Observational Studies

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Role of history of traumatic life experiences in current psychosomatic manifestations

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Abstract

Objectives – Although the relationship between traumatic experiences (TEs) and psychosomatic manifestations (pain, somatization, somatosensory amplification [SSA], and alexithymia) has been widely described, very few studies have investigated how these variables correlate with each other and with a history of TEs. The aim of this study was to investigate whether and how current psychosomatic manifestations are correlated with major and minor adult- and childhood TEs.

Methods – One hundred and forty-six patients (91 with pain) from the Pisa Gift Institute for Integrative Medicine Psychosomatics Lab., Italy, were assessed for pain, history of TEs (divided into major and minor based on whether or not they meet the DSM-5 Criterion A for post-traumatic stress disorder), alexithymia, somatization, and SSA.

Results – TEs were positively correlated with age, the sensorial dimension and intensity of pain, somatization, psychopathology index, SSA, and alexithymia. Using the somatization score (controlled for age) as a covariate, the previous correlations between psychosomatic dimensions and TEs lost their statistical significance: SSA (total TEs: from $r = 0.30$, $p = 0.000$ to $r = -0.04$, $p = 0.652$); alexithymia (total TEs: from $r = 0.28$, $p = 0.001$ to $r = 0.04$, $p = 0.663$); sensorial dimension of pain (total TEs: from $r = 0.30$, $p = 0.015$ to $r = 0.12$, $p = 0.373$); and pain intensity (total TEs: from $r = 0.38$, $p = 0.004$ to $r = -0.15$, $p = 0.317$). Interestingly, the tendency to report more intense pain was mainly predicted by minor TEs in childhood ($\beta = 0.28$; $p = 0.030$).

Conclusions – The number of lifetime TEs is positively correlated with the sensorial dimension and intensity of pain but not its affective and cognitive dimensions. However, the former relationship depends on the presence of somatization. The intensity of pain is associated with minor rather than major TEs, especially when they occur in childhood.

Keywords: trauma, somatization, alexithymia, pain, psychopathology, psychosomatic

1 Introduction

According to the recent WHO World Mental Health survey, the prevalence of traumatic experiences (TEs), defined as self-reported exposure to stressful events, is estimated to be 82.7% in the United States and 69.7% across all participating countries, with 30.5% of adults having experienced almost four TEs [1]. TEs can lead to the development of post-traumatic stress disorder (PTSD) and other mental disorders, including anxiety, depression, and substance-use disorders [2]. A single TE exposure is also linked to an increased risk of physical diseases like chronic pain, which further increases as more TEs are experienced [3].

For the purposes of diagnosing PTSD, TEs included in the DSM-5 Criterion A are by definition “major,” involving “death, threatened death, actual or threatened serious injury, or actual or threatened sexual violence” [4]. To this might be added life-altering events such as involuntary separation from/as a child. Due to the severity of their impact, major TEs are those most explored in the pain literature [5], but other TEs should not be overlooked [6]. To this end, Giannantonio proposed a systematization of traumas, which includes a group of minor traumas (adoption, divorce, economic problems, physical/emotional neglect, miscarriage, non-sudden death, observations of a sexual nature), distinguishing between TEs that occurred in childhood (before the age of 18) and adulthood [7]. Such a system would be useful in clearing some of the confusion in the classification of trauma in the literature. For example, in a study by Haviland et al. highlighting the relationship between assault/sexual abuse and fibromyalgia, emotional neglect (which had no relationship with fibromyalgia) was included in the major trauma group [8], despite it being

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absent from DSM-5 Criterion A. As mentioned, Giannantonio classed emotional neglect as a minor trauma [7]. This lack of clarity may have a detrimental impact on psychological research in general. For example, although the relationship between somatization and TEs has been widely described in the scientific literature [9–12], how somatization is related to major versus minor trauma, and to what extent, currently remains uncertain.

In line with Lipowski, for this study, we defined somatization as the tendency to experience and communicate psychological distress in the form of somatic symptoms and to seek medical help for them [13]. The tendency to experience intense, noxious, and disturbing somatic sensations (somatosensory amplification [SSA]) [14] and alexithymia (the difficulty in identifying and distinguishing between feelings and bodily sensations, difficulty in describing feelings, and outward-oriented thinking) [15] appear to be two of the most influential factors on the process of somatization [16], the former enhancing somatization symptoms and the latter contributing to its cognitive dimension, attributing negative implications to normal somatic sensations [16].

According to the literature, the level of SSA (measured using the somatosensory amplification scale [SSAS]) is increased in fibromyalgia [17], and high SSA is associated with a low pressure-pain threshold in healthy individuals [18]. It also seems to be associated with oral hypervigilance and oral behaviours that predispose an individual to temporomandibular disorders [19]. It has also been shown, using a questionnaire investigating major TEs, that subjects with somatoform disorders report a greater number of TEs than healthy controls, and that there is a positive correlation between major TEs and SSA [12].

As for the aetiopathogenesis of fibromyalgia, TEs (such as physical or sexual violence) are widely considered to be involved, even though the only available evidence comes from case series or reports, and the results to date have been inconsistent [20]. Similarly, emotional and physical abuse in childhood and an unsupportive family have been implicated in the relationship between somatization and TEs [21], and somatization features may stem from intergenerational transmission of maternal PTSD [22]. In contrast, the relationship between TEs and somatization appears to be little affected by the presence of alexithymia [22], which, instead, is observed more clearly in the relationship between trauma and conversion disorder [23,24]. The relationship between TEs and psychosomatic manifestations such as SSA and alexithymia has also been widely described [12,25], but very few studies have investigated how these variables interact with each other and how this relationship relates to a history of TEs [26,24].

Although several studies support a relationship between TEs and somatic symptoms, there are few that have provided significant evidence on the types of TEs that affect the distortion of body perception. Hence, the aim of this study was to investigate whether and how current psychosomatic manifestations, i.e. somatization, pain, SSA, and alexithymia, are correlated with major and minor adult- and childhood TEs.

2 Methods

2.1 Participants

This study is based on retrospective data from 146 patients seeking assessment and treatment for psychological suffering collected at the Pisa Gift Institute for Integrative Medicine Psychosomatics Lab., Italy, between 2021 and 2023. The total sample was divided into pain (91 patients) and pain-free (55 patients). The group with pain was distinguished from the group without pain based on the presence/absence of pain, investigated through relevant screening questions on a case report form (CRF), including “Have you had pain in the last 2 years?” and through the Italian Pain Questionnaire (IPQ) [27]. All patients were identified as alphanumeric codes in the stored data to guarantee their anonymity, and all signed informed consent. This was an observational study conducted in accordance with the Ethical Principles for Medical Research Involving Human Subjects outlined in the Helsinki Declaration. This article adheres to the STROBE statement guidelines for reporting observational research [28].

2.2 Measures

2.2.1 Sociodemographic variables

Data on patients’ age, gender, education, and civil and social status (based on monthly income), as well as general information on their pain (time of onset, persistence, location, and temporal trend), were collected for each patient on a CRF.

2.2.2 Pain

The IPQ [27], the Italian adaptation of the McGill Pain Questionnaire [29], is a self-report questionnaire consisting of 42 pain descriptors distributed across 16 subclasses under the following four main classes or dimensions: sensory (the sensory qualities of pain), affective (unpleasantness of

pain experience), evaluative (pain intensity and subjective evaluation of pain experience), and mixed (the mixed sensory, affective and evaluative aspects of pain). In our study, IPQ dimensions were calculated on the basis of the PRIrc (pain rating index rank coefficient) ordinal coefficient score between 0 and 1. Scores for each dimension: sensorial (PRIrcS), affective (PRIrcA), evaluative (PRIrcE), and mixed (PRIrcM) were calculated, as was the total (PRIrcT, the sum of all the four dimensions). The internal consistency (Cronbach's α) of our data was as follows: total IPQ = 0.90 and sensory dimension = 0.94.

In line with a previous study [30], the intensity of current pain was assessed using a numerical rating scale (NRS), a self-assessment tool consisting of a horizontal line with numbers at each end, respectively, corresponding to "no pain" (a score of 0) and the "maximum pain imaginable" (a score of 10), which is not included in the IPQ.

2.2.3 History of TEs

The "Inventory of Stressful and Traumatic Life Events" [7], the Italian adaptation of the Life Stressor Checklist-Revised [31], is a self-report questionnaire made up of 29 questions exploring stressful/traumatic events. The questionnaire elicits information on TEs, distinguishing between childhood and adult trauma. Subjects presenting one or more events listed in DSM 5 Criterion A for PTSD [4] were taken as having experienced "Major Trauma," while other TEs, not listed in DSM 5 Criterion A, were defined as having experienced "Minor Trauma." The internal consistency (Cronbach's α) of our data for the total TEs was 0.79.

2.2.4 Alexithymia

Toronto Alexithymia Scale-20 (TAS-20) [15] is a self-report questionnaire composed of 20 items investigating: difficulty in identifying and distinguishing between feelings and bodily sensations (F1), difficulty in describing feelings (F2), and outward-oriented thinking (F3). A total score is also provided. For a diagnosis of alexithymia, the total score must reach at least 61 [15]. The internal consistency (Cronbach's α) of our data for total TAS-20 was 0.65.

2.2.5 Somatization

The Symptom Checklist-90 Revised (SCL-90 R) [32] is a self-report questionnaire used to measure psychopathology. It consists of 90 items grouped into nine symptom dimensions, namely somatization, obsession-compulsion, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoia, and psychoticism. Three global indices are also provided: the Global Severity Index (GSI), the Positive Symptom Total (PST), and the Positive Symptom Distress Index (PSDI). The internal consistency (Cronbach's α) of our data for the somatization dimension was 0.95.

2.2.6 SSA

The somatosensory amplification scale (SSAS) [14] is a self-report scale that quantifies the propensity of a subject to SSA, i.e. the tendency to experience intense, noxious, and disturbing somatic sensations. It consists of ten items scored on a 0–4 Likert scale, with high scores indicating a greater tendency to somatic amplification. The internal consistency (Cronbach's α) was 0.72 [14].

2.3 Statistical analysis

All the data were analysed using the IBM Statistical Package for Social Sciences, version 26.0, and the significance level was set at $p < 0.05$. The Kolmogorov–Smirnov test was used to confirm the Gaussian distribution of the data. The total sample was subdivided on the basis of the self-reported presence of pain over the preceding 2 years into pain-free and pain groups, and the differences between groups in sociodemographic variables, number of TEs, somatization, alexithymia, and psychopathological dimensions were investigated using the *t*-test for continuous variables, and the chi-squared test with Fisher's exact test for categorical variables. The effect sizes were calculated with the $t\text{x}2/(\text{df})^{0.5}$ formula for the *t*-test, and are expressed as phi (φ; small = 0.10, medium = 0.30, large = 0.50) for chi-squared [33]. To investigate any relationships between TEs, alexithymia, and pain, Pearson's partial correlation analyses were performed. To interpret effect size according to Cohen's *d* [34], an *r* correlation coefficient of 0.10 was considered a weak or small association; an *r* of 0.30 a moderate correlation; and an *r* of 0.50 a greater or strong correlation.

To investigate TEs as a predictor of psychosomatic manifestations (somatization, pain, SSA, alexithymia), multiple regression analyses using the stepwise forward model were performed. The elements of the linear regression represented are the following: the coefficient of determination (or $R2$), which measures the ability of the model to predict the result (an $R2$ of 1 indicates that the model explains all of the variability in the outcome); the *t*-test,

which tests the significance of single regression parameters; the standardized coefficient (or β), which reveals the relative relevance of each variable and thereby enables identification of which factors have the highest and lowest relative predictive validity; the p value, which indicates a statistically significant association between the predictor variables and the outcome variable; and the confidence interval (CI), which will be used to determine statistical significance: when the CI does not contain 0, there is a statistically significant difference [35].

3 Results

3.1 Differences between pain-free and pain groups

The total sample was divided into pain-free (55 patients) and pain (91 patients) groups. As shown in Table 1, the two groups differed in terms of age, with the pain-free group being younger (t = −4.185, p = 0.000). Married and divorced people were more prevalent in the pain than in the pain-free group, and the only widowed people were in the pain group (χ^2 = 8.55, p = 0.036, φ = 0.25). No differences in gender, education, or social status were found between the two groups.

Significant differences between the two groups were found in the number of total and minor TEs (t = −2.127, p = 0.036; t = −2.196, p = 0.030, respectively), which were both higher in the pain group, as shown in Table 1. The pain group also had higher scores than the pain-free group for the SCL-90 R dimension somatization, obsession-compulsion, and depression (t = −3.119, p = 0.002; t = −2.320, p = 0.022; t = −2.000, p = 0.047, respectively). SSAS scores were also higher in the pain group than in the pain-free group (t = −4.216, p = 0.000). No differences in alexithymia dimensions (TAS-20) were found between the two groups.

From Table 1, an SD value greater than some average scores can be observed. This could be attributed to the sample size, as highlighted in the limitations discussed below.

3.2 Correlations between TE subtypes, age, psychopathology, alexithymia, somatization, SSA, and pain

Figure 1 (heatmap) reports bivariate linear correlations between TEs and psychosomatic variables for the whole sample. Variables with no significant correlation with TE subtypes, including the remaining TAS-20 factors and SCL-90 R dimensions, are not included in the heatmap.

Linear correlation analysis showed that all TE subtypes were positively correlated with age (total TEs: r = 0.29, p = 0.000), and both the sensorial dimension (PRIrcS, total TEs: r = 0.30, p = 0.015) and intensity of pain (NRS, total TEs: r = 0.38, p = 0.004), as well as somatization (total TEs: r = 0.46, p = 0.000), the SCL-90 R GSI (total TEs: r = 0.35, p = 0.000), SSAS (total TEs: r = 0.30, p = 0.000), and alexithymia, in particular the difficulty in identifying and distinguishing between feelings and bodily sensations (TAS-20 F1, total TEs: r = 0.28, p = 0.001). Only the number of TEs experienced in adulthood did not correlate significantly with PRIrcS (r = 0.17, p = 0.154) or NRS (r = 0.26, p = 0.054). With the exception of the PRIrcS (which was only correlated with age), all psychosomatic dimensions correlated with both age and each other. The strongest effect sizes were found between TAS-20 F1 and SCL-90 R somatization (r = 0.53, p = 0.000), and between SSAS and SCL-90 R somatization (r = 0.48, p = 0.000).

3.3 Role of each variable in the relationships between TE subtypes, alexithymia, somatization, SSA, and pain

Since there was a difference in the mean age of the two groups of subjects studied (Table 1) and since age was found to correlate with most of the variables investigated (Figure 1), all the correlations among the psychosomatic variables explored were adjusted for age. Even when adjusted for age, the somatization dimension seems to be closely linked to the number of TEs in childhood, as shown in Table 2, r = 0.36; p = 0.000, with a medium effect size when the partial correlation analysis was controlled for age. The correlation between SCL90 somatization and the number of TEs in childhood remained significant even when SSAS (r = 0.38; p = 0.000), TAS-20 F1 (r = 0.28, p = 0.001), PRIrcS (r = 0.32, p = 0.012), and NRS (r = 0.40, p = 0.005) were added to the correction effect adjustment.

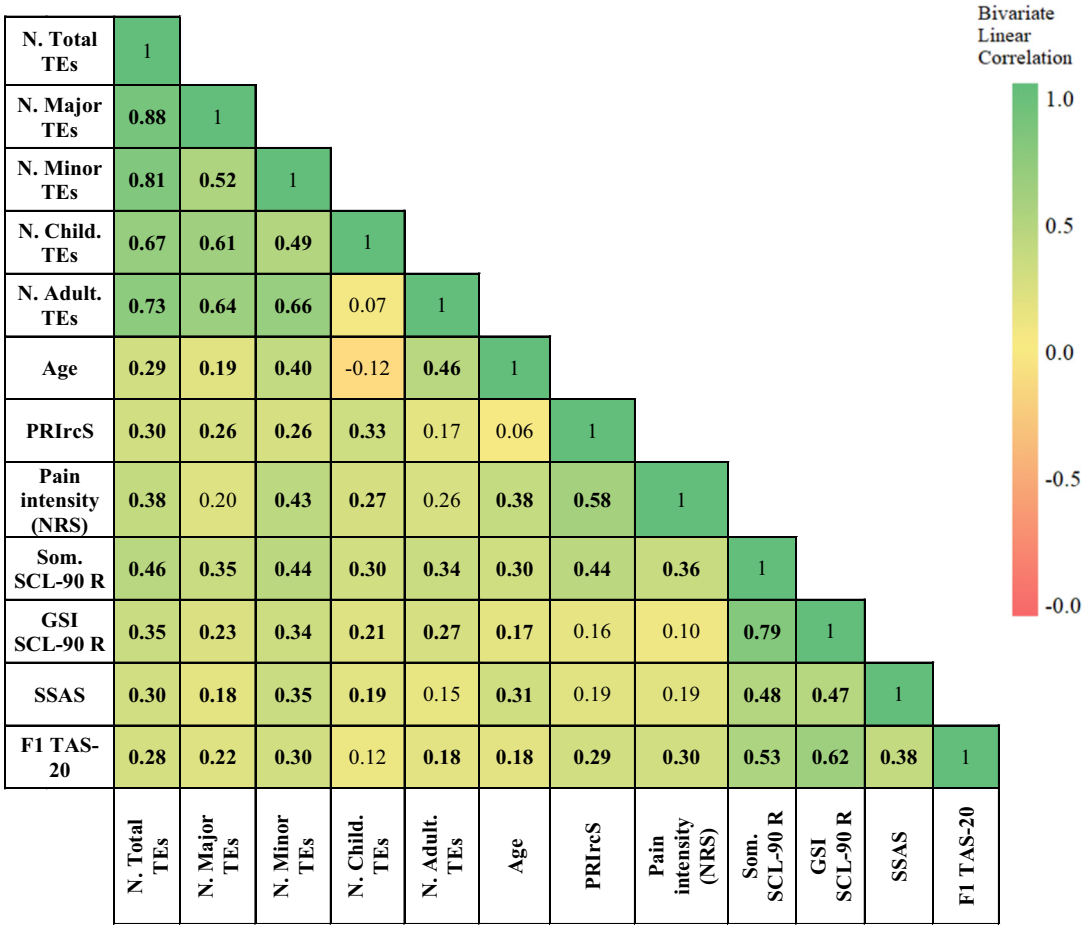
After the somatization dimension was used as a controlling variable in the partial correlation, all correlations among TE subtypes and psychosomatic dimensions previously found to be statistically significant were no longer so (Table 2). Somatization appears to play a relevant role in the correlation between pain, particularly in its sensory dimension and intensity, and all types of TEs. Indeed, as shown in Table 2, the correlations between PRIrcS and NRS and all subtypes of TEs lost their statistical significance when controlled for SCL-90 R somatization.

Table 1: Differences in socio-demographic variables, TE subtypes, somatization, psychopathology, SSA, and alexithymia between the pain-free and pain groups

		Pain-free group		Pain group					
		***N* (%)**	***M* (sD)**	***N* (%)**	***M* (sD)**	***χ*2**	***t***	***p***	***φ*/*d***
Total sample size		55 (37.67)		91 (62.33)					
Age			27.54 (8.72)		36.80 (14.80)		−4.18	**0.000**	0.76
Gender	Males	22 (40.00)		29 (31.90)		0.99		0.372	0.08
	Females	33 (60.00)		62 (68.10)					
Education (years)			17.27 (2.82)		16.57 (3.14)		1.32	0.190	0.23
Civil status	Single	45 (91.84)		62 (71.26)		8.55		**0.036**	0.25
	Married	3 (6.12)		17 (19.54)					
	Divorced	1 (2.04)		7 (8.05)					
	Widowed	0 (0.00)		1 (1.15)					
Social status	High	2 (4.16)		0 (0.00)		4.00		0.135	0.17
	Medium	40 (83.34)		77 (91.67)					
	Low	6 (12.50)		7 (8.33)					
No TEs		3 (75.00)		1 (25.00)		2.40		0.153	0.13
No. total TEs			3.20 (2.31)		4.16 (2.84)		−2.13	**0.035**	0.37
No. major TEs			1.55 (1.40)		1.98 (1.73)		−1.57	0.118	0.27
No. minor TEs			1.45 (1.21)		1.95 (1.36)		−2.19	**0.030**	0.38
No. child. TEs			1.38 (1.75)		1.54 (1.59)		−0.56	0.579	0.09
Subtypes of child. TEs	Major		0.42 (0.50)		0.51 (0.50)		−1.02	0.126	0.18
	Minor		0.42 (0.50)		0.48 (0.50)		−0.76	0.153	0.12
No. adult. TEs			1.62 (1.53)		2.16 (1.77)		−1.90	0.059	0.32
SCL-90 R	Somatization		0.67 (0.74)		1.06 (0.70)		−3.12	**0.002**	0.54
	Obsession-Compulsion		0.87 (0.87)		1.22 (0.86)		−2.32	**0.022**	0.40
	Interpersonal sensitivity		0.80 (0.87)		0.95 (0.82)		−1.02	0.310	0.17
	Depression		1 (1.02)		1.33 (0.91)		−2.00	**0.047**	1.27
	Anxiety		0.85 (0.89)		1.06 (0.83)		−1.46	0.150	0.24
	Hostility		0.59 (0.71)		0.66 (0.58)		−0.60	0.550	0.10
	Phobic anxiety		0.40 (0.66)		0.42 (0.56)		−0.20	0.840	0.03
	Paranoid ideation		0.77 (0.82)		0.83 (0.71)		−0.44	0.660	0.07
	Psychoticism		0.50 (0.63)		0.58 (0.56)		−0.83	0.410	0.13
	GSI		0.74 (0.75)		0.96 (0.62)		−1.90	0.060	0.31
	Total		35.39 (22.59)		43.49 (21.46)		−2.13	**0.035**	0.36
	PSDI		1.60 (0.65)		1.80 (0.54)		−1.91	0.055	0.33
SSAS			5.80 (6.79)		11.65 (8.30)		−4.22	**0.000**	0.77
TAS-20	F1		13.12 (5.64)		15.21 (7.20)		−1.79	0.076	0.32
	F2		12.17 (4.45)		12.16 (5.36)		0.01	0.991	0.00
	F3		15.67 (4.73)		16.36 (4.48)		−0.86	0.394	0.14
	Total		40.94 (11.49)		43.73 (13.32)		−1.25	0.212	0.22

TEs = traumatic experiences; SCL-90 R = SymptomCheck-List-90 Revised; GSI = Global Severity Index; PSDI = Positive Symptom Distress Index; SSAS = Somatosensory Amplification Scale; TAS-20 = Toronto Alexithymia Scale-20; t = unpaired t value; χ^2 = chi-squared value; $p < 0.05$; φ = phi (small = 0.10, medium = 0.30, large = 0.50); d (Cohen's d effect size): 0.20 = small effect, 0.50 = moderate effect, and 0.80 = large effect. Statistically significant values are in bold.

SSA (SSAS) and alexithymia (TAS-20 F1) also appear to influence the correlations between the intensity and sensory dimension of pain with all types of TEs investigated, except for childhood trauma ($r = 0.34$, $p = 0.009$; $r = 0.34$, $p = 0.007$ for the sensory dimension and $r = 0.38$, $p = 0.007$; $r = 0.35$, $p = 0.014$ for the intensity of pain). When controlled for SSAS and TAS-20 F1, the correlations between all TEs (with the exception of childhood trauma) and the sensorial dimension and intensity of pain lost their statistical significance. As a whole, this indicates a significant correlation between the number of TEs in childhood and the degree of somatization, which is not influenced by SSA, pain, or alexithymia. However, SSA and alexithymia do influence each other in their respective correlations with childhood trauma.



	N. Total TEs	N. Major TEs	N. Minor TEs	N. Child. TEs	N. Adult. TEs	Age	PRIrcS	Pain intensity (NRS)	Som. SCL-90 R	GSI SCL-90 R	SSAS	F1 TAS-20
N. Total TEs	1											
N. Major TEs	**0.88**	1										
N. Minor TEs	**0.81**	**0.52**	1									
N. Child. TEs	**0.67**	**0.61**	**0.49**	1								
N. Adult. TEs	**0.73**	**0.64**	**0.66**	0.07	1							
Age	**0.29**	**0.19**	**0.40**	-0.12	**0.46**	1						
PRIrcS	**0.30**	**0.26**	**0.26**	**0.33**	0.17	0.06	1					
Pain intensity (NRS)	**0.38**	0.20	**0.43**	**0.27**	0.26	**0.38**	**0.58**	1				
Som. SCL-90 R	**0.46**	**0.35**	**0.44**	**0.30**	**0.34**	**0.30**	**0.44**	**0.36**	1			
GSI SCL-90 R	**0.35**	**0.23**	**0.34**	**0.21**	**0.27**	**0.17**	0.16	0.10	**0.79**	1		
SSAS	**0.30**	**0.18**	**0.35**	**0.19**	0.15	**0.31**	0.19	0.19	**0.48**	**0.47**	1	
F1 TAS-20	**0.28**	**0.22**	**0.30**	0.12	**0.18**	**0.18**	**0.29**	**0.30**	**0.53**	**0.62**	**0.38**	1

Figure 1: Linear correlations between TE subtypes, age, alexithymia, somatization, SSA, and pain in the total sample. Colours of the heatmap ranges from red to green to illustrate the effect size: green indicates a stronger effect size (r > 0.50) of the correlation, yellow a medium effect (range of r = 0.30–0.50), and red a weak effect (<0.30). TEs = traumatic experiences; PRIrcS = sensorial dimension of pain; NRS = Numeric Rating Scale; Som. SCL-90 R = somatization dimension on SCL-90 R (Symptom Checklist-90 Revised); GSI SCL-90 R = Global Severity Index (Symptom Checklist 90-Revised); SSAS = Somatosensory Amplification Scale; F1 TAS-20 = Factor 1 on TAS-20 (Toronto Alexithymia Scale-20).

3.4 Predicting the effect of TE subtypes on psychosomatic manifestations

Stepwise forward multiple linear regression analysis using psychosomatic manifestations as dependent variables was used to test whether TE subtypes significantly predicted psychosomatic manifestations (Table 3). For all dependent variables, one model is sufficient to predict variables, with the exception of the relationship between pain intensity (NRS) and types of childhood trauma. Minor TEs were found to be an important predictor of pain intensity, not only in general but also considering them in childhood. As shown in Table 3, model 2 revealed that the predictors of pain intensity are lifetime minor TEs and minor childhood TEs. Minor TEs rather than major TEs represent the most important predictor in adulthood of somatic amplification, the inability to recognize emotions and the intensity of pain.

4 Discussion

This study was designed to investigate the influence of the severity of trauma and when it occurred on both pain and somatization in adulthood. Results of sociodemographic variables (Table 1) indicate that there is no gender difference between the pain and pain-free groups. This result does not seem to be in line with what is reported in the literature, as the subjects with pain are mostly female [36,37]. However, our pain-free group was mostly represented by psychiatric subjects with depressive and anxiety disorders. It is known that these disorders mostly affect females [4], so it is possible that the lack of difference between the two groups depends on the type of sample investigated. The level of education in both our groups was medium or high, and there was no difference between the two groups. The literature reports a higher incidence of

Table 2: Partial correlations between TE subtypes and psychosomatic variables

			Controlling for						
Variables		**df**	**Age**	**Age + Som. SCL-90 R**	**Age + GSI SCL-90 R**	**Age + SSAS**	**Age + F1 TAS-20**	**Age + PRIicS**	**Age + NRS**
Som. SCL-90 R	No. total TEs	136	0.40***		0.26**	0.38***	0.32***	0.36**	0.45**
	No. major TEs	136	0.33***		0.25**	0.35***	0.29**	0.32*	0.40**
	No. minor TEs	136	0.31***		0.18*	0.25**	0.19*	0.27*	0.33*
	No. child. TEs	136	0.36***		0.28**	0.38***	0.28**	0.32*	0.40**
	No. adult. TEs	136	0.21*		0.09	0.19*	0.23*	0.23	0.30*
SSAS	No. total TEs	131	0.22*	0.04	0.06		0.09	0.35**	0.25
	No. major TEs	131	0.12	−0.05	−0.01		0.02	0.29*	0.21
	No. minor TEs	131	0.24**	0.11	0.13		0.10	0.3*	0.22
	No. child. TEs	131	0.24**	0.07	0.13		0.10	0.42**	0.31*
	No. adult. TEs	131	−0.01	−0.11	−0.14		−0.04	0.13	0.1
F1 TAS-20	No. total TEs	134	0.23**	0.04	0.11	0.23*		0.22	0.28*
	No. major TEs	134	0.18*	0.00	0.07	0.18*		0.15	0.21
	No. minor TEs	134	0.26**	0.12	0.16	0.25**		0.31*	0.32*
	No. child. TEs	134	0.14	−0.01	0.09	0.12		0.05	0.12
	No. adult. TEs	134	0.11	−0.04	−0.06	0.15		0.14	0.15
PRIrcS	No. total TEs	64	0.29*	0.12	0.24	0.23	0.24		0.20
	No. major TEs	64	0.25*	0.09	0.21	0.22	0.23		0.22
	No. minor TEs	64	0.26*	0.12	0.22	0.17	0.17		0.10
	No. child. TEs	64	0.34**	0.19	0.33*	0.34**	0.34**		0.25
	No. adult. TEs	64	0.17	0.05	0.12	0.06	0.11		0.13
Pain intensity (NRS)	No. total TEs	52	0.28*	0.15	0.22	0.29*	0.29*	0.11	
	No. major TEs	52	0.11	−0.03	0.06	0.21	0.21	−0.04	
	No. minor TEs	52	0.31*	0.22	0.28	0.29*	0.25	0.20	
	No. child. TEs	52	0.34*	0.27	0.35*	0.38**	0.35*	0.14	
	No. adult. TEs	52	0.10	−0.01	0.04	0.12	0.15	0.00	

TEs = traumatic experiences; SCL-90 R Som. = somatization dimension on SCL-90 R; SSAS = Somatosensory Amplification Scale; TAS-20 F1 = TAS-20 Factor 1; PRIrcS = sensorial dimension of pain; NRS = Numeric Rating Scale; *$p < 0.05$, **$p < 0.01$, ***$p = 0.000$.

Table 3: Stepwise forward multiple regression model with TE subtypes predicting somatization (Som. SCL-90 R), somatosensory amplification (SSAS), TAS-20 Factor 1 (TAS-20 F1), sensorial dimension (PRIrcS), and intensity (NRS) of pain

Model	Predictors	Dependent	Adjusted R square	*t*	*β*	*p*	Low	95% CI High
1	No. total TEs	Som. SCL-90 R	0.20	4.49	0.46	0.000	0.08	0.16
1	No. minor TEs	SSAS	0.11	5.12	0.34	0.000	1.13	3.11
1	No. minor TEs	F1 TAS-20	0.08	13.08	0.30	0.000	0.68	2.31
1	No. child. TEs	PRIrcS	0.09	6.57	0.33	0.007	0.01	0.06
1	No. minor TEs	Pain intensity (NRS)	0.17	3.04	0.43	0.001	0.44	0.70
2	No. minor TEs	Pain intensity (NRS)	0.22	2.70	0.34	0.009	0.22	1.49
	No. min. child. TEs		0.22	2.23	0.28	0.030	0.94	4.71

TEs = traumatic experiences; Som. SCL-90 R = somatization dimension on SCL-90 R; SSAS = somatosensory Amplification Scale; F1 TAS-20 = TAS-20 Factor 1; NRS = Numeric Rating Scale; PRIrcS = sensorial dimension of pain; 95 CI = confidence interval of 95%.

chronic pain in subjects with a low social status [36,37], but it is not clear how much this corresponds to the level of education. This also applies to a control sample with psychiatric disorders. Furthermore, it should be underlined that the subjects with pain investigated in this study do not necessarily suffer from chronic pain.

In our study, the group with pain was older than the group without pain, although with a lower average than what is reported in the literature (41–60 years) [36,37]. This result may be due to the composition of the pain group, which did not necessarily include subjects with chronic pain. Nonetheless, we found that age was a significant variable (Figure 1), with our results indicating that with increasing age, there is an increase in both the intensity of pain and somatization. Although the literature reports differences in age and education level between subjects exposed to TEs and those not exposed, especially as regards major traumas (e.g. violence, accidents, and natural disasters) [1], the feature of our sample is that most subjects in our sample had experienced trauma, with only four subjects reporting no TEs. Therefore, our data provide no information relating to subjects without TEs. Although, generally speaking, this might be considered a limitation, in the specific case, it cannot, given the objective of the study.

Our results show that subjects who report pain have a greater tendency towards somatization. This confirms previous findings [13] and indicates that the tendency towards somatization contributes to variations in physiological body perception (interoception), implicated in the transformation of pain from recurrent to chronic [38]. Indeed, pain is one of the most important expressions of somatization, and there seems to be an association between pain in childhood or adolescence and an abnormal response to stress in adulthood [39]. It appears, therefore, that there is a strong link between pain, somatization, and stress response forged in childhood. According to our results, the psychosomatic dimension in adulthood most strongly associated with a history of TEs is somatization (investigated using the SCL-90 R). As shown in Figure 1, its correlations with all TE subtypes are strong, and the number of TEs overall was a predictor for somatization in adults (Table 3).

The presence of somatization in adulthood affects the relationship between TEs and all other aspects of somatization, including pain (Table 2). Furthermore, the age of exposure and the severity of trauma seem to influence the intensity and sensorial component of pain (Table 3). However, the main finding in study is that it is minor rather than major TEs that affect pain and the psychosomatic dimension. This is interesting because most previous research has highlighted the role of major trauma, especially PTSD [40–42]. That being said, most of the studies in the literature have investigated the relationship between trauma and chronic pain, and it is, therefore, possible that the difference lies precisely in this; perhaps minor traumas in childhood predict the presence of pain in adults, but only major traumas predispose to chronic pain.

Whatever the case, the results of this investigation make it clear that limited research into minor trauma is a huge gap in the literature. In the attempt to bridge this gap, our study is one of the very few to investigate minor trauma in subjects with pain. It reveals that the tendency to somatization seems to correlate strongly, and independently of age, with both major and minor traumas, whether the exposure was in childhood or adulthood. However, it is minor trauma that seems to be more predictive of the link between pain and the individual subcomponents of somatization, specifically somatic amplification and alexithymia, in particular the aspects pertaining to lack of recognition of emotions, in line with Wise and Mann theory that alexithymia and SSA contribute to the process of somatization [16].

Although, according to the ICD-11 classification [43], alexithymia seems more closely linked to primary rather than secondary chronic pain, our results confirm the weak relationship between TEs and alexithymia that we have previously reported [12], though it should be noted that in this study Cronbach's alpha for the total TAS was relatively low. That being said, the inability to recognize and be aware of emotions (TAS-20 Factor 1) seems to be a dimension of alexithymia that is linked to the presence of pain, as revealed in our previous studies conducted on primary school children [44]. Furthermore, it supports the hypothesis that the elaboration of trauma is focused on the body and the information that spreads from it.

We encourage more research in this area, as there have been very few studies to explore the effect of minor trauma on pain and somatization. Traumatic everyday events can also affect temporality, trust and perceptual awareness, as well documented by Craig [45], and it would be interesting to explore in more depth the links emerging between these variables.

5 Limitations

The main limitation of this study was the sample size, which may explain the weakness of the correlations and the reliability of some questionnaires found. Like previous studies, ours was also cross-sectional, retrospective, and observational; the results would certainly be more meaningful if the study had been conducted longitudinally. As mentioned above, the sample of this study was younger and better educated than reported by clinical studies for the chronic pain population. At present, we cannot rule out that a different age and/or a different level of education may affect the results obtained. That being said, it is important to note that our sample had pain, not specifically chronic pain. Considering the literature, it might have been more useful to investigate chronic pain, rather than pain in general. Although this may be thought of as a limitation, it may also represent a strength further to the investigation of predictors of the onset of chronic pain. Indeed, our results indicate that TEs predispose a person to somatization and pain, even if it is not chronic.

The lack of difference in gender between pain-free and pain groups might also be a limitation. However, as we have reported previously, subjects without pain often suffer from anxiety and/or depression, which mainly affect females.

The use of self-report tools is also a weakness, as it is associated with various biases – in particular, social desirability – that can affect results. The mid-level Cronbach for some tools used, such as the questionnaire that investigates TEs, encourages us to look for more reliable and validated tools in Italy, which guarantees us a more accurate investigation.

On the other hand, a strength of this study is the investigation of the relationship between trauma and somatization, breaking down the two conditions into their individual subparts, as each of them contributes to a greater or lesser extent to generating what is the complexity, or "gestalt," of the suffering of an individual with psychosomatic problems.

6 Conclusions

Interestingly, the presence of pain in adulthood appears to be associated with minor rather than major TEs, especially if experienced during childhood. This relationship appears to be mediated by somatization, a psychosomatic variable with a strong association with all types of traumatic events. In short, our results indicate that the more pronounced the history of minor daily childhood trauma, the adult is more prone to somatization, and the more severe their pain and the somatic components thereof.

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Research ethics: As it is a retrospective study, no Ethics Committee approval was necessary. The study adheres to the STROBE statement guidelines for observational research.

Informed consent: Informed consent was obtained from all individuals included in this study.

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