

The relationship between posttraumatic stress disorder, psychiatric comorbidity, and personality traits among patients with chronic idiopathic urticaria

Man Cheung Chung^{a,*}, Christine Symons^b, Jane Gilliam^b, Edward R. Kaminski^b

^aUniversity of Plymouth, Clinical Psychology Teaching Unit, Peninsula Allied Health Centre, PL6 8BH, United Kingdom

^bDepartment of Clinical Immunology and Allergy, Derriford Hospital, Plymouth PL6 8DH, United Kingdom

Abstract

Background: Several studies have highlighted the link between posttraumatic stress disorder (PTSD) and physical illnesses. No empirical studies, however, have investigated the relationship between PTSD and chronic idiopathic urticaria (CIU). The role of personality traits in this relationship was also unknown.

Objectives: This study aimed to investigate (1) the extent to which patients with CIU fulfilled the PTSD diagnosis resulting from past traumas and (2) whether they developed psychiatric comorbidity, and (3) the relationship between CIU patients' personality traits, PTSD diagnosis, severity of CIU, and psychiatric comorbidity.

Methods: One hundred patients with CIU and 60 patients with allergy (control) participated in the study. Patients' CIU severity was assessed. Both groups completed the Posttraumatic Stress Diagnostic Scale, the General Health Questionnaire-28, the Social Readjustment Rating Scale, the Perceived Stress Scale, and the NEO-Five Factor Inventory.

Results: Thirty-four percent of patients with CIU and 18% of allergy patients met the diagnostic criteria for PTSD. Patients with CIU were 1.89 times more likely to have a current diagnosis of PTSD than the control group. Controlling for life event stress and perceived stress, significant differences were found between groups (CIU PTSD, CIU no PTSD, allergy PTSD, allergy no PTSD) in somatic problems, anxiety, and social dysfunction. Controlling for life event stress and perceived stress, regression analyses showed no significant associations between personality traits, PTSD diagnosis, and the severity of CIU. Posttraumatic stress disorder diagnosis and neuroticism were, however, associated with psychiatric comorbidity.

Conclusions: Patients with CIU have been shown to have concurrent PTSD resulting from past traumas and developed psychiatric comorbidity. Chronic idiopathic urticaria patients' comorbidity was related to the patients' PTSD diagnosis and their neurotic personality trait.

© 2010 Elsevier Inc. All rights reserved.

1. Introduction

Trauma exposure has been shown to be associated with physical illnesses [1–3]. After trauma, individuals could develop posttraumatic stress disorder (PTSD) that affects, for example, their immune system. In turn, susceptibility to illness or exacerbation of different diseases is increased [4–7]. Indeed, PTSD often leads to illness, often along with psychiatric comorbidity (eg, anxiety and depression) (eg, see references [8–19]). Among these illnesses, dermatological

disorders have been identified in individuals with PTSD [6,10,19–23]. In fact, one study showed that PTSD, alongside depression, anxiety, obsessive-compulsive disorder, and panic disorder, was prevalent among patients who attended dermatology clinics [24,25]. However, these studies have simply raised awareness of the fact that individuals with PTSD also had dermatological disorders. Empirical studies with proper controlled designs to examine this link between PTSD and dermatological disorders such as chronic idiopathic urticaria (CIU) are few. The lack of empirical research on such a link also means a lack of understanding in terms of the risk factors associated with it.

Chronic idiopathic urticaria is defined as the occurrence of daily or frequent wheals and itching for at least 6 weeks for which no obvious cause has been identified. The

* Corresponding author. University of Plymouth, Clinical Psychology Teaching Unit, Peninsula Allied Health Centre, PL6 8BH Plymouth, United Kingdom.

E-mail address: m.chung@plymouth.ac.uk (M.C. Chung).

diagnosis of CIU excludes other causes of urticaria such as allergies, autoimmune urticaria, and physical urticaria. This diagnosis is facilitated by a typical symptom set consisting of recurrent urticaria (with or without angioedema) occurring at time points that are not associated with meals or medication and commencing typically in the evening or during the night. In most patients, this is a self-limiting condition lasting several months to several years.

There are theoretical postulates suggesting that the link between PTSD and CIU is a plausible one. The skin is the most visible organ through which individuals communicate their emotional distress [26]. As patients manifest dermatological problems, they could in fact manifest somatic symptoms, that is, bodily symptoms that emerge as an expression of, for example, some underlying traumatic memories resulting from traumatic events (eg, family violence, child abuse, and earthquakes). In other words, the latter can be experienced on a sensory level as “body memories,” which are fragments of the sensory component of the traumatic experience [27–29], and may manifest themselves in urticaria, pruritus, angioedema, and unexplained exacerbations of stress-reactive dermatoses (eg, psoriasis, atopic eczema). In short, dermatological patients may have experienced a “conversion” phenomenon in which they have converted overwhelming traumatic emotions into more acceptable physical dermatological symptoms described above as well as other cutaneous sensory symptoms including burning, numbness, tingling, crawling sensations, pricking sensations, pain, tenderness of the skin, and unexplained bruising of the skin [26,28,30–33]. These cutaneous sensory symptoms, for which no medical cause had been identified, were associated with major life events among community samples [34].

As was mentioned, there is little empirical evidence on the link between PTSD and CIU and on factors that may influence this link. For example, there is no knowledge of whether patients’ personality traits may influence it. Yet, it is reasonable to speculate that personality traits may have a role to play because they have been shown to contribute to the development and progression of health problems, that is, the “disease-prone” personality hypothesis [35–37]. Also, personality traits have been shown to be associated with dermatological disorders. For example, patients with urticaria, psoriasis, or alopecia were more hostile and neurotic than people with other dermatological diseases [38]. People with “psychosomatic diseases” including CIU had significantly higher level of neuroticism than the control [39]. Alexithymia was also associated with different dermatological disorders [40–43] and with psychosocial functioning that, in turn, was negatively associated with the burden of dermatological diseases [44]. Type A trait was also associated with dermatological diseases such as psoriasis [45,46].

The aims of the present study were threefold. First, to investigate whether patients with CIU would meet the PTSD diagnosis resulting from past traumas more than the patients in the control group (patients with allergy). Second, to

examine whether CIU patients with PTSD would experience more severe psychiatric comorbidity than those without PTSD and the control group with and without PTSD. Third, to examine the relationship between personality traits, PTSD diagnosis, the severity of CIU, and psychiatric comorbidity among patients with CIU.

Given the literature described above, we hypothesized that the proportion of patients with CIU meeting the PTSD diagnosis resulting from past traumas would be higher than that of the control group. We also hypothesized that CIU patients with PTSD would experience more severe psychiatric comorbidity than those without PTSD and the control group with and without PTSD, after controlling for life event stress and perceived stress. We also hypothesized that CIU patients’ personality traits (neuroticism, in particular) and PTSD diagnosis would be associated with the severity of CIU and psychiatric comorbidity, after controlling for life event stress and perceived stress.

We planned to control for life event stress and perceived stress because one would speculate that patients’ level of stress serves as the confounding factor influencing the outcome variables, that is, the severity of CIU and psychiatric comorbidity. Indeed, research has shown that patients with CIU or other dermatological disorders often experience a high level of stress (eg, daily stress, life event stress leading to significant life adjustment) sometime before the onset or exacerbation of CIU (eg, see references [38,40,47–51]).

2. Methods

2.1. Participants

One hundred patients with CIU (82 female, 18 male) with a mean age of 46.52 (SD, 14.10) participated in the study, and most of them (95%) had CIU for the first time. Sixty patients with allergy (type I hypersensitivity) (39 female, 21 male) with a mean age of 36.23 (SD, 15.88) constituted the control group. Patients with CIU were significantly older than the patients in the control group ($t_{158} = 4.25$, $P < .001$). There was a significant difference between groups in terms of the onset of dermatological disorders ($t_{83} = -3.10$, $P < .003$). On average, patients with CIU first noticed their CIU approximately 4 years ago (mean, 50.26 months; SD, 78.61), whereas patients in the control group first noticed their allergy about 9 years ago (mean, 110.16, SD, 136.56). Significantly more females than males participated in the study ($\chi^2_1 = 5.87$, $P < .01$). There were no significant differences between groups in marital status (married: CIU = 62% vs allergy = 55%, $\chi^2_4 = 4.88$, not significant [NS]), educational level (up to secondary education: CIU = 63% vs allergy = 60%, $\chi^2_3 = 1.04$, NS), income level (low income: CIU = 60% vs allergy = 66%, $\chi^2_2 = 2.42$, NS), and the number of other illnesses (eg, asthma, thyroid problems, eczema, back pain, hypertension, psoriasis) (CIU mean, 0.75

[SD, 0.98] vs allergy mean, 0.81 [SD, 1.03]; $t_{157} = -1.75$, NS). Almost all of the participants were white (99%).

2.2. Procedure

This study comprised patients with CIU and allergy (the control group) who were all recruited from an immunology clinic in one hospital in one city of the United Kingdom. The data collection started in January 2004 and finished in December 2006. During this period, 116 patients with CIU were referred to the clinic, met the inclusion criteria (see below), and were therefore invited to take part in the study. One declined our invitation without giving any reason. Fifteen patients never returned the questionnaires. For the control group, 81 patients with allergy were referred to the clinic. They all met the inclusion criteria and were therefore invited to participate in the study. One declined the invitation without giving a reason. Twenty patients did not return the questionnaires.

When patients were invited to take part in the study, the purpose and procedure of the study were explained to them. The patients who agreed to participate signed a consent form and were asked to complete a demographic sheet (sex, age, marital status, ethnicity, occupation, educational level, how long ago they started noticing the appearance of their first CIU, or most recent allergy and other illnesses that they had).

During the clinical interview, the nurse specialist assessed the severity of CIU using a local variation of a scoring system devised by the European Association of Allergy and Clinical Immunology [52]. The consultant looked through the medical records to determine whether patients had any long-term psychiatric history or cognitive impairment. Both groups of patients were asked to complete the Posttraumatic Stress Diagnostic Scale (PDS), the General Health Questionnaire-28 (GHQ-28), the Social Readjustment Rating Scale (SRRS), the Perceived Stress Scale (PSS), and the NEO-Five Factor Inventory (NEO-FFI) at home and returned their questionnaires.

The inclusion criteria were patients with a diagnosis of CIU and, for the control group, urticaria with or without angioedema due to a diagnosed allergy (type I hypersensitivity). The diagnosis of type I hypersensitivity was made based on a suggestive history confirmed by skin prick and/or specific immunoglobulin E tests. Patients were excluded if they (1) had dermatological disorders that were not specified in the inclusion criteria, (2) had a history of long-term psychiatric illness, (3) had cognitive impairment, and (4) were unwilling or unable to give consent. The study was approved by the local research ethics committee.

2.3. Measures

The PDS [53] aims to assess PTSD, based on the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition*, criteria. This was completed by both the CIU and allergy groups. The first part of PDS focuses on a range of previous traumatic events throughout life that participants

may have experienced. If patients had more than one traumatic event, they were asked to identify the one that was most traumatic for them. The second part assesses PTSD symptoms that result from having experienced the most traumatic event. Patients were asked to rate the severity of the symptoms according to the rating scale: 0 = not at all, 1 = once a week or less/once in a while, 2 = 2 to 4 times a week/half the time, 3 = 5 or more times a week/almost always. 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).

The GHQ-28 [54] yields 4 subscales, which are somatic problems, anxiety, social dysfunction, and depression. The questions are scored using the rating scale of 1 to 4. The range of each subscale is 7 to 28. It has shown a sensitivity value of 88% at a specificity of 84.2% and an overall misclassification rate of 14.5%.

The SRRS [55] aims to assess the level of stress resulting from life events that leads to life adjustment. The scale comprises 43 life events (eg, death of spouse, divorce, jail term, marriage, retirement) that are arranged in rank order from the most stressful to the least stressful. Each event has been assigned a value, ranging from 100 points for the death of a spouse to 11 points for minor violations of the law. The points are added up and yield a stress score that can then be correlated with, for example, the incidence of illness, to ascertain the relationship between stress and the occurrence of physical illness. For the present study, patients with CIU and allergy were asked to report the kinds of events that they experienced in the 12-month period before the first onset of CIU and before the onset of the most recent allergy, respectively.

The PSS [56] is a 14-item scale measuring the degree to which people appraise situations in their lives as stressful. By stressful, it means that people appraise the situations as unpredictable, uncontrollable, and overloading. The items refer to people's subjective appraisals of events that occur within a 1-month time frame. They are scored on a rating scale: 0 = never, 1 = almost never, 2 = sometimes, 3 = fairly often, 4 = very often. The internal consistency was 0.84, 0.85, and 0.86 in 3 samples tested by Cohen et al [56] and 0.75 in a population study [57]. The test-retest reliability over 2 days among college students was 0.85. The PSS was also shown to have predictive validity that predicted physical symptoms (ranging from 0.52 to 0.70). It was also significantly correlated with future use of health services both in college students and in the general population (correlations ranging from 0.12 to 0.22).

The NEO-FFI [58] aims to measure the "Big Five" personality traits: neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness. Patients were asked to respond to the inventory on a Likert scale from "strongly disagree = 0" to "strongly agree = 4." The 5 factors of the NEO-FFI correlated well with the 5 factors of the NEO-PI-R; 0.92, 0.90, 0.91, 0.77, and 0.87 for neuroticism,

Table 1
The percentage of PTSD in the 2 groups

	CIU		Allergy		χ^2
	n	%	n	%	
PTSD	34	34	11	18	4.55*
No PTSD	66	66	49	82	

* $P < .05$.

extraversion, openness, agreeableness, and conscientiousness, respectively. Internal consistency was shown to be 0.86, 0.77, 0.73, 0.68, and 0.81 for neuroticism, extraversion, openness, agreeableness, and conscientiousness, respectively. The range for each subscale is 0 to 48.

2.4. Chronic idiopathic urticaria severity

The disease activity (severity) of CIU was assessed using a local variation of a scoring system devised by the European Association of Allergy and Clinical Immunology in 1994 [52]. 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 centers. 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, affect on respiration, facial involvement, affect on school/work, severity of itching and affect on sleep, and used a scale from 0 to 14.

2.5. Data analysis

We examined the assumptions and diagnostics pertaining to multivariate analysis. Because of nonnormality, the variables of social dysfunction, depression, agreeableness, conscientiousness, and extraversion were subjected to a log transformation. Outliers (Mahalanobis ≥ 3) were not detected during the exploration of diagnostics. After exploration and transformation, assumptions relating to multivariate normality, linearity, and homoscedasticity were met.

Descriptive statistics were used to describe the demographic information of the participants. χ^2 tests were used

to compare PTSD diagnoses between the CIU and the control groups. A multivariate analysis of covariance was used to compare the 4 GHQ-28 subscales between groups (CIU PTSD, CIU no PTSD, allergy PTSD, allergy no PTSD) with life event stress and perceived stress controlled. *t* tests were used to compare the personality traits between the CIU and control groups. Hierarchical multiple regression analyses were used to identify the association between personality traits, PTSD diagnosis, the severity of CIU, and psychiatric comorbidity among patients with CIU with life event stress and perceived stress controlled. A separate regression analysis was also carried out to investigate whether personality traits would moderate the link between PTSD and comorbidity, again, controlling for life event and perceived stress.

3. Results

To address the first aim of the present study, using the PDS, we found a significant association between PTSD diagnoses and the type of dermatological disorders. Thirty-four percent of patients with CIU and 18% with allergy met the diagnostic criteria for PTSD (see Table 1). Patients with CIU were 1.89 times more likely to have a current diagnosis of PTSD than the allergy group. The past traumas for both groups included sudden unexpected death of someone close (CIU, 35%; control, 30%), life-threatening injury or illness (CIU, 11%; control, 12%), childhood abuse (CIU, 8%; control, 5%), physical assault in adulthood (CIU, 7%; control, 8%), and serious accident (CIU, 7%; control, 7%).

To address the second aim, CIU patients with PTSD reported higher mean scores on the 4 GHQ-28 subscales than the CIU patients without PTSD and allergy patients with and without PTSD. A multivariate analysis of covariance was carried out to compare differences in these subscales, controlled for life event stress and perceived stress. Before showing the results, it is worth pointing out that there were significant differences between groups in terms of life event stress and perceived stress. Pairwise comparisons showed that CIU patients with PTSD reported significantly more stress than the other groups (life event stress, $P < .05$ or better; perceived stress, $P < .01$ or better).

Table 2
The means and SDs of GHQ-28, SRRS, and PSS

	CIU				Allergy				F
	PTSD		No PTSD		PTSD		No PTSD		
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Somatization	17.76	4.82	13.90	4.07	13.72	4.02	11.24	2.79	7.02*
Anxiety	19.52	5.10	14.50	4.83	13.81	4.28	11.18	3.16	11.13*
Social dysfunction	18.55	4.55	15.37	2.29	15.45	2.29	13.91	1.38	8.48*
Depression	13.58	6.53	9.13	3.33	10.36	4.05	8.55	3.02	1.88
Life event stress	208.17	124.20	139.80	121.23	118.54	109.08	78.24	91.09	9.03*
Perceived stress	31.44	6.70	22.45	8.37	23.45	8.14	21.34	8.79	11.91*

* $P < .001$.

Controlling for life event stress and perceived stress, the results also showed that there were significant differences between groups in somatic problems, anxiety, and social dysfunction. The level of depression was similar between groups. Pairwise comparisons showed that CIU patients with PTSD reported significantly higher severity in anxiety than the other 3 groups (CIU patients without PTSD, $P < .01$; allergy with PTSD, $P < .01$; and allergy without PTSD, $P < .001$). For somatic problems and social dysfunction, however, pairwise comparisons showed that CIU patients with PTSD reported significantly higher severity ($P < .01$ or better) than only the no-PTSD groups (ie, the CIU patients without PTSD and the allergy patients without PTSD) (see Table 2).

To address the third aim of the study, Table 3 shows the means and SDs of the 5 personality traits of patients with CIU and the control. By way of comparison, patients with CIU were significantly more introverted than patients in the control. Otherwise, both groups were similar in terms of the degree of neuroticism, openness to experience, agreeableness, and conscientiousness.

A series of hierarchical multiple regression analyses were carried out to explore the relationship between personality traits, PTSD diagnosis, the severity of CIU, and psychiatric comorbidity among patients with CIU. To control for life event stress and perceived stress, the stress variables were entered into block 1 of the regression analyses. Subsequently, PTSD diagnosis was entered into block 2 and the 5 personality traits into block 3.

To report first the results on the severity of CIU, model 1 did not explain a significant proportion of the variance (less than 1%). After adjusting for the variables in model 1, model 2 did not improve significantly the prediction of the severity of CIU and explained just more than 1% of the variance. After adjusting for the variables for models 1 and 2, the overall model 3 did not improve significantly the prediction either and explained less than 3% of the variance. The results basically showed a lack of association between personality traits, PTSD diagnosis, and the severity of CIU (see Table 4).

Turning to the results on psychiatric comorbidity, the results showed the opposite pattern in that model 1 explained a significant proportion of the variance (48%) of comorbidity. Tests associated with the regression coefficients showed that perceived stress ($P < .001$) made a significant contribution to predicting comorbidity. After controlling

Table 3
The means and SDs of the NEO-FFI personality traits

	CIU		Allergy		<i>t</i>
	Mean	SD	Mean	SD	
Neuroticism	23.74	10.19	22.61	8.47	0.75
Extraversion	26.30	7.14	29.26	5.98	−2.42*
Openness	26.42	6.27	26.58	6.08	−0.16
Agreeableness	32.75	6.27	32.08	6.10	1.05
Conscientiousness	33.08	7.39	32.81	7.54	0.03

* $P < .01$.

Table 4

Hierarchical multiple regression for the relationship between PTSD, personality traits (independent variables), and the severity of CIU (dependent variable), controlling for perceived stress and life event stress

	<i>B</i>	SE <i>B</i>	β	<i>F</i>	Adjusted R^2
Block 1				0.77	−0.005
Perceived stress	−0.00	0.02	−.00		
Life event stress	0.00	0.00	.12		
Block 2				0.06	−0.014
Perceived stress	0.00	0.03	.00		
Life event stress	0.00	0.00	.12		
PTSD diagnosis	−0.14	0.55	−.03		
Block 3				0.74	−0.028
Perceived stress	0.06	0.05	.25		
Life event stress	0.00	0.00	.12		
PTSD diagnosis	−0.08	0.57	−.01		
Neuroticism	−0.05	0.04	−.24		
Extraversion	−0.97	1.87	−.08		
Openness	−0.00	0.04	−.01		
Agreeableness	3.25	3.10	.11		
Conscientiousness	1.95	2.19	.12		

for the stress variables in model 1, model 2 improved significantly the prediction of comorbidity and explained about 51% of the variance. Regression coefficients showed that PTSD diagnosis ($P < .017$) made a significant contribution to predicting comorbidity. After adjusting for the stress variables in model 1 and PTSD diagnosis in model 2, however, the overall model 3 did not improve significantly the prediction and explained 53% of the variance. Nevertheless, regression coefficients showed that neuroticism ($P < .01$) made a significant contribution to predicting comorbidity (see Table 5).

To further analyze the foregoing relationship between personality traits, PTSD diagnosis, and comorbidity, we examined to what extent personality traits would moderate

Table 5

Hierarchical multiple regression for the relationship between PTSD, personality traits (independent variables) and comorbidity (dependent variable), controlling for perceived stress and life event stress

	<i>B</i>	SE <i>B</i>	β	<i>F</i>	Adjusted R^2
Block 1				46.72**	0.48
Perceived stress	1.13	0.14	.62**		
Life event stress	0.01	0.01	.13		
Block 2				5.94*	0.505
Perceived stress	0.97	0.15	.53**		
Life event stress	0.01	0.01	.12		
PTSD diagnosis	6.65	2.73	.19*		
Block 3				1.92	0.528
Perceived stress	0.54	0.24	.29*		
Life event stress	0.01	0.01	.12		
PTSD diagnosis	5.77	2.73	.17*		
Neuroticism	0.51	0.19	.32*		
Extraversion	9.39	9.01	.10		
Openness	−0.35	0.22	−.13		
Agreeableness	1.62	14.90	.00		
Conscientiousness	−4.26	10.51	−.03		

* $P < .05$.

** $P < .001$.

the relationship between PTSD diagnosis and comorbidity, controlling for life event and perceived stress. To do so, a separate regression analysis was carried out by entering life event and perceived stress into block 1 and the product variables (5 personality traits $\times$ PTSD diagnosis) into block 2. The results showed that model 1 predicted significantly comorbidity ($F_{2,97} = 54.64$, $P < .001$) and explained 52% (adjusted $R^2 = 0.52$) of the variance. Regression coefficients showed that perceived stress made a significant ($P < .001$) contribution to predicting comorbidity. After controlling for the stress variables in model 1, the overall model 2 improved significantly the prediction ($F_{5,92} = 3.63$, $P < .01$, R^2 change = 0.078) and explained about 58% (adjusted $R^2 = 0.577$) of the variance. Tests associated with regression coefficients showed a significant moderator effect in that neuroticism interacted with PTSD diagnosis in predicting comorbidity ($P < .001$). In other words, CIU patients' neuroticism moderated the impact of PTSD diagnosis on comorbidity, after adjusting for life event and perceived stress.

4. Discussion

It has been postulated that to understand how traumatic events could affect physical health, a range of mechanisms (biological, psychological, attentional, and behavioral) that interact in a complex manner need to be taken into account [16,59]. This study did not set out to examine such complex interaction; however, it was designed to focus on increasing our understanding of the psychological mechanism involved in PTSD and CIU. It aimed to examine the extent to which patients with CIU had a concurrent diagnosis of PTSD resulting from past traumas and developed psychiatric comorbidity. It also aimed to investigate the role that personality traits played in the relationship between PTSD diagnosis, the severity of CIU, and psychiatric comorbidity.

The results confirmed the first hypothesis in that the proportion of patients with CIU meeting the PTSD diagnosis resulting from past traumas was higher than that of the control group patients. This finding echoed the postulate that PTSD after traumas may increase the risk of multiple idiopathic physical symptoms that are medically unexplained and yet have physical manifestations often resulting in decreased functioning [31]. Patients with CIU could have converted their traumatic emotions into some physical symptoms in that they manifested or communicated traumatic memories or emotions through their skin [26–30,32–34].

The exact mechanism involved in explaining how the preceding “mind” (PTSD) and “skin” (CIU) interact together, however, remains to be empirically tested. One proposed model suggests that stress or PTSD, a severe form of stress, can trigger or exacerbate the local neuroimmunendocrine circuitry that underlies the pathogenesis of some allergic and inflammatory skin diseases [60,61]. One implication from the above model is that if the level of stress

or PTSD can be controlled, the impact on the whole chain of biological mechanisms can also be reduced. For this reason, some attempts have been made to help individuals control their level of stress by interventions such as stress management, relaxation, hypnosis, and conditioning trials. In turn, this should have an impact on improving people's immunological parameters [62].

The results also supported the second hypothesis in the sense that CIU patients with PTSD reported significantly more anxiety than those without PTSD and the control groups with and without PTSD, after adjusting for life event stress and perceived stress. This finding is consistent with the general finding in the PTSD literature that individuals with PTSD also tend to develop a whole range of psychiatric comorbidity [63–66]. However, to look at this finding in more detail, an opposite pattern emerged in that CIU patients with PTSD did not differ significantly from the other groups in depressive symptoms. The implication is that when CIU patients with PTSD develop psychiatric comorbidity, they could be prone to developing certain specific psychiatric symptoms (eg, anxiety rather than depression). Also, alongside these opposite findings on anxiety and depression, CIU patients with PTSD reported significantly more somatic problems and social dysfunction than the no-PTSD control groups only. In other words, the degree of severity of certain psychiatric symptoms among these CIU patients with PTSD could be similar to that of other dermatological patients (eg, allergy) with PTSD. This means that, for certain psychiatric symptoms, the degree of severity may be more related to whether patients have PTSD than to whether they have a skin condition with known causes. Clearly, more research is needed to explore such differences in psychiatric responses among patients with CIU.

The results of the study partially supported the third hypothesis in that although PTSD diagnosis and neuroticism were associated with psychiatric comorbidity, neither PTSD diagnosis nor personality traits were associated with severity of CIU. The significant link between neuroticism and psychiatric comorbidity echoed research evidence suggesting that neuroticism is associated with a variety of psychiatric symptoms [67] and that it is a strong personality risk factor for poor health [68]. For example, neuroticism has been shown to be a predisposing factor for major depression [69,70]. People with depression or generalized anxiety tend to have high neuroticism or negative affectivity [71,72].

Also, the results revealed that PTSD diagnosis and neuroticism did not affect psychiatric comorbidity independently. Instead, there was a significant moderating effect (ie, neuroticism interacted with PTSD diagnosis in predicting comorbidity), which reflects “some” aspects of an integrative model for adaptation to traumatic stress proposed by Joseph and associates [73]. This model states that when people experience traumatic events, they form event cognitions, which are in imaginal form and set the basis for intrusive thoughts (PTSD symptom) of the traumatic event. Thus, these event cognitions are in fact traumatic event cognitions.

The model then goes on to say that the way in which people (in this case, CIU patients) react to these traumatic event cognitions is influenced by their own personality traits (eg, neuroticism). They draw on aspects of personality to appraise and reappraise the information and meaning presented by the traumatic event cognitions. This in turn would lead to the emergence of strong emotional states (eg, anxiety as psychiatric comorbidity). This theoretical model is helpful in that it shows us how PTSD, neuroticism, and psychiatric comorbidity could be integrated among CIU patients with PTSD.

It is worth mentioning briefly the findings on the lack of association between PTSD diagnosis, personality traits, and the severity of CIU. One could argue that the finding on the nonsignificant relationship between PTSD diagnosis and the severity of CIU was not too surprising. Several studies have in fact demonstrated that PTSD was not associated with the objective severity of illnesses (eg, myocardial infarction) (eg, see references [74,75]). Some researchers may argue that it is more useful to establish the link between “perceived” subjective severity of illnesses (in this case, CIU) and PTSD [76]. Similarly, some researchers suggest that the way people think about or perceive the inherently aversive character of their illness would have an impact on their physical and psychological health status [77]. Such subjective illness cognitions of one’s illness may prove to be more useful than objective severity of the illness. Unfortunately, in this study, no data have been collected on patients’ perceived subjective severity or subjective illness cognition of CIU. Therefore, the extent to which PTSD relates to these patients’ subjective perceptions of CIU remains to be tested.

Similarly, one could argue that the lack of association between personality traits and the severity of CIU was not too surprising. To examine it from the angle of perceived subjective severity of CIU may have revealed something. There is research evidence suggesting that people with high levels of neuroticism, for example, tend to “magnify” the impact of stressful events [78]. This presumably could include chronic illnesses. In other words, there seems to be a link between people’s specific personality traits and their subjective perception of stressors such as illnesses.

Before mentioning some reservations about this study, it is worth pointing out that, as shown in the regression analysis for comorbidity, perceived stress consistently made a significant contribution to the models despite the fact that the β value became considerably smaller when PTSD diagnosis and personality traits were introduced. The implication from this observation is that it is wise to consider the degree to which patients with CIU appraise their current situations in their lives as stressful (as unpredictable, uncontrollable, and overloading) in future studies.

To close the article, it is noteworthy that there are reservations about this study. First, one could argue that we could have classified the patients into full PTSD, partial PTSD, and no PTSD. Some researchers believe that PTSD occurs along a continuity of normal to abnormal stress

reactions implying that it is not always helpful to view PTSD in terms of either having PTSD or not having PTSD [79]. Just because some people have not fulfilled the full diagnostic criteria for PTSD does not mean that they have not experienced quite severe impairment in functioning. They could still require the same level of care as those with a full diagnosis of PTSD. Thus, some researchers believe that to classify PTSD reactions at different levels is more helpful [80,81]. However, to do so would probably require a substantial increase of our sample size that would have been impossible to achieve because of time and financial constraint. Also, if we insisted on staying with the same sample size and analyzing the data according to 3 diagnostic groups, the power of the study would have been severely jeopardized.

Second, returning to the integrative model proposed by Joseph et al [73], it states that people draw on aspects of personality to “appraise and reappraise” the information and meaning presented by the traumatic event cognitions. The phrase “appraise and reappraise” imply coping. That is, we cope by appraising or reappraising the meaning presented by these traumatic event cognitions and whether we have personal resources (social support and feelings of personal control) that would help us cope with these stressful situations [82]. This is why some PTSD researchers believe that instead of looking at personality only, it is important to look at the complex relationship between PTSD, personality traits, coping strategies, and maladjustment [83,84].

To conclude, patients with CIU have been shown to have concurrent PTSD resulting from past traumas. In other words, it is possible that traumatic memories or emotions could be manifested through skin, or, more specifically, CIU. They can also develop psychiatric comorbidity that is, in turn, associated with PTSD diagnosis and neuroticism.

References

- [1] Freyd JJ, Klest B, Allard CB. Betrayal trauma: relationship to physical health, psychological distress, and a written disclosure intervention. *J Trauma Dissociation* 2005;6:83–104.
- [2] Rodgers CS, Norman SB, Thorp SR, Lang AJ, Lebeck MM. Trauma exposure, posttraumatic stress disorder and health behavior: impact on special populations. In: Corales TA, editor. *Focus on posttraumatic stress disorder research*. Hauppauge: Nova Science Publishers; 2005. p. 203–24.
- [3] van Kamp I, van der Velden PG, Stellato RK, Roorda J, van Loon J, Kleber RJ, et al. Physical and mental health shortly after a disaster: first results from the Enschede firework disaster study. *Eur J Public Health* 2006;16:252–8.
- [4] Altemus M, Dhabhar FS, Yang R. Psychobiology of posttraumatic stress disorders: a decade of progress. In: Yehuda R, editor. *Psychobiology of posttraumatic stress disorders: a decade of progress* (Vol. 1071). *Annals of the New York Academy of Sciences*. Malden (Mass): Blackwell Publishing; 2006. p. 167–83.
- [5] Dougall AL, Baum A. Stress, health and illness. In: Baum A, Revenson TA, Singer JE, editors. *Handbook of health psychology*. New Jersey: Lawrence Erlbaum Associates; 2001. p. 321–37.
- [6] Everson MP, Kotler S, Blackburn WD. Neuroendocrine immune basis of the rheumatic diseases. In: Cutolo M, Masi AT, Bijlsma JWJ,

- Chikanza IC, Bradlow HL, et al, editors. Neuroendocrine immune basis of the rheumatic diseases. *Annals of the New York Academy of Sciences*, Vol. 876. New York: New York Academy of Sciences; 1999. p. 413–8.
- [7] Friedman MJ, McEwen BS. Posttraumatic stress disorder, allostatic load, and medical illness. In: Schnurr PP, Green BL, editors. *Trauma and health: physical health consequences of exposure to extreme stress*. Washington (DC): American Psychological Association; 2004. p. 157–88.
 - [8] Buckley TC, Green BL, Schnurr PP. Trauma, PTSD and physical health: clinical issues. In: Wilson JP, Keane TM, editors. *Assessing psychological trauma and PTSD*. New York: Guilford Press; 2004. p. 441–65.
 - [9] Ford JD, Schnurr PP, Friedman MJ, Green BL, Adams GA, Jex S. Posttraumatic stress disorder symptoms, physical health, and health care utilization 50 years after repeated exposure to a toxic gas. *J Trauma Stress* 2004;17:185–94.
 - [10] Friedman MJ, Schnurr PP. The relationship between trauma, post-traumatic stress disorder, and physical health. In: Friedman MJ, Charney DS, Deutch AY, editors. *Neurobiological and clinical consequences of stress: from normal adaptation to post-traumatic stress disorder*. Philadelphia: Lippincott Williams & Wilkins Publishers; 1995. p. 507–24.
 - [11] Green BL, Kimerling R. Trauma, posttraumatic stress disorder, and health status. In: Schnurr PP, Green BL, editors. *Trauma and health: physical health consequences of exposure to extreme stress*. Washington (DC): American Psychological Association; 2004. p. 13–42.
 - [12] Jakupcak M, Osborne T, Michael S, Cook J, Albrizio P, McFall M. Anxiety sensitivity and depression: mechanisms for understanding somatic complaints in veterans with posttraumatic stress disorder. *J Trauma Stress* 2006;19:471–9.
 - [13] McFarlane AC, Atchison M, Rafalowicz E, Papay P. Physical symptoms in post-traumatic stress disorder. *J Psychosom Res* 1994;38:715–26.
 - [14] Norris FH, Slone LB, Baker CK, Murphy AD. Early physical health consequences of disaster exposure and acute disaster-related PTSD. *Anxiety Stress Coping* 2006;19:95–110.
 - [15] Schnurr PP, Green BL. *Trauma and health: physical health consequences of exposure to extreme stress*. Washington (DC): American Psychological Association; 2004.
 - [16] Schnurr PP, Green BL, Kaltman S. Trauma exposure and physical health. In: Friedman MJ, Keane TM, Resick PA, editors. *Handbook of PTSD*. New York: The Guilford Press; 2007. p. 406–24.
 - [17] Schnurr PP, Spiro A. Combat disorder, posttraumatic stress disorder symptoms, and health behaviours as predictors of self-reported physical health in older veterans. *J Nerv Ment Dis* 1999;187:353–9.
 - [18] Weisberg RB, Bruce SE, Machan JT, Kessler RC, Culpepper L, Keller MB. Nonpsychiatric illness among primary care patients with trauma histories and posttraumatic stress disorder. *Psychiatr Serv* 2002;53: 848–54.
 - [19] Wolfe J, Schnurr PP, Brown PJ, Furey J. Posttraumatic stress disorder and war-zone exposure as correlates of perceived health in female Vietnam war veterans. *J Consult Clinical Psychol* 1994;62: 1235–40.
 - [20] Burges-Watson IP, Wilson GV, Hornsby H. “War neurosis” and associated physical conditions: an exploratory statistical analysis. *Ir J Psychol Med* 1992;9:30–6.
 - [21] Dirkzwager AJE, van der Velden PG, Grievink L, Yzermans CJ. Disaster-related posttraumatic stress disorder and physical health. *Psychosom Med* 2007;69:435–40.
 - [22] Mayer EA. Somatic manifestations of traumatic stress. In: Kirmayer LJ, Lemelson R, Barad M, editors. *Understanding trauma: integrating biological, clinical and cultural perspectives*. New York: Cambridge University Press; 2007. p. 142–70.
 - [23] Schnurr PP, Spiro A, Paris AH. Physician-diagnosed medical disorders in relation to PTSD symptoms in older male military veterans. *Health Psychol* 2000;19:91–7.
 - [24] Friedman S, Hatch M, Paradis CM. Obsessive compulsive disorder in two black ethnic groups: incidence in an urban dermatology clinic. *J Anxiety Disord* 1993;7:343–8.
 - [25] Woodruff PWR, Higgins EM, du Vivier AWP, Wessely S. Psychiatric illness in patients referred to a dermatology-psychiatry clinic. *Gen Hosp Psychiatry* 1997;19:29–35.
 - [26] Gupta MA. Somatization disorders in dermatology. *Int Rev Psychiatry* 2006;18:41–7.
 - [27] Briere J. Treating adult survivors of severe childhood abuse and neglect: future development of an integrative model. In: Myers JFB, Berliner L, Briere J, editors. *The APSAC handbook on child maltreatment*. Newbury Park: Sage Publications; 2002. p. 175–204.
 - [28] Gupta MA, Lanius RA, van der Kolk BA. Psychologic trauma, posttraumatic stress disorder, and dermatology. *Dermatol Clin* 2005;23:649–56.
 - [29] van der Kolk BA, Fisler R. Dissociation and the fragmentary nature of traumatic memories: overview and exploratory study. *J Trauma Stress* 1995;8:505–25.
 - [30] Brown RJ. Psychological mechanisms of medically unexplained symptoms: an integrative conceptual model. *Psychol Bull* 2004;130: 793–812.
 - [31] Engel CC. Somatization and multiple idiopathic physical symptoms: relationship to traumatic events and post-traumatic stress disorder. In: Schnurr PP, Green BL, editors. *Trauma and health, physical health consequences of exposure to extreme stress*. Washington (DC): American Psychological Association; 2004. p. 191–215.
 - [32] Gupta MA, Gupta AK. Psychodermatology: an update. *J Am Acad Dermatol* 1996;34:1030–46.
 - [33] Nijenhuis ERS. *Somatiform dissociation: phenomena, measurement and theoretical issues*. New York: W.W.Norton; 2004.
 - [34] Gupta MA, Gupta AK. Stressful major life events are associated with a higher frequency of cutaneous sensory symptoms: an empirical study of non-clinical subjects. *J Eur Acad Dermatol Venerol* 2004;18:560–5.
 - [35] Friedman HS. *Personality and disease*. Oxford: John Wiley & Sons; 1990.
 - [36] Friedman HS, Booth-Kewley S. The “disease-prone personality”: a meta-analytic view of the construct. *Am Psychol* 1987;42:539–55.
 - [37] Wiebe DJ, Fortenberry KT. Mechanisms relating personality and health. In: Vollrath ME, editor. *Handbook of personality and health*. Chichester: John Wiley & Sons Ltd; 2006. p. 137–56.
 - [38] Lyketsos GC, Stratigos GC, Tawil G, Psaras M, Lyketsos CG. Hostile personality characteristics, dysthymic states and neurotic symptoms in urticaria, psoriasis and alopecia. *Psychother Psychosom* 1985;44: 122–31.
 - [39] Ma LH, Tang LY, Luo GY, Li YL, Wei ZL, Lu GF, et al. A survey of psychosocial factors of psychosomatic diseases. *Chin J Clin Psychol* 2002;10:266–9.
 - [40] Fava GA, Perini GI, Santonastaso P, Fornasa CV. Life events and psychological distress in dermatologic disorders: psoriasis, chronic urticaria and fungal disorders. *Br J Med Psychol* 1980;53:277–82.
 - [41] Fortune DG, Richards HL, Griffiths CE, Main CJ. Psychological stress, distress and disability in patients with psoriasis: consensus and variation in the contribution of illness perceptions, coping and alexithymia. *Br J Clin Psychol* 2002;41:157–74.
 - [42] Picardi A, Mazzotti E, Gaetano P, Cattaruzza MS, Baliva G, Melchi CF, et al. Stress, social support, emotional regulation, and exacerbation of diffuse plaque psoriasis. *Psychosomatics* 2005;46:556–64.
 - [43] Picardi A, Pasquini P, Cattaruzza MS, Gaetano P, Melchi CF, Baliva G, et al. Stressful life events, social support, attachment security and alexithymia in vitiligo: a case-control study. *Psychother Psychosom* 2003;72:150–8.
 - [44] Picardi A, Porcelli P, Mazzotti E, Fassone G, Lega I, Ramieri L, et al. Alexithymia and global psychosocial functioning: a study on patients with skin disease. *J Psychosom Res* 2007;62:223–9.
 - [45] Picardi A, Pasquini P, Abeni D, Fassone G, Mazzotti E, Fava GA. Psychosomatic assessment of skin diseases in clinical practice. *Psychother Psychosom* 2005;74:315–22.

- [46] Xiao L, Cheng Z, Wang G. Psychosomatic factors in patients with psoriasis. *Chin Ment Health J* 2002;16:693-5.
- [47] Berrino AM, Voltolini S, Fiaschi D, Pellegrini S, Bignardi D, Minale P, et al. Chronic urticaria: importance of a medical-psychological approach. *Eur Ann Allergy Clin Immunol* 2006;38:149-52.
- [48] Evers AWM, Lu Y, Duller P, van der Valk PGM, Kraaijaat FW, van de Kerhof PCM. Common burden of chronic skin diseases? Contributors to psychological distress in adults with psoriasis and atopic dermatitis. *Br J Dermatol* 2005;152:1275-81.
- [49] Lyketsos GC, Stratigos J, Tawil G, Psaras M. Hostile personality characteristics, dysthmic states and neurotic symptoms in urticaria, psoriasis and alopecia. *Psychother Psychosom* 1986;44:122-31.
- [50] Rigatelli M, Bianchini M, Pietri G. The psychiatric-psychosomatic consultations in Modena University Hospital Department of Dermatology: the present state and perspectives. *New Trends Exp Clin Psychiatr* 1992;8:127-32.
- [51] Yang HY, Sun CC, Wu YC, Wang JD. Stress insomnia and chronic idiopathic urticaria—a case-control study. *J Formos Med Assoc* 2005;104:254-63.
- [52] Zuberbier T, Bindslev-Jensen C, Canonica W. EAACI/GA2LEN/EDF guideline: definition, classification and diagnosis of urticaria. *Allergy* 2006;61:316-20.
- [53] Foa EB, Cashman L, Jaycox L, Perry K. The validation of a self-report measure of posttraumatic stress disorder. The posttraumatic diagnostic scale. *Psychol Assess* 2007;9:445-51.
- [54] Goldberg DP, Hillier VF. A scaled version of the General Health Questionnaire. *Psychol Med* 1979;9:139-45.
- [55] Holmes TH, Rahe RH. The Social Readjustment Rating Scale. *J Psychosom Res* 1967;11:213-8.
- [56] Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. *J Health Soc Behav* 1983;24:385-96.
- [57] Cohen S, Williamson GM. Perceived stress in a probability sample of the United States. In: Spacapan A, Oskamp A, editors. *The social psychology of health*. California: Sage; 1988. p. 31-67.
- [58] Costa PT, McCrae RR. Trait psychology comes of age. In: Sonderegger TB, editor. *Nebraska symposium on motivation 1991: Psychology and aging*. Current theory and research in motivation. Lincoln (NE): University of Nebraska Press; 1992. p. 169-204.
- [59] Schnurr PP, Green BL. Understanding relationships among trauma, posttraumatic stress disorder, and health outcomes. In: Schnurr PP, Green BL, editors. *Trauma and health: physical health consequences of exposure to extreme stress*. Washington (DC): American Psychological Association; 2004. p. 247-75.
- [60] Paus R, Theoharides TC, Arck PC. Neuroimmunoendocrine circuitry of the “brain-skin connection”. *Trends Immunol* 2006;27:32-9.
- [61] Segerstrom SC, Miller GE. Psychological stress and the human immune system: a meta-analytic study of 30 years of inquiry. *Psychol Bull* 2004;130:601-30.
- [62] Miller GE, Cohen S. Psychological interventions and the immune system: a meta-analytic review and critique. *Health Psychol* 2001;20:47-63.
- [63] Davidson JT, Hughes D, Blazer DG, George LK. Post-traumatic disorder in the community: an epidemiological study. *Psychol Med* 1991;21:713-21.
- [64] Helzer JE, Robins LN, McEvoy L. Posttraumatic stress disorder in the general population: findings of the epidemiologic catchment area survey. *N Engl J Med* 1987;317:1630-4.
- [65] Keane TM, Wolfe J. Comorbidity in post-traumatic stress disorder: an analysis of community and clinical studies. *J Appl Soc Psychol* 1990;20:1776-88.
- [66] Norris FH, Friedman MJ, Watson P, Byrne CM, Diaz E, Kaniasty K. 60,000 disaster victims speak: Part I. An empirical review of the empirical literature, 1981-2001. *Psychiatry* 2002;65:207-39.
- [67] Levenson MR, Aldwin CM, Bosse R, Spiro A. Emotionally and mental health: longitudinal findings from the normative aging study. *J Abnorm Psychol* 1988;97:94-6.
- [68] Smith TW. Personality as risk and resilience in physical health. *Curr Dir Psychol Sci* 2006;15:227-31.
- [69] Bagby RM, Joffe RT, Parker JDA, Kalembo V, Harkness KL. Major depression and the five factor model of personality. *J Personal Disord* 1995;9:224-34.
- [70] Surtees PG, Wainwright NWJ. Fragile states of mind: neuroticism, vulnerability and the long-term outcome of depression. *Br J Psychiatry* 1996;169:338-47.
- [71] Clark LA, Watson D, Mineka S. Temperament, personality and the mood and anxiety disorders. *J Abnorm Psychol* 1994;103:103-16.
- [72] Eysenck HJ, Eysenck MW. Personality and individual differences: a natural science approach. New York: Plenum; 1985.
- [73] Joseph S, Williams R, Yule W. Psychosocial perspectives on post-traumatic stress. *Clin Psychol Rev* 1995;15:515-44.
- [74] Ginzburg K, Solomon Z, Bleich A. Repressive coping style, acute stress disorder, and posttraumatic stress disorder after myocardial infarction. *Psychosom Med* 2002;64:748-57.
- [75] Ginzburg K, Solomon Z, Koifman B, Keren G, Roth A, Kriwisky M, et al. Trajectories of posttraumatic stress disorder following myocardial infarction: a prospective study. *Journal of Clinical Psychiatry* 2003;64:1217-23.
- [76] Michaels AJ, Michaels CE, Moon CH, et al. Posttraumatic stress disorder after injury: impact on general health outcome and early risk assessment. *J Trauma* 1999;47:460-7.
- [77] Evers AWM, Kraaijaat FW, Lankveld WV, Jongen PJH, Jacobs JWJ, Bijlsma JWJ. Beyond unfavourable thinking: the illness cognition questionnaire for chronic diseases. *J Consult Clin Psychol* 2001;69:1026-36.
- [78] Zautra AJ, Affleck GG, Tennen H, Reich JW, Davis MC. Dynamic approaches to emotion and stress in everyday life: Bolger and Zuckerman reloaded with positive as well as negative affects. *J Pers* 2005;73:1511-38.
- [79] Joseph S, Williams R, Yule W. Understanding posttraumatic stress: a psychosocial perspective on PTSD and treatment. Chichester: John Wiley & Sons; 1997.
- [80] Blank AS. The longitudinal course of posttraumatic stress disorder. In: Davidson JRT, Foa EB, editors. *Posttraumatic stress disorder: DSM-IV and beyond*. Washington (DC): American Psychiatric Press; 1993. p. 3-22.
- [81] Carlier IVE, Gersons BPR. Partial posttraumatic stress disorder (PTSD): the issue of psychological scars and the occurrence of PTSD symptoms. *J Nerv Ment Dis* 1995;183:107-9.
- [82] Lazarus RS. From psychological stress to the emotions: a history of changing outlooks. *Ann Rev Psychol* 1993;44:1-21.
- [83] Chung MC, Dennis I, Easthope Y, Werrett J, Farmer S. A multiple indicator multiple-cause model for posttraumatic stress reactions: personality, coping and maladjustment. *Psychosom Med* 2005;67:251-9.
- [84] Hewitt PL, Flett GL. Personality traits and the coping process. In: Zeidner M, Endler NS, editors. *Handbook of coping*. New York: John Wiley & Sons; 1996. p. 410-33.