were assigned to the CSS group (self-reported diagnosis in the Central Sensitization Inventory; Mayer et al, 2012) (n = 467); and individuals with other medical conditions other than CSS (e.g., cardiac, endocrine, gynecological, autoinmune, respiratory, respiratory, traumatological, dermatological) were assigned to the "other pathology" group (n = 214). The other pathology group was established in order to determine whether potential gender differences were specific to the CSS group or also occurred in individuals with other conditions (other than CSS). Out of the total number of participants (n = 1542), 13 non-binary individuals were excluded, resulting in a final sample size of 1529 people (1058 women and 471 men).

2.2 Instruments

Items about socio-demographic data (e.g., age, marital status, educational level, etc.) and health data (e.g., perceived current health with four response options—poor, fair, good, and excellent—diagnosed illnesses, medication, surgical interventions, accidents, etc.).

Interview on Traumatic Events and PTSD Symptoms (developed by the authors of this study). This measure was based on the description of PTSD according to the DSM-5 (American Psychiatric Association, 2013) and other instruments (e.g., Global Assessment of Post-traumatic Stress; Crespo et al, 2017; Posttraumatic Stress Disorder Symptom Severity Scale-Revised; Echeburúa et al, 2016), and three independent evaluators (expert psychologists) confirmed the adequacy of the formulated items. The interview includes two sections. The first part includes a list of 15 types of traumatic events (of diverse nature, e.g., physical trauma, physical and sexual abuse, psychological trauma), that the person answers according to the options: "I have not experienced it", "I had a direct experience with this event", "I directly witnessed this event happening to another person(s)", and "I have knowledge that this event happened to a close family member or friend". Then, the person has to briefly explain the traumatic event that most marked him/her and answer a series of questions about when the event happened, how old he/she was at the time, how long ago it happened, and how often the event occurred. The second part covers the DSM-5 diagnostic criteria for PTSD (American Psychiatric Association, 2013), including 28 questions with 4 response alternatives quantified between 0 and 3 points ("not at all", "a little", "quite a lot" and "a lot") that explore PTSD symptoms. These questions are grouped into the following six dimensions. Intrusive symptoms: distressing memories of the trauma; distressing dreams related to the trauma; experiencing sensations, emotions, or behaviors as if the trauma was recurring; intense psychological distress when exposed to cues that symbolize/resemble the trauma; intense physiological reactions to cues that symbolize/resemble the trauma. Avoidance behaviors: avoidance of distressing memories, thoughts, or feelings about

the trauma; avoidance of people, places, conversations, activities, objects, or situations that arouse distressing memories, thoughts, or feelings about the trauma. Cognitive and mood symptoms: difficulty/inability to recall important aspects of the trauma; negative beliefs about oneself, others, or the world; distorted belief that oneself or others are to blame for the trauma; negative emotional state; diminished interest in meaningful activities in daily life; feeling detached, estranged, or distant from others; inability to experience positive emotions. Hyperarousal symptoms: irritable behavior and outbursts of rage; reckless or self-destructive behavior; constant state of alert; becoming easily startled or alarmed; concentration problems; sleep disturbance. Dissociative symptoms: feeling that one is an external observer of one's own mental or bodily processes, and feeling of unreality of one's surroundings. Interference in daily life: impact of symptoms on various areas of life (social, work or academic, relationship with partner, family relationship, etc.). In this sample, the Cronbach's alpha coefficients of the subescales were: intrusive symptoms (0.89), avoidance behaviors (0.83), cognitive and mood symptoms, (0.90), hyperarousal symptoms (0.86), dissociative symptoms (0.88), and interference in daily life (0.90).

Central Sensitization Inventory (CSI; Mayer et al, 2012). The CSI explores symptoms related to CS. For this study, Part A of the instrument was used, which consists of 25 items about health symptoms scored from 0 (never) to 4 (always). The scores range from 0 to 100, with 40 being the cutoff point for identifying a person with CS. The Spanish adaptation of the CSI demonstrated adequate internal consistency (0.87) and test-retest reliability (0.91) (Cuesta-Vargas et al, 2016). In this sample, the Cronbach's alpha coefficient was 0.91.

McGill Pain Questionnaire-Short Form (MPQ-SF; Melzack, 1987). This questionnaire assesses several dimensions of pain experience using 15 verbal pain descriptors, a current pain intensity index, and a visual analogue scale (VAS) to assess pain intensity in the last week (from 0 to 10). The present study used the VAS and the sensory-affective scale. Several studies have reported the reliability and validity of the Spanish version of the MPQ (e.g., Lázaro et al, 2001). In this sample, the Cronbach's alpha coefficient of the sensory-affective scale was 0.91.

Pittsburgh Sleep Quality Index (PSQI; Buysse et al, 1989). The PSQI includes 19 items that explore subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbances, use of sleeping medication, and daytime functioning. The score ranges from 0 to 21, with high scores indicating disturbance. The Spanish version of the PSQI has shown acceptable internal consistency (0.81) test-retest reliability and convergent validity (Hita-Contreras et al, 2014). In this sample, the Cronbach's alpha coefficient of the PSQI was 0.81.

Hospital Anxiety and Depression Scale (HADS; Zigmond and Snaith, 1983). This scale explores anxiety and depression symptoms using 14 items that are rated on a scale ranging from 0 to 3. The Spanish version of this instrument has good internal consistency (0.85 in the anxiety scale and 0.84 in the depression scale) and external validity (Herrero et al, 2003). In this sample, the Cronbach's alpha coefficient of the anxiety scale and depression scale was 0.84 and 0.80, respectively.

Pain Catastrophizing Scale (PCS, Sullivan et al, 1995). This scale assesses the rumination, magnification and helplessness associated with pain. It includes 13 items measured on a Likert scale ranging from 0 (not at all) to 4 (all to time). The Spanish version of the PCS has shown good internal consistency (0.79), test-retest reliability, and sensitivity to change (García-Campayo et al, 2008). In this sample, the Cronbach's alpha coefficient of the PCS was 0.95.

2.3 Procedure

Participants completed an online survey that took approximately thirty minutes to complete, was conducted on the LimeSurvey platform (https://www.limesurvey.org/es/) and disseminated through the institutional mail of the University of Granada, social networks, non-care community contexts, etc. The study was approved by the Granada Provincial Research Ethics Committee. All participants provided informed consent before taking part in the study. The inclusion criteria were an age of at least 18 years of age and the willingness to complete the survey voluntarily without any reward. The first section of the survey contained information on sociodemographic and health data. The second section consisted of several questionnaires on the psychological variables of interest.

2.4 Data Analyses

The analyses were performed using IBM SPSS Statistics software (version 28.0.1.0, IBM Corporation, Armonk, NY, USA) The recruited sample as well as the established groups were well above the minimum required sample size (n = 172) assuming an anticipated effect size of 0.5, a desired statistical power of 0.90, and a significance level of 0.05.

Probabilities <0.05 were used as the level of significance. The basic descriptive statistics were presented as mean (standard deviation) and percentage. To compare clinical characteristics between men and women in each group, the χ^2 test was used for categorical variables, and the independent samples t-test was used for quantitative variables. Effect sizes were calculated using Cohen's d and the following guidelines were considered (Cohen, 1988): small (0.2 to 0.4), medium (0.5 to 0.7), and large (above 0.8).

The interaction between factors was examined through a 3 (group; CSS vs. other pathology vs. healthy) $\times$ 2 (gender; men vs. women) Multivariate Analysis of Variance (MANOVA) and univariate tests for each dependent variable. The effect size was calculated with

the η_p^2, and the following guidelines were considered: small (0.01 to 0.04), medium (0.06 to 0.11), and large (above 0.14) (Cohen, 1988). The relationship between clinical measures was examined with Pearson's correlation coefficient. Correlations were interpreted as: low (0.10 to 0.29), medium (0.30 to 0.49) or high (0.50 or higher) (Cohen, 1988). To reduce the probability of a Type I error, the Bonferroni adjustment was used. To determine which factors, contribute to the prediction of sensory-affective pain (dependent variable) in both men and women, multiple regression analysis (enter method) was employed. The independent variables included in each regression analysis were based in the correlational patterns identified.

3. Results

3.1 Sociodemographic Characteristics

The mean age of women was 31.02 years (SD = 14.78), while that of men was 33.8 years (*SD* = 15.91). The majority of participants were single (71% in women and 65.4% in men), had completed university studies (61.6% in women and 45.2% in men) and were actively employed (31.7% in women and 47.6% in men). There were no significant differences between men and women in marital status (χ^2 = 8.08, p = 0.089), but there were significant differences in age (t = 3.22, $p < 0.001$), completed studies (χ^2 = 43.36, $p < 0.001$), employment status (χ^2 = 45.15, $p <$ 0.001), and current health (χ^2 = 28.28, $p < 0.001$).

3.2 Clinical Characteristics

Women exhibited significantly higher scores than men across all variables in the CSS group. In the other pathology group, women scored higher in all measures except sleep quality, whereas in the healthy group, gender differences were observed in all variables except depressive symptoms (Table 1). Comparing the magnitude of these gender differences in each group, it was observed that the CSS group had a larger effect size than the healthy group in CS, pain intensity, sensory-affective pain, sleep quality, and anxiety. The other pathology group showed larger effect sizes than the CSS group on measures of sensory-affective pain, anxiety, depression, and pain catastrophizing.

The 3×2 MANOVA on the set of clinical variables showed a significant effect of the factors Group, F (14, 3010) = 10.23, $p < 0.001$, η_p^2 = 0.05, and Gender, F (7, 1504) = 20.13, $p < 0.001$, η_p^2 = 0.09, but not from the Group × Gender interaction F (14, 3010) = 1.43, p = 0.129. The univariate approach also showed a significant inter-subjects effect of the Group factor, between F (2) = 9.65, $p < 0.001$, η_p^2 = 0.01 and F (2) = 50.41, $p < 0.001$, η_p^2 = 0.06, and the Gender factor, between F (1) = 13.34, $p < 0.001$, η_p^2 = 0.01 and F (1) = 98.08, $p < 0.001$, η_p^2 = 0.06, in all measures. Furthermore, there was a significant inter-subjects effect of the Group × Gender interaction on CS, pain (intensity and sensory-affective), and depression, between F (2) = 3.26, $p < 0.05$, η_p^2 = 0.004 and F (2) = 5.55, $p < 0.01$, η_p^2 = 0.01, which was not evident in sleep quality, anxiety and pain catastrophizing ($p > 0.128$).

3.3 Comparison in Traumatic Events and PTSD

The results showed (Table 2) that 48% of men and 56.3% of women in the CSS group had experienced at least one traumatic event; in the other pathology group, 47.7% of men and 59.5% of women; and in the healthy group, 34% of men and 45.8% of women. There were more women than men (in all groups) who had experienced potentially interpersonal and/or ongoing traumatic events (sexual harassment by an acquaintance/unknown, bullying/psychological abuse in the work/academic or intrafamily/partner areas, and physical abuse in the intrafamily/partner area), except for two cases: there was a higher percentage of men (6.3%) versus women (4.4%) in the healthy group who had experienced physical abuse in the intrafamily/partner area, and a slightly higher proportion of men (26.5%) versus women (25.5%) in the CSS group who had experienced bullying/psychological abuse in the work/academic area.

In the CSS group all values were higher than in the healthy group (in both genders), except for sexual harassment by an acquaintance, where there was a higher percentage of healthy men (2.5%) compared to CSS men (2%). In the other pathology group, women had lower percentages than in the CSS group but higher than in the healthy group in all the events described, except for rape by a stranger, where the percentage (4.8%) was lower than both the CSS group (9.6%) and the healthy group (7.2%). In men, the percentages were lower than the rest of the groups in sexual harassment by a stranger and physical abuse in the intrafamily/partner area, lower than the CSS group but higher than the healthy group in psychological abuse in the work and family/partner areas, and lower compared to the healthy group but higher than the CSS group in sexual harassment by an acquaintance. Traumatic events occur mostly in adult life and a single occasion in both genders (in all groups).

With respect to PTSD symptomatology (Table 3), it was observed that in the CSS group, the gender differences were significant in all symptoms except dissociative symptoms (higher scores in women). In the other pathology group, the differences were significant in intrusive symptoms, dissociative symptoms and avoidance behaviors, but not in cognitive/emotional symptoms, hyperarousal symptoms and interference in daily life. In the healthy group the differences were significant in all symptoms.

The 3×2 MANOVA on the set of PTSD symptoms showed a significant effect of the factors Group, F (12, 1550) = 3.30, $p < 0.001$, η_p^2 = 0.03 and Gender, F (6, 774) = 6.18, $p < 0.001$, η_p^2 = 0.05, but not from the Group × Gender interaction F (12, 1550) = 0.72, p = 0.730. The univariate approach showed a significant inter-subjects effect of the Group factor, between F (2) = 4.22, $p < 0.05$, η_p^2 = 0.01 and F (2) = 17.86, $p < 0.001$, η_p^2 = 0.04, and Gender factor, between F (1) = 8.20, $p < 0.01$, η_p^2 = 0.01, and F

Table 1. Clinical characteristics of men and women in the study groups.

	Central sensitization syndrome				Other pathology				Healthy			
	Men n = 98 M (SD)	Women n = 364 M (SD)	t	d	Men n = 88 M (SD)	Women n = 126 M (SD)	t	d	Men n = 285 M (SD)	Women n = 568 M (SD)	t	d
Central sensitization (CSI)	32.67 (12.38)	43.37 (15.80)	7.13***	0.71	26.48 (12.97)	35.80 (14.54)	4.82***	0.67	25.60 (12.10)	31.52 (13.32)	6.31***	0.46
Pain intensity (MPQ-SF)	3.21 (2.10)	4.34 (2.45)	4.52***	0.48	2.52 (1.82)	3.49 (2.4)	3.36***	0.45	2.26 (1.57)	2.56 (1.84)	2.48**	0.17
Sensory–affective pain (MPQ-SF)	5.84 (6.98)	8.70 (9.16)	3.35***	0.33	2.92 (4.68)	5.68 (7.47)	3.32***	0.43	2.67 (4.13)	3.58 (4.66)	2.89**	0.20
Sleep quality (PSQI)	6.90 (3.51)	8.34 (4.34)	3.39***	0.35	6.35 (3.71)	7.02 (3.92)	1.26	0.18	5.62 (2.90)	6.27 (3.38)	2.94**	0.20
Anxiety (HADS-A)	6.84 (3.86)	9.02 (4.45)	4.43***	0.51	5.15 (3.83)	7.84 (4.44)	4.62***	0.64	5.64 (3.47)	7.12 (4.21)	5.47***	0.37
Depression (HADS-D)	5.03 (4.06)	6.17 (4.46)	2.29*	0.26	4.10 (3.54)	5.45 (4.32)	2.50**	0.34	4.33 (3.51)	4.42 (3.70)	0.34	0.03
Pain catastrophizing (PCS)	11.66 (9.62)	17.48 (12.66)	4.95***	0.48	8.65 (9.08)	14.70 (11.76)	4.24***	0.56	8.61 (8.54)	13.77 (11.03)	7.53***	0.50

Note. CSI, Central Sensitization Inventory; MPQ-SF, McGill Pain Questionnaire-Short-Form; PSQI, Pittsburgh Sleep Quality Index; HADS-A, Hospital Anxiety and Depression Scale (anxiety); HADS-D, Hospital Anxiety and Depression Scale (depression); PCS, Pain Catastrophizing Scale; M, mean; SD, standard deviation. *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

Table 2. Frequency of traumatic events of men and women in the study groups.

Traumatic Events	Central sensitization syndrome			Other pathology			Healthy		
	Men $n = 98$	Women $n = 364$	χ^2	Men $n = 88$	Women $n = 126$	χ^2	Men $n = 285$	Women $n = 568$	χ^2
Natural disasters (%)	29.6	25.8	0.65	13.6	21.4	7.47	15.8	18.7	1.75
Transport accidents (%)	35.7	24.2	7.75	18.2	23	1.91	24.6	15.3	14.04**
Others accidents (%)	23.5	17.6	5.86	18.2	8.7	6.38	16.8	9.2	11.75**
Sexual harassment/rape by an acquaintance (%)	2	14.3	13.92**	2.3	10.3	6.75	2.5	6.7	11.58**
Sexual harassment/rape by an unknown (%)	6.1	9.6	1.39	1.1	4.8	2.90	2.8	7.2	11.08*
Bullying/psychological abuse in the work/academic (%)	26.5	25.5	0.09	15.9	21.4	1.15	10.9	18.1	7.96*
Bullying/psychological abuse in the intrafamily/partner area (%)	12.2	27.5	10.57*	9.1	23	9.13*	7.7	16.5	15.97**
Physical abuse in the intrafamily/partner area (%)	9.2	17.6	5.99	5.7	11.1	4.14	6.3	4.4	8.10*
Physical violence in the community context (%)	13.3	4.4	16.37***	6.8	1.6	5.13	6.3	2.5	8.47*
Sudden, accidental or violent death of a loved one (%)	28.6	33.8	2.02	29.5	37.3	3.40	21.1	25.2	4.06
Serious illness (%)	6.1	14	4.98	19.3	15.9	2.26	5.3	6.7	5.56
War zone exposure (%)	2	1.4	0.52	0	0.8	2.83	2.5	0.5	10.50*
Terrorist acts, torture or kidnapping (%)	1	0.5	2.97	0	1.6	2.24	2.5	0.5	8.23*
Imprisonment or detention (%)	6.1	2.2	7.07	3.4	0	5.82	3.5	0.7	9.33*
Repulsive situations (%)	7.1	2.2	8.43*	1.1	1.6	3.46	5.6	1.6	10.96*
Other traumatic event (%)	22.4	16.2	2.12	11.4	17.5	3.31	10.5	10.2	4.84
Time of occurrence of the traumatic event (%)			1.28			0.81			1.46
Childhood	13.7	19.4		27.7	20.8		18.9	17.7	
Adolescence	37.3	38.9		27.7	28.6		35.1	41.7	
Adulthood	49	41.7		44.7	50.6		45.9	40.6	
Frequency of occurrence of the traumatic event (%)			9.05*			2.11			8.99*
Single occasion	56.9	46.8		61.7	54.5		61.3	59.4	
Several occasions	37.3	28.2		12.8	23.4		27.9	18.4	
Repeatedly	5.9	25		25.5	22.1		10.8	22.3	

Note. For each trauma, response options included: "I have not experienced it", "I had a direct experience with this event", "I directly witnessed this event happening to another person(s)", and "I have knowledge that this event happened to a close family member or friend". The percentage corresponding to "I had a direct experience with this event" within the gender is indicated in the cross-tabulation tables.

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

(1) = 35.71, $p < 0.001$, $\eta_p{}^2 = 0.04$, in all PTSD symptoms, but not the Group × Gender interaction ($p > 0.544$)

In the CSS group, 30.8% of women and 20.4% of men met diagnostic criteria for PTSD; in the other pathology group, 26.2% of women and 14.8% of men; and in the healthy group, 19% of women and 8.8% of men. These gender differences were significant in all groups (all $p_s < 0.05$).

3.4 Relationship Between Clinical Variables and PTSD Symptoms

In women, all variables correlated significantly with both pain measures in the three subgroups. In men, all variables correlated significantly with sensory-affective pain and pain intensity, except in the group CSS, where depression does not correlate with pain intensity. Regarding the correlation between PTSD symptoms and pain measures, as can be seen in Table 4, a differential pattern was observed in men and women in the three subgroups.

3.5 Pain Predictors

Various regression analyses were performed to determine the predictors of sensory-affective pain (dependent variable) for women and for men in each group. As independent variables, those with significant and high correlations (≥0.50 in the CSS and other pathology groups) or medium-high (≥0.30 in the healthy group) were considered (Table 4). The CS was the most frequent significant predictor in the analyses. In the CSS group, in women, CS ($\beta = 0.53$, $t = 7.28$, $p < 0.001$), sleep quality ($\beta = 0.14$, $t = 2.25$, $p < 0.05$) and pain catastrophizing ($\beta = 0.18$, $t = 3.25$, $p < 0.001$) and in men, CS ($\beta = 0.41$, $t = 3.45$, $p < 0.001$) and anxiety ($\beta = 0.22$, $t = 2.09$, $p < 0.05$) were significant predictors. In the other pathology group, in women, interference in daily life of PTSD symptoms ($\beta = 0.47$, $t = 3.58$, $p < 0.001$) and in men, CS ($\beta = 0.37$, $t = 2.82$, $p < 0.01$), pain catastrophizing ($\beta = 0.37$, $t = 3.42$, $p < 0.001$) and interference in daily life of PTSD symptoms ($\beta = 0.34$, $t = 2.34$, $p < 0.05$) were significant predictors. In the healthy group, in women, CS ($\beta = 0.41$, $t = 6.32$, $p < 0.001$), anxiety ($\beta = 0.16$, $t = 2.17$, $p < 0.05$), pain catastrophizing ($\beta = 0.17$, $t = 3.35$, $p < 0.001$) and dissociative symptoms of PTSD ($\beta = 0.12$, $t = 2.09$, $p < 0.05$), and in men, anxiety ($\beta = 0.28$, $t = 2.18$, $p < 0.05$), and dissociative symptoms of PTSD ($\beta = 0.34$, $t = 2.92$, $p < 0.01$) were significant predictors.

4. Discussion

This study analyzed gender differences in trauma exposure, pain, and related constructs in a general Spanish population sample. Hypothesis 1 is confirmed since the results indicate that women present more exacerbated manifestations than men in all groups in pain, CS, sleep problems, anxiety, depression and pain catastrophizing, which agrees with previous research (Arias-de la Torre et al, 2021; Keogh, 2022; Meints et al, 2017; Smith et al, 2019; Zeng et al, 2020). The effect size of these differences between men and women was greater in the CSS group compared to the healthy group (in almost all variables), which could indicate that the gender differences observed in healthy population are accentuated when chronic pain develops. The CSS group presented more intense clinical symptoms than the other groups, as expected based on previous studies (Miró et al, 2012).

Regarding traumatic experiences, women reported more frequently than men (in all groups) having suffered sexual harassment/rape by an acquaintance/unknown, and psychological abuse in the intrafamily/partner relationship. They also reported having experienced more bullying/psychological abuse in the work/academic in the other pathology and healthy groups and more physical abuse in the intrafamily/partner area in the CSS and other pathology groups. So, these potentially interpersonal and ongoing events are more prevalent in women, results that agree with previous studies (Blanco et al, 2018; Liu et al, 2017) and with hypothesis 2 proposed. The CSS group suffered a greater proportion of the traumatic events mentioned; for example, in the CSS group, 23.9% of the women had been sexually harassed/raped by an acquaintance/unknown, compared to 15.1% and 13.9% of the women in the other pathology group and the healthy group, respectively. Also, noteworthy are the high percentages of men in the CSS group compared to the rest of the groups (6.1% had experienced sexual harassment/rape by an unknown; 26.5% bullying/psychological abuse at work/academic). These data agree with studies such as that of Krantz et al. (2019), who documented that people with chronic pain had higher rates of physical, sexual, and psychological abuse.

These findings suggest that women are at greater risk than men of experiencing interpersonal and prolonged trauma, along with its psychological consequences, both in the healthy population and CSS groups. On the other hand, the high percentages of these traumatic events reported by men in the CSS group stand out. Due to existing gender stereotypes, men may have greater difficulty verbalizing and sharing these experiences due to fear of stigma and the need to conform to those gender standards.

Regarding the manifestations of PTSD, greater severity was observed in women in all symptoms compared to men. These differences were significant in all symptoms except dissociative symptoms in the CSS group and in all symptoms in the healthy group. These findings are consistent with previous research (Guina et al, 2019; Miró et al, 2020) and with hypothesis 3. In addition, women also presented higher rates of PTSD diagnosis than men in all groups, in line with previous research (Kimerling et al, 2018) and with hypothesis 4. Participants with CSS had higher rates of PTSD diagnosis than the rest of the study subjects, according to previous research (Reyes-Pérez et al, 2020).

Table 3. Symptoms of post-traumatic stress disorder of men and women in the study groups.

	Central sensitization syndrome				Other pathology				Healthy			
	Men	Women			Men	Women			Men	Women		
	n = 98	*n* = 364	*t*	*d*	*n* = 88	*n* = 126	*t*	*d*	*n* = 285	*n* = 568	*t*	*d*
	M (SD)	*M (SD)*			*M (SD)*	*M (SD)*			*M (SD)*	*M (SD)*		
Intrusive symptoms	3.47 (3.19)	5.69 (4.11)	4.21***	0.56	3.02 (3.42)	4.82 (3.96)	2.58**	0.48	2.43 (2.90)	4.26 (3.62)	5.24***	0.54
Avoidance behaviors	1.51 (1.64)	2.20 (1.88)	2.41**	0.38	1.34 (1.72)	2.01 (1.92)	1.96*	0.36	0.98 (1.45)	1.76 (1.85)	4.42***	0.45
Cognitive and mood symptoms	4.76 (4.64)	6.81 (5.47)	2.47**	0.38	4.28 (4.91)	5.91 (5.54)	1.66	0.31	3.2 (4.25)	4.63 (4.70)	2.79**	0.31
Hyperarousal symptoms	4.65 (4.07)	6.30 (4.61)	2.35*	0.37	4.02 (3.82)	4.74 (4.25)	0.95	0.18	2.51 (2.75)	3.94 (3.76)	4.16***	0.41
Dissociative symptoms	1.06 (1.61)	1.24 (1.62)	0.71	0.11	0.47 (1.20)	1.03 (1.65)	2.18*	0.38	0.45 (0.89)	0.82 (1.41)	3.10**	0.29
Interference in daily life	4.18 (4.88)	5.78 (5.07)	2.05*	0.32	3.64 (4.35)	4.48 (4.87)	0.10	0.18	2.84 (3.90)	3.84 (4.17)	2.19*	0.26

Note. *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

Table 4. Relationship between clinical variables of men and women in the study groups.

	Central sensitization syndrome				Other pathology				Healthy			
	Pain intensity (MPQ-SF)		Sensory-affective pain (MPQ-SF)		Pain intensity (MPQ-SF)		Sensory-affective pain (MPQ-SF)		Pain intensity (MPQ-SF)		Sensory-affective pain (MPQ-SF)	
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
	n = 98	*n* = 364	*n* = 98	*n* = 364	*n* = 88	*n* = 126	*n* = 88	*n* = 126	*n* = 285	*n* = 568	*n* = 285	*n* = 568
Clinical measures												
CSI	0.41*	0.55*	0.63*†	0.69*†	0.57*	0.51*	0.53*†	0.59*†	0.36*	0.50*	0.42*†	0.58*†
PSQI	0.40*	0.47*	0.38*	0.53*†	0.52*	0.50*	0.58*†	0.61*†	0.23*	0.35*	0.31*†	0.41*†
HADS-A	0.43*	0.41*	0.55*†	0.51*†	0.53*	0.36*	0.49*	0.41*	0.33*	0.41*	0.46*†	0.47*†
HADS-D	0.28	0.39*	0.52*†	0.51*†	0.47*	0.43*	0.39*	0.50*†	0.30*	0.39*	0.35*†	0.42*†
PCS	0.38*	0.41*	0.41*	0.51*†	0.49*	0.37*	0.64*†	0.41*	0.29*	0.29*	0.33*†	0.31*†
Symptoms of post-traumatic stress disorder												
IS	0.26	0.23*	0.32	0.32*	0.46*	0.56*	0.58*†	0.50*†	0.20	0.23*	0.30	0.20*
AB	0.29	0.21	0.28	0.29*	0.24	0.47*	0.32	0.43*	0.26	0.22*	0.26	0.22*
CMS	0.29	0.26*	0.38	0.33*	0.52*	0.47*	0.53*†	0.59*†	0.23	0.26*	0.35*†	0.31*†
HS	0.26	0.38*	0.40	0.50*†	0.48*	0.57*	0.42	0.65*†	0.26	0.34*	0.39*†	0.38*†
DS	0.33	0.24*	0.47*	0.33*	0.46*	0.49*	0.41	0.56*†	0.22	0.17	0.46*†	0.34*†
ID	0.11	0.25	0.23	0.33*	0.62*	0.54*	0.60*†	0.67*†	0.20	0.27*	0.31*†	0.32*†

Note. IS, intrusive symptoms; AB, avoidance behaviors; CMS, cognitive and mood symptoms; HS, hyperarousal symptom; DS, dissociative symptoms; ID, interference in daily life.

† Independent variables selected for regression analysis.

Bonferroni Adjustment, *$p < 0.0019$.

Regarding the link between pain and PTSD symptoms, there was no significant relationship in men in the CSS group (except for the dissociative symptoms with the sensory-affective of pain), but in women, all symptoms correlated significantly with the sensory-affective of pain, and all, except avoidance behaviors and interference in daily life, with pain intensity. This may indicate that the relationship between PTSD and pain is greater in women than in men in the chronic pain population. In the healthy group, all symptoms of PTSD correlated significantly with the sensory-affective of pain in women, and in men all symptoms did so except intrusive symptoms and avoidant behaviors. None of the PTSD symptoms were significantly associated with pain intensity in men in the healthy group, but in women, all symptoms were significantly associated except dissociative symptoms. This could indicate that there is no relationship between PTSD symptoms and pain intensity in men, but there is in women, both in the healthy and chronic pain population. The findings suggest that the relationship between PTSD symptoms and sensory-affective pain is similar in men and women in a healthy population, but when chronic pain develops, this link is consolidated in women while it is attenuated in men. The most relevant symptoms in this relationship, in the men, were the dissociative ones, since they presented the highest correlation in the healthy group and the only significant one in the CSS group. The results indicate a more prominent correlational pattern in women than in men, thus confirming hypothesis 5. However, it differs from the findings of previous research (Friedman et al, 2024; Hadlandsmyth et al, 2024; MacDermid et al, 2025). Note that these studies were carried out on military personal/veterans, which may constitute a group with distinct characteristics than the general population, given that military culture often emphasizes bravery and strength, which can lead to repressing/minimizing discomfort and equalize possible gender differences.

The CS was the most frequent predictor variable of pain, which supports previous research that documents the relationship between both variables (Noel et al, 2015). On the other hand, in the healthy group, dissociative symptoms were significant predictors of pain in both men and women. In this sense, it has been found that dissociative manifestations are linked to worse physical health (Panisch et al, 2022). The findings indicate that the variables that contributed to explaining the pain were partially different in women and men, so hypothesis 6 was only partially confirmed.

The present study had several limitations. The CSS group included the most common chronic pain conditions, but other disorders involving central sensitization may not have been adequately represented. The substance use/abuse, a common problem both in people with PTSD and in those with pain syndromes, was not evaluated. The cross-sectional nature of the study prevents establishing causal relationships. There may be a recall bias in self-reporting of traumatic events. Beyond the inter-rater reliability and internal consistency reported in the present study, the Interview on Traumatic Events and PTSD Symptoms does not have independent psychometric validation. The high number of women participants may limit the generalizability of gender comparisons. For future research, it would be of great interest to replicate these findings in samples from healthcare settings (e.g., rheumatology services, hospital pain units) in non-military population, and to use objective measures to assess clinical parameters (e.g., algometry for pain, polysomnography for sleep). Furthermore, to avoid perpetuating a dichotomous view of gender, studies that include the wide range of gender identities, expressions, and roles that exist in society would be necessary.

5. Conclusions

The findings of the present study suggest that women are more prone than men to all pain-related variables, whether or not they have a CSS. This differential susceptibility is likely exacerbated during the development of chronic pain. Furthermore, women are also more prone than men to traumatic events with greater psychological impact, present greater PTSD symptoms, and have higher rates of PTSD diagnosis, whether or not they have a CSS. People with CSS have higher levels of clinical symptoms, traumatic events, PTSD symptoms, and PTSD diagnoses. Finally, the relationship between PTSD symptoms and pain appears to be stronger in women than in men, which, together with the above, suggests the importance of considering trauma and its consequences in the psychological treatment of pain, especially in women. It is recommended that the treatment of chronic pain adopt a multidisciplinary and integral perspective in accordance with the clinical characteristics of each patient (Martínez et al, 2021; Sánchez et al, 2021). In this sense, understanding gender-specific differential patterns can be relevant for individualized treatment planning, and for promoting specific clinical strategies aimed at addressing the distinct needs identified in women and men.

Availability of Data and Materials

The data are available from the corresponding author on reasonable request.

Author Contributions

Conceptualization, MPM, AIS, and EM; Methodology, investigation and formal analysis, MPM, NP, AIS, NVA, CA, and EM; Provided supervision and assistance with the clinical interpretation of the results, MPM, AIS, and EM; Writing—original draft, MPM, NP, and EM; Writing—review and editing, MPM, NP, AIS, NVA, CA, and EM. All authors contributed to editorial changes in the manuscript. All authors read and approved the final manuscript. All authors participated sufficiently in the

work and agreed to be accountable for all aspects of the work.

Ethics Approval and Consent to Participate

This study is part of a broader research project that was approved and carried out following the recommendations of the CEIM/CEI Provincial de Granada (acta 11/19) (Consejería de Salud y Familias, Junta de Andalucía), and in accordance with the Declaration of Helsinki. Informed consent was obtained from all participants included in the study.

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Conflict of Interest

The authors declare no conflict of interest.

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