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ORIGINAL PAPER

Posttraumatic Stress Disorder and Chronic Idiopathic URTICARIA: the Role of Coping and Personality

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Abstract
This study compared the severity of chronic idiopathic urticaria (CIU) and psychiatric symptoms between patients with different levels of posttraumatic stress disorder (PTSD) and investigated a model depicting the interrelationship between PTSD from past trauma, personality traits, coping strategies, CIU severity and psychiatric symptom severity. One hundred CIU and 60 allergy patients participated in the study, completing measures on PTSD, psychiatric symptoms, personality traits and coping strategies. The results showed that for CIU patients, 7%, 40 and 34% met the diagnostic criteria for no-PTSD, partial-PTSD and full-PTSD respectively whereas for allergy patients, 15%, 45 and 18% met the same criteria. Apart from CIU, psychiatric symptom severity differed significantly between diagnostic groups. PTSD was associated with coping strategies which were in turn associated with CIU severity and psychiatric symptom severity. PTSD was not significantly associated with personality. Emotion-focused coping mediated PTSD and CIU severity, PTSD and psychiatric symptom severity and neuroticism and CIU severity. To conclude, psychiatric symptom severity varies depending on the level of PTSD among CIU patients. Neurotic patients with a high level of PTSD from past trauma show raised CIU and psychiatric symptom severity when using emotion-focused coping strategies.

Keywords Posttraumatic stress disorder · Chronic idiopathic urticaria · Coping · Personality

Introduction

Chronic idiopathic urticaria (CIU) is a distressing dermatological disorder. Patients experience daily or frequent wheals and itching lasting at least 6 weeks for which there is no obvious

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cause. These symptoms can last from several months to several years. Research shows that the prevalence rate for CIU patients meeting the diagnostic criteria for posttraumatic stress disorder (PTSD) from past traumas ranges from 32 to 34% [1, 2]. Elevated PTSD symptom severity was associated with increased CIU symptom severity. A large proportion (82%) of CIU patients are also thought to suffer from general psychological disorders [2]. CIU patients with PTSD report significantly higher anxiety than CIU patients without PTSD and allergy patients [1].

Two gaps in knowledge are noteworthy in the relevant literature. Firstly, little is known regarding the role of partial-PTSD among these patients. PTSD occurs along a continuity of normal to abnormal stress reactions. Although people may not meet the full diagnostic criteria for PTSD, they can still experience severe impairment in functioning and need the same level of care as those with a full diagnosis. Thus, classifying PTSD reactions at different levels is seen to be important [3, 4].

Secondly, we know little about whether personality traits and coping strategies have a role to play in the relationship between PTSD from past trauma and physical (CIU severity) or psychological outcomes among these patients. Increasingly, evidence suggests that coping and personality influence responses to trauma. Turning first to coping strategies, according to the two-stage appraisal of stress model [5, 6], when a stressful event (trauma) happens, one reacts to it actively, rather than passively, engaging in psychological processes in which one appraises (primary appraisal) whether it is potentially or actually harmful to one's psychological well-being. If harmful, one copes with the resultant psychological distress by deciding on a course of action (secondary appraisal). Trauma can lead to the endorsement of coping strategies, be they adaptive or maladaptive [7].

Broadly speaking, there are two coping strategies: emotion-focused and problem-focused. Emotion-focused coping involves effort to reduce the discomfort associated with the stressful situation without, in fact, changing the situation itself. Problem-focused coping involves planful action to change the stressful situation by acting on the environment or ourselves [5, 6]. These coping strategies influence health outcomes in different ways: emotion-focused coping tends to be endorsed by those who have PTSD and leads to a higher level of anxiety [8, 9]. Patients suffering from life threatening illnesses [10, 11] have reported using a great deal of emotion-focused coping and suffering from an elevated psychiatric symptom severity.

On the other hand, low level use of emotion-focused coping is associated with reduced psychiatric symptoms and general psychological distress [12]. Conversely, problem-focused coping tends to buffer against psychiatric symptoms [13], although a couple of studies showed an increase in PTSD symptoms [14] and long term emotional distress [15]. Literature suggests that past trauma can have an impact on coping, which mediates [16] between PTSD and health outcomes. This mediational effect has been supported in literature [17].

Turning to personality traits, research shows an interweave between PTSD, personality and health outcomes [18]. For example, neuroticism and introversion were positively associated with PTSD and psychiatric co-morbidity e.g., [18–23]. Psychoticism was also positively associated with PTSD among victims of different kinds e.g., [24–26]. This is a common trait among those who have been severely affected by trauma and developed a high level of PTSD [27, 28] or who have received specialized inpatient treatment for trauma [29].

Personality traits and coping strategies are not independent of each other, relating to influence health outcomes [16, 18, 30, 31]. It has been advocated that within the integrative conceptual framework of the coping process [32], personality traits influence our response to a crisis which, in turn, triggers an appraisal or coping process leading to certain health outcomes.

The differential choice-effectiveness model also points to the fact that personality traits can influence choice when it comes to coping strategy [33]. Similarly, Horowitz's [34] stress response syndrome alluded to the fact that trauma precedes drastic changes in the way people perceive themselves, pre-empting a great deal of emotional distress. To prevent emotional exhaustion, coping strategies are employed to try to inhibit the flow of traumatic information to a tolerable extent [35–37].

This suggests a model: PTSD from past trauma is related to personality traits or coping strategies which influence health outcomes. PTSD can influence personality traits which impact on coping strategies to influence health outcomes. This model (depicted in Fig. 1) has not been examined among CIU patients.

The present study 1) compared the severity of CIU and psychiatric symptoms according to levels of PTSD and 2) examined the model depicted in Fig. 1. We hypothesized that there would be significant differences between patients with different levels of PTSD in the severity of CIU and psychiatric symptoms. We also hypothesized that PTSD would be associated with coping strategies or personality traits which in turn would be associated with CIU and psychiatric symptom severity. Furthermore, we hypothesized that PTSD would be associated with personality traits which would be associated with coping strategies to influence CIU and psychiatric symptom severity.

Methods

Procedure

One hundred CIU and 60 allergy patients (control group) were recruited consecutively within a 12 month period from an immunology clinic in one hospital in the United Kingdom. Allergy patients were included for comparison purposes (to compare PTSD and co-morbidity rates and personality traits and coping strategies). The recruitment procedure and the inclusion and exclusion criteria of the study have been described elsewhere [1]. Approval was granted by the Plymouth Local Research Ethics Committee.

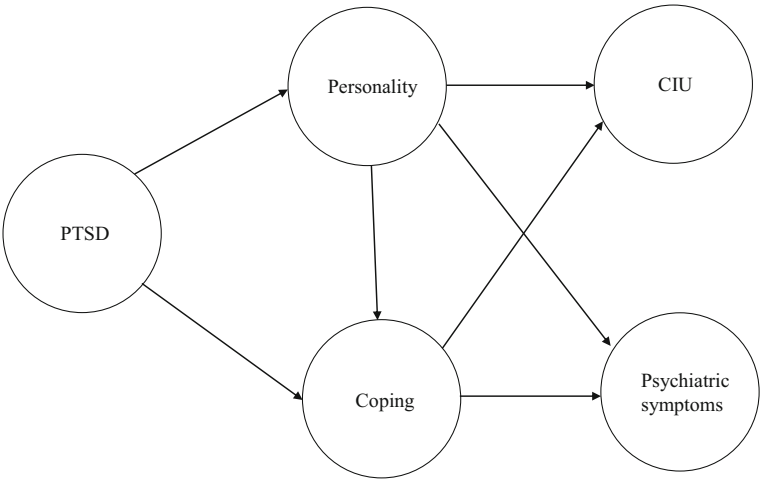

Fig. 1 The hypothesized model

Measures

Demographic information was used to record information on gender, age, marital status, ethnicity, occupation, education level, time since onset of CIU or most recent allergy and other illnesses.

The Posttraumatic Stress Diagnostic Scale (PDS) [38] aims to assess PTSD, based on DSM-IV criteria, and was completed by both the CIU and allergy groups. Patients were classified into four groups: no trauma (no experience of previous trauma), no-PTSD (not meeting the diagnostic criteria), partial-PTSD [meeting the criteria for 1 or 2 of the symptom sub-scales (re-experiencing, avoidance, hyperarousal) or all three sub-scales but without feelings of helplessness, terror and an impact upon daily functioning] and full-PTSD (meeting all criteria). This scale has shown good reliability and validity and good agreement with the Structured Clinical Interview for Diagnosis (kappa = 0.65, agreement = 82%, sensitivity = 0.89 and specificity = 0.75). Based on the current sample, Cronbach's α for PTSD total was 0.92.

The General Health Questionnaire-28 (GHQ-28) [39] yields four subscales: somatic problems, anxiety, social dysfunction and depression. Reliability coefficients range from 0.78 to 0.95 [40]. Based on the current sample, the reliability of the four subscales was good (somatic problems, α=0.82, anxiety, α=0.87, social dysfunction, α=0.88, depression, α=0.89, GHQ total, α=0.95).

Chronic idiopathic urticaria severity was assessed using a local variation of a scoring system devised by the European Association of Allergy and Clinical Immunology (EAACI) (Zuberbier et al., 2006). Previously, several scoring systems had been proposed using scales from 0 to 3 or up to 10 points. For the purpose of this study, a unified scoring system was proposed that would facilitate comparison of study results from different centres. This simple scoring system is based on the assessment of key urticaria symptoms (wheal and pruritus). Our local variation included frequency of episodes of urticaria, duration of lesions, effect on respiration, facial involvement, school/work, severity of itching and effect on sleep and used a scale from 0 to 14.

The NEO-Five Factor Inventory (NEO-FFI) [41] aims to measure the "Big Five" personality traits: neuroticism, extraversion, openness to experience, agreeableness and conscientiousness. The respective internal consistencies were: 0.86, 0.77, 0.73, 0.68 and 0.81. The respective reliability scores were 0.88, 0.78, 0.70, 0.71 and 0.85 for the current study.

The Ways of Coping Checklist (WOC) [42] aims to examine "problem-focused" or "emotion-focused" functions of coping. This checklist measures eight coping strategies and, based on the current sample, reliability scores were 0.70 (confrontive coping), 0.74 (distancing), 0.70 (self-controlling), 0.76 (seeking social support), 0.72 (accepting responsibility), 0.77 (escape-avoidance), 0.70 (problem solving) and 0.66 (positive reappraisal).

Data Analysis Plan

Descriptive statistics were used to describe the demographic information of the samples and the percentages of patients meeting different levels of PTSD diagnosis. To compare differences between diagnostic groups, ANOVA, MANOVA and loglinear analyses were used. Partial least squares (PLS) modelling was used to examine the hypothesized model. Briefly, PLS generates outer and inner model estimates. Outer model estimates refer to the loadings for each indicator and show how strongly it relates to the construct. To examine outer model estimates is to examine the validity and reliability (composite reliability, Cronbach's alpha, convergent

validity, discriminant validity) of the items in the model. Incorporating multiple indicators of the construct increases the reliability of what the construct represents. To this end, for the construct of CIU severity, 3 item parcels were created. Three indicators (openness, agreeableness, CIU severity 3) were dropped from the model because of the weak loading scores (−0.04, −0.31 and 0.07 respectively). Inner model estimates refer to the linear relationship between constructs by means of regression coefficients. PLS does not generate a test of model fit but provides estimates of path coefficients in the model and tests whether these path coefficients differ significantly from zero. The tests were carried out using bootstrap resampling ($n = 1000$) to generate t statistics. PROCESS was used to examine meditational paths identified in the PLS analyses.

Results

Sample Characteristics

One hundred CIU patients (F = 82, M = 18) participated in the study; 95% had CIU for the first time. The mean age was 46.52 ± 14.10. The sixty allergy (type I hypersensitivity) patients (F = 39, M = 21) recruited had a mean age of 36.23 ± 15.88. Using the PDS diagnostic criteria, 19% of CIU patients reported no traumas in life to date; 7%, 40 and 34% met the diagnostic criteria for no-PTSD, partial-PTSD and full-PTSD respectively. Of the allergy patients, 22% did not report any traumatic experiences; 15%, 45 and 18% respectively met the criteria for the same diagnoses.

Comparing the differences between diagnostic groups, we combined the no trauma and no-PTSD groups. In terms of how long ago the most traumatic event had happened, there were no significant differences between the PTSD diagnostic groups [CIU: no trauma/no-PTSD, mean (in months) = 219.80 ± 184.72, partial-PTSD, mean = 132.32 ± 140.12, full-PTSD, mean = 112.96 ± 133.99; Allergy: no trauma/no-PTSD, mean = 206.80 ± 307.64, partial-PTSD, mean = 74.15 ± 68.39, full-PTSD, mean = 133.00 ± 127.39, $F(2,109) = 2.78$, ns], nor was there an interaction effect [illness types x PTSD diagnostic groups x how long ago the traumatic event occurred $F(2,109) = 0.85$, ns].

Table 1 shows the demographic information, means and standard deviations for CIU severity, psychiatric symptom severity, personality traits and coping strategies between the diagnostic groups. Three-way loglinear analysis showed that the final models indicated good model fits (no significant differences between groups) for gender, income, marital status and education level. There were no three-way interaction effects for these variables. MANOVA revealed no significant differences between the diagnostic groups in age, onset of symptoms and number of other illnesses. Neither were there any significant interaction effects. Almost all of the CIU and allergy patients were Caucasian.

Differences in the CIU and Psychiatric Symptom Severity According to Level of PTSD

In terms of CIU severity, no significant difference was found between the three PTSD diagnostic groups. However, MANOVA revealed significant differences in somatic problems ($p < 0.001$), anxiety ($p < 0.001$), social dysfunction ($p < 0.001$) and depression ($p < 0.01$). Post Hoc analyses (LSD) showed that the full-PTSD patients reported significantly higher psychiatric symptoms than the no-trauma/no-PTSD and partial-PTSD groups at the α level of 0.01.

Table 1 Demographic information, the means and standard deviations of psychiatric symptoms, personality traits and coping strategies of CIU and allergy patients

	CIU						Allergy						GoF χ^2	Pearson χ^2	F	^{2}
	No trauma/ no-PTSD ($n = 26$)		Partial-PTSD ($n = 40$)		Full-PTSD ($n = 34$)		No trauma/ no-PTSD ($n = 22$)		Partial-PTSD ($n = 27$)		Full-PTSD ($n = 11$)					
	N	%	N	%	N	%	N	%	N	%	N	%				
Female	21	81	32	80	29	85	10	45	19	70	10	91	7.03	3.31	–	–
Male	5	19	8	20	5	15	12	55	8	30	1	9				
Single	6	23	3	7	10	29	10	45	7	26	3	27	15.84	0.44	–	–
Married	15	58	29	73	18	53	10	45	17	63	6	55				
Cohabitate	1	4	3	7	3	9	0	0	3	11	0	0				
Separated/Divorced	3	11	4	10	3	9	2	10	0	0	1	9				
Widowed	1	4	1	3	0	0	0	0	0	0	1	9				
Caucasian	26	100	39	97	33	97	22	100	27	100	11	100	–	–	–	–
Higher education	3	11	6	15	5	14	4	18	3	11	5	45	11.14	0.60	–	–
Undergrad	5	19	8	20	4	12	4	18	5	19	0	0				
Postgrad	2	8	2	5	2	6	1	5	2	7	0	0				
Secondary education	16	62	24	60	23	68	13	59	17	63	6	55				
Low Income	19	73	27	67	19	56	15	68	19	70	9	82	14.37	2.08	–	–
Medium income	4	15	10	25	14	41	6	27	8	30	2	18				
High Income	3	12	3	8	1	3	1	5	0	0	0	0				
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD				
Age	43.11	10.98	49.72	14.08	45.35	15.73	34.36	17.37	37.48	16.27	36.90	12.36			1.49	–
When did CIU/allergy symptoms start (in months)	42.19	54.09	59.32	107.65	45.76	49.54	74.77	96.34	115.18	130.41	168.63	199.34			2.31	–
Total number of other illness	1.69	0.88	1.50	0.67	1.79	0.88	1.50	0.74	1.74	0.81	2.00	0.89			1.64	–
CIU severity	8.69	1.87	8.90	2.49	8.85	2.33	–	–	–	–	–	–			0.06	–
Somatic problems	12.80	3.18	14.62	4.45	17.76	4.82	10.95	2.45	11.48	3.06	13.72	4.02			9.87	0.11
Anxiety	14.23	4.83	14.67	4.89	19.52	5.10	11.40	3.09	11.00	3.26	13.81	4.28			9.58	0.11
Social dysfunction	15.26	2.25	15.45	2.35	18.55	4.55	14.04	0.95	13.81	1.66	15.45	2.29			9.42	0.10
Depression	9.69	3.35	8.77	3.30	13.58	6.53	8.59	3.60	8.51	2.51	10.36	4.05			7.41	0.09
Neuroticism	21.11	11.17	19.65	7.44	30.55	8.84	21.09	8.44	22.40	8.55	26.18	8.04			8.85	0.10
Extraversion	26.57	7.51	27.57	6.57	24.58	7.37	30.22	4.37	28.03	7.50	30.36	4.20			0.20	–
Openness	24.88	7.99	26.87	5.65	27.05	5.43	25.72	5.18	26.81	7.33	27.72	4.33			1.31	–
Agreeable	30.73	7.91	34.00	6.09	32.82	4.64	32.27	5.66	31.55	6.83	33.00	5.38			0.73	–

Table 1 (continued)

	CIU						Allergy						GoF χ^2	Pearson χ^2	F	^{2}
	No trauma/ no-PTSD ($n = 26$)		Partial-PTSD ($n = 40$)		Full-PTSD ($n = 34$)		No trauma/ no-PTSD ($n = 22$)		Partial-PTSD ($n = 27$)		Full-PTSD ($n = 11$)					
Conscient	32.50	8.88	35.07	5.41	31.17	7.79	31.45	5.95	34.33	8.73	31.81	7.18			2.86	–
Problem-focused	10.80	5.04	14.13	7.72	16.58	8.63	10.59	7.59	15.66	9.01	16.10	9.15			5.83	0.07
Emotion-focused	17.60	10.14	20.31	13.73	29.41	13.37	13.04	9.11	15.44	9.14	17.80	13.25			4.65	0.05

GoF χ^2 = Goodness of fit likelihood ratio; There were no significant interaction effects [age: $F(2,154) = 0.27$, ns; onset of symptoms: $F(2,154) = 1.95$, ns; other illness: $F(2,154) = 1.10$, ns]; There were no significant interaction effects (illness types x PTSD diagnostic types x dependent variables) for psychiatric symptoms [somatic: $F(2,154) = 0.81$, ns; anxiety: $F(2,154) = 1.06$, ns; social dysfunction: $F(2,154) = 1.21$, ns; depression: $F(2,154) = 1.37$, ns], personality traits [neuroticism: $F(2,154) = 1.81$, ns; extraversion: $F(2,154) = 1.89$, ns; openness: $F(2,154) = 0.08$, ns; agreeableness: $F(2,154) = 1.49$, ns; conscientiousness: $F(2,150) = 0.14$, ns] and coping strategies [problem-focused: $F(2,150) = 0.24$, ns; emotion-focused: $F(2,150) = 1.02$, ns]

Examination of the Hypothesized Model Depicting the Interrelationship between PTSD, Personality Traits, Coping Strategies and Health Outcomes

Before analysing the hypothesized model, MANOVA was used to examine personality traits and coping strategies according to diagnostic groups. Turning to personality traits, there were significant differences between groups in neuroticism with the full-PTSD group reporting a significantly higher level than the no-trauma/no-PTSD and partial-PTSD groups at the α level of 0.001. Regarding coping strategies, the full-PTSD group used significantly more emotion-focused coping than the other two groups at the α level of 0.05. There were no significant interaction effects (illness types x PTSD diagnostic types x dependent variables) for psychiatric symptoms, personality traits and coping strategies.

To examine the hypothesized model depicting the interrelationship between PTSD, personality traits, coping strategies and health outcomes (CIU and psychiatric severity), we carried out partial least squares (PLS) modelling [43]. This analytic technique has been described in detail in recent PTSD studies e.g. [2, 44].

The outer model results of the correlations between constructs, composite reliability, average variance extracted, discriminant validity, communality and redundancy are shown in Table 2. The values of composite reliability and Cronbach's alpha were mostly over the minimum threshold of 0.70 [45] indicating the reliability of these scales. The average variance extracted (AVE) for all constructs was above 0.50 indicating convergent validity of all the constructs except personality (although this was very close to the ideal threshold). There was also evidence for satisfactory discriminant validity in that all the square root of AVE values were greater than the correlations between any of the paired constructs in the model.

The inner model results of the path coefficients for relationships between constructs are shown in the final PLS structural model depicted in Fig. 2. PTSD from past trauma was significantly correlated with coping (B = 0.19, SE = 0.08, $t = 2.31$, $p < 0.05$, 95% CI: 0.35–1.04, $f^2 = 0.20$, a medium effect) which, in turn, was significantly correlated with CIU severity (B = 0.32, SE = 0.08, $t = 3.59$, $p < 0.01$, 95% CI: 0.01–0.05, $f^2 = 0.08$, a small effect) and psychiatric symptom severity (B = 0.19, SE = 0.07, $t = 2.42$, $p < 0.05$, 95% CI: 0.10–0.43, $f^2 = 0.11$, close to a medium effect). Personality was significantly correlated with coping

Table 2 The results of the correlations between constructs, composite reliability, average variance extracted, discriminant validity, communality and redundancy

	Correlations						CR[a]	AVE[b]	√ AVE[c]	Average communality	Average redundancy
		1	2	3	4	5					
1	PTSD	1					0.99	0.99	0.99	0.99	0.00
2	Personality	0.23*	1				0.73	0.49	0.70	0.60	0.00
3	Coping	0.41**	0.21*	1			0.85	0.74	0.86	0.80	0.08
4	CIU severity	0.13	0.10	0.28	1		0.77	0.63	0.79	0.66	0.12
5	Psychiatric symptoms	0.65**	0.15	0.31**	0.14	1	0.91	0.72	0.84	0.68	0.33

*$p < 0.05$; **$p < 0.01$

[a] Composite reliability

[b] Average variance extracted (convergent validity)

[c] square root of AVE to indicate whether or not discriminant validity is satisfactory

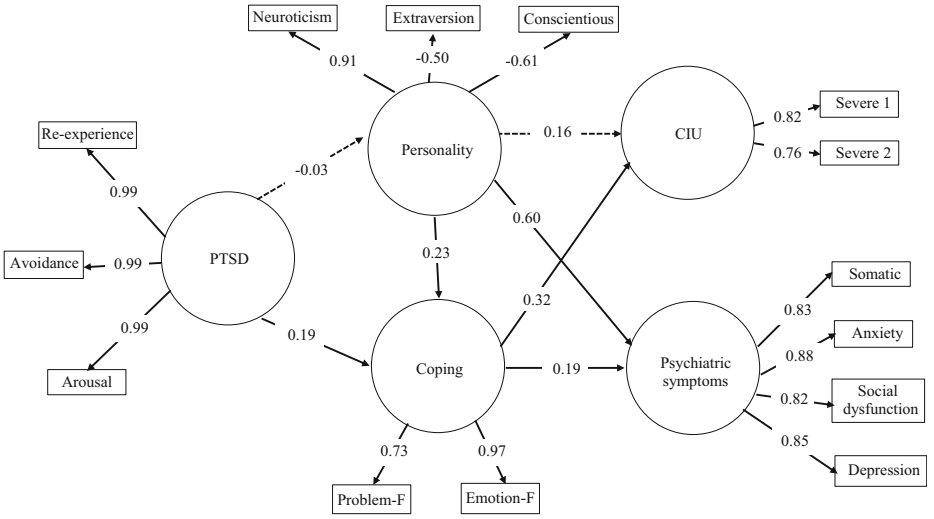

Fig. 2 The results of the final PLS model with significant paths at 5% or better (dotted arrows denote non-significant paths)

(B = 0.23, SE = 0.11, $t = 2.01$, $p < 0.05$, 95% CI: 0.02–0.37, $f^2 = 0.04$, a small effect) and psychiatric symptom severity (B = 0.60, SE = 0.07, $t = 7.78$, $p < 0.01$, 95% CI: -0.03-0.27, $f^2 = 0.02$, a small effect).

The R^2 values for the endogenous variables of personality, coping strategies, CIU severity and psychiatric symptom severity were 0.01, 0.10, 0.19 and 0.49 respectively. They were weak values except for psychiatric symptoms which was moderate. The average R^2 was 0.15. The GoF index was 0.34 which indicated an acceptable fit and allowed us to conclude that the predictive relevance of the model was acceptable. Omission distance G = 30 blocks was used for the blindfolding analysis. High values were recorded for most of the blocks for the communality index (this measures the quality of the measurement model for each block). They were over and above zero (Fornell and Cha, 1994) and the average communality was 0.75. On the other hand, all the values for the redundancy index which measures the quality of the structural model for each endogenous block were lower, taking into account the measurement model. The average redundancy was 0.12.

Mediational Analysis

The PLS results showed that PTSD and personality traits influenced coping strategies which, in turn, impacted on CIU and psychiatric symptom severity. This implies that coping mediated the relationships between 1) PTSD and CIU severity, 2) PTSD and psychiatric symptoms, 3) personality and CIU and 4) personality and psychiatric symptoms. To verify this PROCESS [46] was used to assess indirect effects in multiple mediator models. This would estimate the path coefficients in a mediator model and generate bootstrap confidence intervals (bias-corrected and accelerated) for testing total and specific indirect effects of X on Y through multiple mediators of coping. The bootstrap estimates were based on 1000 bootstrap samples. Point estimates and confidence intervals (95%) are estimated for the indirect effects. The point estimate is considered to be significant when the confidence interval does not contain zero. The results suggested significant indirect effects in that emotion-focused coping mediated the path

between PTSD and CIU severity as well as PTSD and psychiatric symptoms. It also mediated the path between neuroticism and CIU severity (see Table 3).

Discussion

The present study compared CIU and psychiatric symptom severity between patients with different levels of PTSD from past trauma and examined the interrelationship between PTSD, personality traits, coping strategies and health outcomes (CIU and psychiatric symptom severity). The results partially supported hypothesis one in that while psychiatric symptom severity differed significantly between diagnostic groups, CIU severity was similar across groups. Hypothesis two was also partially supported in that PTSD was associated with coping strategies which were in turn associated with CIU and psychiatric symptom severity. Surprisingly, PTSD was not significantly associated with personality. Mediational analysis showed that emotion-focused coping mediated 1) PTSD and CIU severity, 2) PTSD and psychiatric symptoms and 3) neuroticism and CIU severity.

The finding that CIU patients with full-PTSD reported higher rates of psychiatric symptoms than the other groups provided further support for the dose-response hypothesis [47, 48]. That is, the greater the severity of PTSD symptoms, the stronger the psychiatric symptoms. Interestingly, this dose-response phenomenon only occurred as patients manifested psychiatric symptoms, rather than in parallel with CIU severity. In other words, the severity of psychiatric symptoms seemed to be more changeable than the severity of CIU for patients with varying levels of PTSD. This was also the case among studies looking at PTSD following myocardial infarction. The variability of MI severity did not seem to relate to the severity of PTSD e.g. [49].

Bearing in mind the integrative two-factor model of PTSD (i.e. PTSD is related to both neurological and psychological systems), this implies that whilst patients with full PTSD might have developed a psychological and neurological hypersensitivity leading to more psychiatric symptoms [50] than those with less severe PTSD, it is not necessarily the case that the biological regulation of those with full-PTSD would be affected [51–53] more than those with less severe PTSD.

Although CIU and psychiatric symptom severity seemed to vary depending on the degree of PTSD, when coping strategies were taken into account, a different picture emerged regarding how they related to PTSD. PTSD was associated with coping strategies which were associated with CIU and psychiatric symptom severity. This is consistent with that postulated in the introduction. Specifically, elevated PTSD was related to elevated endorsement of emotion-focused coping which itself was associated with both health outcomes. This is in line with existing literature on emotion-focused coping being a predictor for poor outcomes [8–11, 54], increased psychiatric symptoms [13], greater general psychological distress [55–57] and greater physical and somatic symptoms and social dysfunction [58–60]. This is consistent with literature supporting mediational effects on distress outcomes for people who have experienced trauma e.g. [18, 31, 61–64].

Escape-avoidance, as an emotion-focused coping strategy, was highly and positively correlated with PTSD ($r = 0.52$, $p < 0.001$). This echoes a meta-analysis on the association between avoidance coping and distress [65]. Following trauma, CIU patients might attempt to make the resultant distressing emotion tolerable by avoiding it [35–37], instead of confronting it using problem-focused coping. Distressing emotion left unresolved might explain the

Table 3 Mediational analyses: The indirect effects of PTSD and personality on CIU severity or psychiatric symptoms through coping

			Bootstrapping				Bootstrapping	
			BCa 95% CI				BCa 95% CI	
Indirect effects of PTSD on CIU severity through coping					Indirect effects of PTSD on psychiatric symptoms through coping			
	Effect	Boot SE	Lower	Upper	Effect	Boot SE	Lower	Upper
Total	0.02	0.01	0.00	0.05	0.01	0.07	−0.11	0.17
Problem-focused	0.00	0.00	−0.01	0.01	−0.08	0.06	−0.24	0.00
Emotion-focused	0.02	0.01	0.00	0.05	0.10	0.06	0.00	0.26
Indirect effects of personality on CIU severity through coping					Indirect effects of personality on psychiatric symptoms through coping			
Neuroticism					Neuroticism			
Total	0.03	0.01	0.01	0.06	0.05	0.05	−0.04	0.17
Problem-focused	0.00	0.00	−0.00	0.00	−0.00	0.01	−0.05	0.02
Emotion-focused	0.03	0.01	0.01	0.06	0.05	0.05	−0.04	0.17
Extraversion					Extraversion			
Total	0.00	0.01	−0.01	0.03	0.01	0.10	−0.17	0.21
Problem-focused	−0.00	0.00	−0.01	0.00	−0.03	0.05	−0.21	0.01
Emotion-focused	0.00	0.01	−0.01	0.03	0.04	0.10	−0.17	0.25
Conscientiousness					Conscientiousness			
Total	−0.01	0.01	−0.05	0.01	−0.13	0.10	−0.35	0.03
Problem-focused	−0.01	0.00	−0.02	0.00	−0.02	0.05	−0.21	0.03
Emotion-focused	−0.01	0.01	−0.05	0.00	−0.10	0.10	−0.35	0.05

association between emotion-focused coping and psychiatric symptom and CIU severity; it also demonstrates the inhibition hypothesis in that escape-avoidance as a coping mechanism leads to cumulative stress on the body and psychosomatic illness (in this case CIU) and psychiatric symptoms [66, 67].

These results have extended our understanding of the conversion hypothesis among CIU patients who have experienced trauma. The skin is the most visible organ through which emotional distress is communicated [68]. As dermatological problems manifest, somatic symptoms - bodily symptoms which emerge as an expression of, for example, underlying traumatic memories (such as family violence, child abuse) - may also be manifesting. Essentially, traumatic events can be experienced on a sensory level as "body memories", which are fragments of the sensory component of the traumatic experience [69–71], and may manifest as urticaria, pruritus, angioedema, and unexplained exacerbations of stress-reactive dermatoses (psoriasis, atopic eczema). In short, CIU patients can experience a "conversion" phenomenon in which overwhelming traumatic emotions are converted into more acceptable physical dermatological symptoms [68, 70, 72–75]. According to our findings, this converting process might be facilitated by the degree to which patients use escaping/avoiding or other emotion-focused types of coping. In other words, it may not simply be about whether the body manifests the traumatic memories, but about how patients cope with the emotion associated with the memories; To not process it is to increase the likelihood of experiencing increased CIU and psychiatric symptoms. The therapeutic implication then is that to help CIU patients, one needs to address not only the impact of their past traumas but the way in which they process traumatic emotion.

Surprisingly, PTSD was not significantly correlated with personality. However, one should not therefore disregard the notion of trauma having a major influence on self-schema [34] or the emergence of a sense of traumatized self or vulnerable identity [76]. Neither should one disregard the wealth of literature, mentioned in the introduction, suggesting an intimate link between PTSD and personality traits. It is difficult to explain the lack of a significant link between PTSD and personality. One could postulate the problematic nature of the Five-Factor model. There are inconsistencies in terms of research findings using the Five-Factor model among people who have experienced trauma [77]. This model might not be "optimal" in terms of generalizability; It has produced inconsistent findings across methods [78] including different sample types [79, 80]. Moreover, the Five-Factor model is not always helpful in terms of linking psychological disorders since it mainly links ordinary personality traits as opposed to psychopathological ones [80, 81].

Although PTSD was not significantly correlated with personality, personality was correlated with coping which in turn was correlated with health outcomes. Specifically, mediational findings showed that neuroticism was correlated with emotion-focused coping which itself influenced CIU severity. Three observations are worth noting: firstly, while there is evidence suggesting that patients who had dermatological problems, including urticaria, were more hostile and neurotic than people with other dermatological diseases [82], the relationship between personality and CIU severity is far more complex than indicated in research. Mediation or moderation analysis would have been necessary to tease out the mechanisms underpinning this relationship. This is what we did in the present study.

Secondly, the present results have extended the disease-prone personality hypothesis [83, 84]. Much research has focused on what constitutes such a personality and concluded that it involves depression, anger/hostility, and anxiety [83]. However, the present findings suggest that the degree to which emotion-focused coping is used should also be taken into

account. Thirdly, neuroticism, as a disease-prone personality trait, did not influence psychiatric symptom severity via emotion-focused coping. Rather, CIU severity increased specifically when emotion-focused coping was used.

The last two observations reflect some of the mechanisms described in literature linking personality and health. For example, part of the transactional stress-moderation model describes how personality (e.g. neuroticism) can influence emotion-focused coping which has a knock-on effect on physiological arousal leading to increased severity of an illness [84]. This is specifically about physical rather than psychiatric symptom severity. Similarly, expression of symptoms among CIU patients seemed to be a combination of neuroticism and specific emotion-focused coping, affecting physical symptom severity, despite the fact that neuroticism has been thought in literature to be a "generalized biological vulnerability" factor [85] predisposing people to general psychological distress [86].

There are limitations in the present study. Firstly, a longitudinal design would have given us a much better understanding of causality between the constructs investigated. Secondly, our measure on CIU severity could have been strengthened by a supplementary measure of, for example, Skindex-17 [87]. This would have given us additional information pertaining to dermatology-specific quality of life which might have shed more light onto the relationship between PTSD and CIU symptom severity. Thirdly, it would have been interesting to look at "distress-prone" personality traits such as Type D rather than "generic" personality traits such as the Big Five. This might have given another perspective on the link between personality and psychiatric symptoms via emotion-focused coping.

To conclude, CIU patients with different levels of PTSD resulting from past traumas can display different levels of psychiatric symptoms. When patients avoid dealing with the effects of trauma, CIU severity and psychological difficulties tend to increase. In particular, when neurotic patients engage in emotion-focused coping, CIU symptom severity increases specifically.

Compliance with Ethical Standards

Conflict of Interests All authors declare that they have no conflicts of interest.

Ethical Approval All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all participants included in the study.

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