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Research report

Affective temperaments and ego defense mechanisms associated with somatic symptom severity in a large sample

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ABSTRACT

Background: Several complex mechanisms including biological, psychological and social factors may contribute to the development of bodily symptoms. Affective temperaments may represent heritable subclinical manifestations of mood disorders, and the concept of ego defense mechanisms has also provided a model for the comprehension of psychopathology. The relationship between affective temperaments, defensive functioning and somatic symptom severity remains unknown.
Methods: We obtained data from a subsample of the Brazilian Internet Study on Temperament and Psychopathology (BRAINSTEP). Participants completed the Affective and Emotional Temperament Composite Scale (AFECTS), the Defense Style Questionnaire (DSQ-40) and the Symptom Checklist-90-Revised (SCL-90-R). SCL-90-R Somatization scale was used as outcome variable.
Results: Among 9937 participants (4472 male; 45%), individuals with dysphoric, cyclothymic and depressive temperaments and those who adopted displacement, somatisation and passive aggression as their predominant defense mechanisms presented high somatic symptom severity. Participants with dysphoric temperament and those with higher displacement scores were more likely to endorse numerous bodily symptoms after controlling for age, gender, education and depressive symptoms. Moderator analysis showed that the relationship of dysphoric temperament with somatic symptom severity was much more powerful in people who adopted displacement as their predominant defense.
Limitations: The data was collected from a convenience web-based sample. The study was cross-sectional. There was no information on the presence of established physical illness.
Conclusions: Affective temperaments and defense mechanisms are associated with somatic symptom severity independently of depressive symptoms. These two personality theories provide distinct but interacting views for comprehension of somatic symptom formation.

1. Introduction

Somatic symptoms are multiply determined and are common in everyday life, constituting the leading cause of outpatient medical visits (Kroenke, 2003; Dimsdale and Creed, 2009). Although somatic symptom severity is associated with the diagnosis of a somatoform disorder (Körber et al., 2011), this diagnostic concept has been challenged, mainly because it requires the presence of persistent multiple "medically unexplained" symptoms (American Psychiatric Association, 1994), a criterion that has been criticized because it is rather restrictive, dualistic in concept, and may raise questions regarding an undetected somatic disease (Ladwig et al., 2010; Creed et al., 2010). Therefore, field researchers have been arguing for the necessity to consider "bodily symptoms in their own right" (Kroenke et al., 2007; Sharpe et al., 2006) and not just as manifestations of either bodily pathology or psychopathologies (Ladwig et al., 2010). Recent research proposes a biopsychosocial approach, which encompasses the interaction of physiological, psychological and social factors in understanding

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the origins and presentation of widespread somatic complains (Hauser et al., 2009; Tanaka et al., 2011; Creed et al., 2012). Accordingly, the DSM-V workgroup had advocated the concept of "somatic symptom disorder", which considers the patient's difficulty to tolerate physical discomfort and to cope adaptively with bodily symptoms as hallmarks of this new diagnostic category (Dimsdale and Creed, 2009).

Several complex mechanisms may contribute to the emergence of widespread bodily symptoms. For instance, history of child abuse, lower education, general medical conditions, anxiety and depression have been indicated as risk factors for persistent multiple somatic symptoms in population-based cohort studies (Gureje and Simon, 1999; Creed and Barsky, 2004; Leiknes et al., 2007; Creed et al., 2012). Our knowledge, however, about the psychopathogenesis of multiple somatic symptoms remains incomplete (Creed et al., 2011) and if a high total somatic symptom count is to be considered an independent dimension of psychopathology, it is necessary to demonstrate additional factors associated with this phenomenon (Creed et al., 2012), including personality dimensions. Among the personality variables studied, neuroticism was independently associated with self-reported somatic symptoms in large community samples (Rosmalen et al., 2007; Neeleman et al., 2004).

Akiskal and collaborators (Akiskal et al., 2005a, 2005b) operationalized the concept of affective temperaments for use in research based on theoretical and clinical observations from the seminal works of Kraepelin (1921) and Kretschmer (1936). Recently, Lara et al. (2012a) extended the concept of affective temperaments to include 12 predominant types, namely euthymic, depressive, anxious, apathetic, obsessive, cyclothymic, dysphoric, irritable, volatile, disinhibited, hyperthymic and euphoric. Affective temperaments may be a genetically determined part of personality (Gonda et al., 2006; Rihmer et al., 2010) which influence the vulnerability to psychopathology, such as affective disorders (Akiskal and Akiskal, 2005). Therefore, affective temperaments may play a contributory role in the formation of somatic symptoms as well.

The concept of ego mechanisms of defense was first proposed by Sigmund Freud (1914) and further developed by his daughter Anna Freud (Freud, 1986) and others (for a review see Cramer, 1991). These personality constructs are defined as "automatic psychological processes that protect the individual against anxiety and from the awareness of internal or external dangers or stressors" (American Psychiatric Association, 1994). It has been argued that no mental status or clinical examination should be considered complete without an effort to identify the patient's predominant defenses (Vaillant, 1992), and in selected instances, a return to the Freudian defense mechanisms is also warranted (Sartorius et al., 1990). The classical psychoanalytic perspective posits that somatic symptoms result from a shifting or *displacement* of psychic energy from the cathexis of mental processes to that of somatic innervations to express in a distorted way the derivatives of repressed forbidden impulses (Fox, 1959). According to the self-psychology perspective, bodily symptoms occur as a consequence of defensive operations to ward off affect when affective arousal triggers the psychological threat of fragmentation (Rodin, 1991). These theoretically sound assumptions have not been empirically confirmed by means of validated measures (i.e., through quantitative research) in large samples.

Table 1
Socio-demographic characteristics of the sample ($N=9937$).

Number of participants	9937
Age (mean ± SD)/(median)	32.67 ± 10.87/30
Gender (*N*, %)	
Male	4472 (45.0%)
Female	5465 (55.0%)
Education (*N*, %)	
Incomplete elementary school	81 (.8%)
Complete elementary school	289 (2.9%)
High school degree	4365 (43.9%)
University degree	3013 (30.3%)
Post-grad degree	2189 (22.0%)
Race (*N*, %)	
Caucasian	7513 (75.6%)
African American	383 (3.9%)
Mulatto[a]	1733 (17.4%)
Asian	145 (1.5%)
Other	163 (1.6%)
Marital status (*N*, %)	
Single	3125 (31.4%)
Married/Stable union	5901 (59.4%)
Widowed	552 (5.6%)
Other	359 (3.6%)
Religion (*N*, %)	
Catholic	3916 (39.4%)
Evangelical (Protestant)	1370 (13.8%)
Spiritist	1404 (14.1%)
Other	741 (7.0%)
Without religion	2549 (25.7%)
Occupation (*N*, %)	
Employed or self-employed (independent contractor)	6163 (62.0%)
Student	2210 (22.2%)
Unemployed	916 (9.2%)
Housewife/Househusband	308 (3.1%)
Under financial aid for disease (government)	75 (.8%)
Retired	265 (2.6%)
Gross monthly income (in US dollars) (mean SD/median)	1491.6 ± 2236.5/857.1

[a] Refers to an ethnic group of mixed white and black ancestry.

For several decades, the field of psychopathology had been fueled with controversies and clashes of different models, because of conflicts in terminology and an inability to integrate different views of personality (Mulder et al., 1996). Although affective temperaments and defense mechanisms are different personality constructs (Carvalho et al., 2013), concurrent assessments of both dimensions may allow a better comprehension of psychopathology. For instance, we have shown that defense mechanisms and affective temperaments may interact in the formation of depressive symptomatology (Carvalho et al., 2013).

However, to our knowledge no study had systematically investigated the contribution of affective temperaments and defense mechanisms in the formation of bothersome somatic symptoms. Therefore, we aimed here to explore how affective temperaments and defense mechanisms are associated with somatic symptom severity in a large web-based sample derived from the Brazilian Internet Study on Temperament and Psychopathology (BRAINSTEP) (Lara et al., 2012b) and to investigate whether affective temperaments moderate the correlations of defenses with somatic symptom severity.

2. Methods

2.1. Sample

The sample comprised 9937 consecutive subjects from the Brazilian Internet Study on Temperament and Psychopathology (BRAINSTEP) (Lara et al., 2012b). Participants' mean age was 32.67 (SD = 10.87) years and 5465 (55.0%) were female. Most were married (59.4%), Caucasian (75.6%) and currently employed (62.0%) and had at least a high school degree (96.2%). Other socio-demographic characteristics are summarized in Table 1.

Briefly, this study is an anonymous and confidential web-based survey in which participants fill in personal information in two phases in a non-commercial, advertisement-free website (www.temperamento.com.br). The study consisted of two parts: psychological and psychiatric. Participants completed a number of measures which were sent via a secure and encrypted connection and stored behind a firewall (see Lara et al., 2012b for details). A number of validation questions throughout the protocol ensured the reliability of the data. Importantly, the present sample comprises participants who had provided reliable responses to the validation and attention questions throughout the study protocol.

This protocol was approved by the ethics committee of the Hospital São Lucas (PUCRS). All participants gave their electronic informed consent before entering the system. This form was created to fulfill the requirements of the National Research Council of Brazil (Resolution 196/1996) and the Code of Ethics of the World Medical Association (Declaration of Helsinki).

2.2. Measures

All participants provided basic socio-demographic data (age, gender, educational level, race, marital status, religious affiliation, occupation and gross monthly income).

Affective temperaments were assessed with the affective section of the validated Brazilian Portuguese version of the Affective and Emotional Composite Temperament Scale (AFECTS) instrument (Lara et al., 2012a). Twelve short descriptions of each putative affective temperament are presented with a 5-item Likert-type scale, from "nothing like me" (rated as 1) to "exactly like me" (rated as 5). Another question asks to select which of these 12 profiles is the best fit to represent participants' affective temperament, allowing for a categorical evaluation (Lara et al., 2012a).

Defense mechanisms were assessed using the validated Brazilian Portuguese version of the 40-item Defense Style Questionnaire (DSQ-40) (Andrews et al., 1993; Blaya et al., 2004). The DSQ-40 provides a valid assessment (Bond, 2004) for 20 individual defenses (*acting out, anticipation, autistic fantasy, denial, devaluation, displacement, dissociation, humor, idealization, isolation, passive-aggression, projection, pseudo-altruism, rationalization, reaction formation, somatization, splitting, sublimation, suppression, and undoing*) which are grouped in 3 defense styles (*mature, neurotic and immature*). Each item is rated on a 9-point Likert-type scale, where 1 indicates "completely disagree" and 9 indicates "completely agree".

To assess severity of anxiety, depressive and somatic symptoms we used the Brazilian Portuguese version (Carissimi, 2011) of the Symptom Checklist 90-Revised (SCL-90-R) (Derogatis and Melisaratos, 1983), a 90-item multidimensional self-report symptom inventory which assesses a wide range of psychopathological symptoms (Derogatis, 1994). We used the SCL-90R *somatization* subscale as our main outcome variable, which assesses on a 5-point Likert-type scale (from "not at all" to "extremely") how much the individual is bothered by a number of bodily symptoms during the past 7 days. Higher scores indicate more severe symptoms.

2.3. Statistical analysis

We had previously shown that defense mechanisms and affective temperaments are to a great extend independent constructs (i.e., they assess distinct psychological substrates) (Carvalho et al., 2013). Therefore, we proceeded here to explore the relationship of affective temperaments and defense mechanisms with somatic symptom severity. First, we compared the SCL-90-R *somatization* scale scores across the 12 affective temperaments as well as across the 20 defense mechanisms by means of one-way analysis of covariance (ANCOVA), adjusted for age, gender and education. If a participant's score for each defense style was 0.5SD above the mean on this style, we considered that this was one of the participant's predominant defense mechanism (Bond, 1992). Since some participants reported using multiple defenses, comparisons were made between those reporting a particular defense as their predominant defense against those who did not report this defense as predominant.

To explore the independent relationships of affective temperaments and defense mechanisms with somatic symptom severity, a hierarchical multiple regression analysis was performed. The demographic variables were entered in step 1, the affective temperaments in step 2, and the defense mechanisms in step 3. Finally, SCL-90-R anxiety and depression symptom scores were entered in model 4. However, anxiety showed unacceptable tolerance values and variance inflation factors indicating serious problems of multi-collinearity and was not included in the final equation. After this, all tolerance values ranged from .46 to .97, all being $>.2$, and all variance inflation factors were <2, indicating that multicollinearity was not biasing the regression models (Miles and Shevlin, 2003).

We also sought to explore whether specific temperaments could act as moderators in the relationship between defenses and somatic symptom severity. To demonstrate moderation, we would have to show a significant interaction between the moderator (i.e., the temperament) and defenses (Kraemer et al., 2002). Simple regression lines were plotted in order to probe the significant interactions effects and further hierarchical multiple regression analyses were performed to quantify moderator effects (Miles and Shevlin, 2003). The standardized predictor and moderator variables were then multiplied to yield an interaction variable. The independent variables were entered into the equation in two steps. In the first step, the appropriate predictor and moderator variables were entered separately, followed in

the second step by the interaction variable (Kraemer et al., 2002; Miles and Shevlin, 2003). SCL-90-R *somatization* scale score was the criterion variable. To further analyze the interaction, we added an additional model in the previous hierarchical regression analysis including the interaction terms, in order to include main and interactive effects of moderator variable.

Finally, since it has been reported that personality dimensions such as neuroticism may be differentially related to different types of physical complaints (Johnson, 2003; Van Diest et al., 2005; Rosmalen et al., 2007), we also tested whether specific somatic complaints were associated with temperaments and defenses. Since we found that *dysphoric* temperament, and *somatization* and *displacement* defenses were associated with somatic symptom severity, three multiple binary logistic analyses with dependent variables the "*dysphoric* temperament" "*somatization* defense" and "*displacement* predominant defense" were also performed. An additional multiple linear regression analysis with dependent variable the interaction term between *dysphoric* temperament and *displacement* defense was also carried out. Statistical Package for the Social Sciences (SPSS Inc, Chicago, IL), version 15.0 for Windows, was used for data analysis. Significance level was set at $p \leq .05$.

3. Results

3.1. Somatic symptom severity across affective temperaments and defense mechanisms

Fig. 1a presents the mean scores in SCL-90-R *somatisation* scale across the 12 affective temperaments adjusted for age, sex and education. As shown in this figure, the higher mean scores ($\pm$SEM) in somatic symptom severity were reported by those with a *dysphoric* temperament ($.82 \pm .03$) followed by those with *depressive* ($.80 \pm .02$) and *cyclothymic* ($.74 \pm .01$) temperaments, while lower scores were reported by individuals with *euthymic* ($.32 \pm .01$) and *hyperthymic* ($.32 \pm .02$) temperaments ($F_{[11,9914]}=77.43$, $p<.001$).

Fig. 1b presents the mean scores in SCL-90-R somatisation scale across each one of the 20 defense mechanisms adjusted for age, sex and education. As shown in this figure, higher mean scores ($\pm$SE) in somatic symptom severity were reported by those with predominant *somatisation* defense ($.81 \pm .01$, $F_{[19,924]}=1187.9$, $p<.001$), followed by those with predominant *projection* ($.77 \pm .01$, $F_{[19,924]}=713.1$, $p<.001$), *displacement* ($.73 \pm .01$, $F_{[19,924]}=641.5$, $p<.001$), *autistic fantasy* ($.73 \pm .01$, $F_{[19,924]}=713.1$, $p<.001$), and *passive aggression* ($.72 \pm .01$, $F_{[19,924]}=154.6$, $p<.001$) defenses. Lower scores were reported by individuals with predominant the mature defenses of *anticipation* ($.50 \pm .01$, $F_{[19,924]}=60.4$, $p<.001$), *rationalization* ($.50 \pm .01$, $F_{[19,924]}=33.4$, $p<.001$), *humor* ($.48 \pm .01$, $F_{[19,924]}=91.5$, $p<.001$) and *suppression* ($.45 \pm .01$, $F_{[19,924]}=154.6$, $p<.001$).

3.2. Affective temperaments and defense mechanisms associated with somatic symptom severity

Table 2 shows that the major demographic variables (model 1) explained 6.8% of the variance in the SCL-90-R somatization scale ($p<.001$). Addition of affective temperaments increased the variance explained by 15.8% (model 2); *dysphoric, depressive, volatile, anxious* and *cyclothymic* temperaments, in descending order, were positively, and *euthymic* temperament was negatively associated with somatic symptom severity. Addition of defense mechanisms significantly increased the variance by a further 8.6% (model 3); *somatization, displacement, projection and devaluation* defenses showed here, in descending order, the greatest beta coefficients in their relationship with somatic symptom severity. Addition of depressive symptoms added an additional 18.8% in the variance (model 4). In this final model, older age, female gender, lower education, *dysphoric* and *depressive* temperaments, higher scores in *somatization* and *displacement* defenses, as well as *depressive* symptoms were the independent correlates of somatic symptom severity (Table 2).

Of the analyses performed to assess potential moderators of the relationship between defense mechanisms and somatic symptom severity across the previously found significant affective temperaments (i.e., *dysphoric, depressive, volatile, anxious* and *cyclothymic*), only one analysis showed a significant moderator effect: a significant interaction was observed between *dysphoric* temperament and *displacement* defense. As shown in Fig. 2, the slope of the relationship between *displacement* and somatic symptom severity is steeper for participants with rather than without a *dysphoric* temperament (Pearson correlation coefficients: .336, $p<.001$ and .200, $p<.001$, respectively). Subsequent hierarchical linear regression models confirmed the aforementioned moderator effect; the *dysphoric* temperament was found to be a significant moderator in the relationship between the *displacement* defense and somatic symptom severity, as the interaction term was significant (Table 3, models 2), indicating that the relationship between somatic symptom severity and *displacement* defense was significantly greater for participants with *dysphoric* temperament. The analysis of the interaction performed adding an additional model in the previous hierarchical analysis of Table 3 (model 5), showed that both main and interactive effects were significant independent correlates of somatic symptom severity.

Finally, multivariate analyses presented in Table 4 showed that symptoms of *faintness* or *dizziness* ($p=.01$) and *heavy feelings in the*

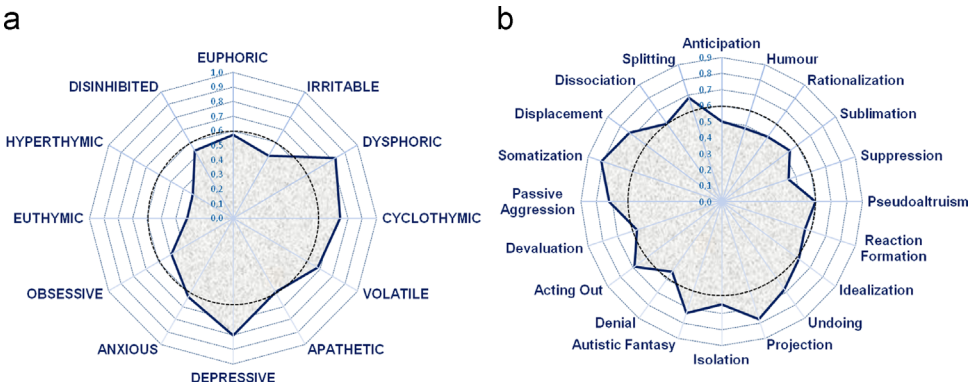

Fig. 1. Mean values of somatization symptoms as measured by the SCL-90-R somatisation scale across the 12 affective temperaments (a) and across the 20 defense mechanisms (b). Values are adjusted for age, sex and education.

Table 2
Hierarchical models of the factors associated with somatization symptoms.

	Model 1	Model 2	Model 3	Model 4	Model 5
Demographics					
Age	.050***	.095***	.107***	.082***	.082***
Gender (M=1, F=2)	.228***	.211***	.140***	.096***	.097***
Education	−.134***	−.087***	−.082***	−.088***	−.088***
Affective Temperaments					
Euphoric	–	.032	.010	.007	.007
Irritable	–	−.002	−.016	.005	.004
Dysphoric	–	.145***	.084***	.055***	.052***
Cyclothymic	–	.062***	.032	.018	.018
Volative	–	.081***	.049***	.022	.021
Apathetic	–	.031	.004	.012	.013
Depressive	–	.106***	.050***	.043***	.042***
Anxious	–	.075***	.036***	.026	.027
Obsessive	–	−.020	−.014	−.007	−.008
Euthymic	–	−.087***	−.045***	−.006	−.006
Hyperthymic	–	−.029	−.010	−.015	−.014
Disinhibited	–	−.008	−.010	−.019	−.020
Ego Defenses					
Anticipation	–	–	−.022	−.012	−.012
Humor	–	–	−.005	−.013	−.013
Rationalization	–	–	−.018	.005	.005
Sublimation	–	–	−.011	−.011	−.010
Suppression	–	–	−.005	−.013	−.012
Pseudo-altruism	–	–	.004	.022	.021
Reaction Formation	–	–	.036***	.016	.016
Idealization	–	–	.028	.023	.022
Undoing	–	–	.036***	.012	.012
Projection	–	–	.102***	.008	.009
Isolation	–	–	.033***	.014	.015
Autistic Fantasy	–	–	.024	.024	.023
Denial	–	–	−.023	−.015	−.015
Acting Out	–	–	.039***	.026	.025
Devaluation	–	–	.051***	.026	.025
Passive Aggression	–	–	.006	.015	.016
Somatization	–	–	.223***	.173***	.172***
Displacement	–	–	.113***	.076***	.070***
Dissociation	–	–	.004	.018	.019
Splitting	–	–	.014	.002	.002
Depressive symptoms	–	–	–	.587***	.585***
Interaction term, Dysphoric x Displacement	–	–	–	–	.042***
Adjusted R^2 of model	.068	.226	.312	.500	.510
Incremental Adj R^2	.068	.158	.086	.188	.010
Significance of F change	< .001	< .001	< .001	< .001	< .001

Note: Values shown are standardized beta regression coefficients.

*** $p < .001$.

arms or legs ($p=.018$) were the predominant specific somatic symptoms in individuals with a *dysphoric* temperament. All somatic symptoms but *pains in lower back* and *numbness in parts of the body* were intense in individuals who predominantly adopted the *somatization* defense (Table 4). *Headaches* ($p=.021$), *faintness or dizziness* ($p=.018$), *pains in lower back* ($p=.002$), *hot or cold spells* ($p=.001$), *numbness or tingling in parts of the body* ($p=.001$), *feeling weak in parts of the body* ($p=.048$) and *heavy feelings in the arms or legs* ($p=.001$) were the predominant somatic symptoms in individuals with predominant *displacement* defense, while *headaches* ($p=.013$) and *hot or cold spells* ($p=.001$) were most closely associated with the interaction of *dysphoric* temperament with *displacement* defense (Table 4).

4. Discussion

The results of the present study showed that specific affective temperaments and distinct defense mechanisms are associated with the severity of common self-reported somatic symptoms in a large web-based convenience sample and these associations were independent of the association between depressive symptoms and somatic symptom severity. An interaction effect between *dysphoric* temperament and *displacement* defense was also observed, indicating that acquired psychological factors may interact with alleged hereditary personality constructs in their associations with somatic symptom severity. These novel findings may open new perspectives for the psychopathological comprehension of multiple bothersome somatic symptoms.

Among the psychological variables studied in relation to somatic symptom formation, neuroticism has attracted great attention and replicated evidences indicate that neuroticism is associated with the reporting of all assessed somatic symptoms independently of psychological distress or psychiatric ill health (Rosmalen et al., 2007; Neeleman et al., 2004). Our results showed that *dysphoric* and *depressive* temperaments are most closely associated with somatic symptom severity. The *dysphoric* temperament as conceptualized in the AFECT model is characterized by a tendency to feel tense, anxious, irritated and agitated, all at the same time (Lara et al., 2012a). This temperament may be related to mixed states (Gupta et al., 2011; Pacchiarotti, et al., in press) with strong connection of the following at different levels: tense body, mixed emotions (irritability,

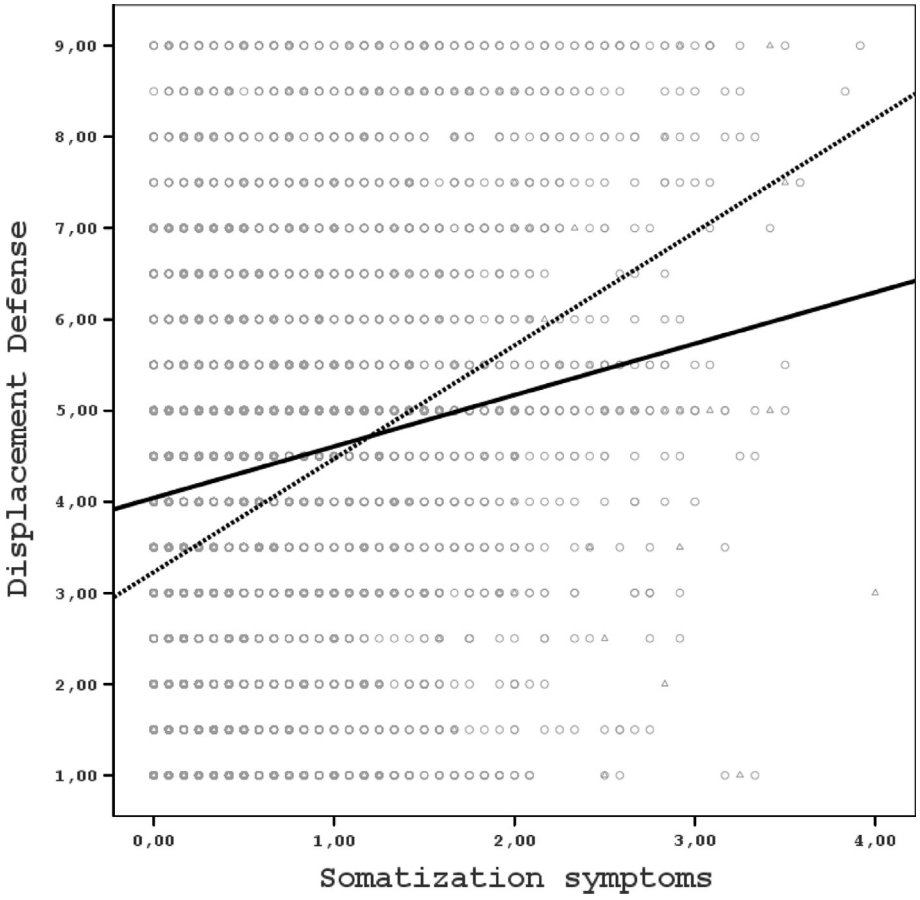

Fig. 2. Scatterplot showing lines of best fit for people with and without *dysphoric* temperament when testing the *dysphoric* temperament as moderator in the relationship between *displacement* defense and somatisation symptoms. The dashed line represents people with *dysphoric* temperament and the continuous line represents people without this temperament.

Table 3
Hierarchical multiple regression analysis to examine whether the dysphoric temperament is a moderator of the relationship between displacement defense and symptoms of somatisation (dependent-criterion variable: SCL-90-R somatisation scale).

	Model 1	Model 2
(z) Dysphoric temperament	.248***	.244***
(z) Displacement defense	.265***	.259***
(z) Dysphoric temperament × displacement defense	–	.050***
Adjusted R^2 of model	.165	.172
Significance of F change	.001	.001

Note: Values shown are standardized beta regression coefficients.
*** $p < .001$.

fear, angst), anxious mind (e.g., apprehension) and "unpeaceful" spirit (Lara et al., 2012a). Additionally, whereas depressive temperament has low salience or intensity and negative valence (i.e. the emotional value associated with a stimulus), dysphoric temperament reflects a combination of high salience or intensity with negative valence (i.e., negative emotions) and little positive valence (Lara et al., 2012a). Therefore, a substantial subgroup of individuals presenting with widespread somatic symptoms may have a bipolar diathesis (i.e., dysphoric or cyclothymic temperaments). This finding is consistent with the recent demonstration that the high load of somatic symptoms in fibromyalgia may indeed be related to bipolarity (Dell'Osso et al., 2009).

Our findings showing that the defenses of *somatization* and *displacement* were independent correlates of somatic symptom severity indicate that the individual's defensive operation plays a significant role in somatic symptom formation. The DSQ-40 assesses *somatization* defense by linking directly the appearance of bodily symptoms with psychological distress (e.g. "I get physically ill when things aren't going well for me" or "I get a headache when I have to do something I don't like"), thereby assuming that a defensive conversion of psychic derivatives into bodily symptoms is activated (Vaillant, 1992; Bond, 1992). In *displacement*, on the other hand, the individual deals with emotional conflicts by redirecting a feeling about or response to an object onto another presumably less threatening object; in this instance onto the body. The present findings provide empirical support to the long-standing psychoanalytic hypothesis that somatic innervations are the result of the shifting or displacement of psychic energy to somatic symptoms through conversion, in order for the latter to express in a distorted way the derivatives of repressed impulses (Rangell, 1959; Fox, 1959; Brenner, 1981). Previous studies have shown that somatization defense was predominant in chronic pain patients (Monsen and Havik, 2001) and that this defense was strongly associated with more severe self-reported dyspnea in a sample of patients with chronic pulmonary obstructive disease, independently of depression and objective functional parameters (Albuquerque et al., 2011). Additionally, defense mechanisms moderated the relationship between pain and physical quality of life in rheumatoid arthritis even after controlling for disease parameters (Bai et al., 2009). Our findings which are based on a population sample of unknown physical comorbidity as well as the results of the aforementioned studies suggest that the relationship of defensive functioning and multiple somatic symptoms

Table 4
Specific somatic symptoms associated with dysphoric temperament, displacement predominant defense and their interaction term (dysphoric temperament x displacement defense) adjusted for age, gender and education ($N=9937$).

	Dysphoric temperament[a]		Somatization predominant defense[b]		Displacement predominant defense[c]		Interaction term[d]	
	Odds ratios (95% CI)	*p* Values	Odds ratios (95% CI)	*p* Values	Odds ratios (95% CI)	*p* Values	beta	*p* Values
Headaches	1.0 (.950–1.199)	.275	**1.4 (1.358–1.508)**	**.001**	**1.1 (1.009–1.116)**	**.021**	**.048**	**.013**
Faintness or dizziness	**1.2 (1.045–1.385)**	**.010**	**1.2 (1.098–1.257)**	**.001**	**1.1 (1.014–1.156)**	**.018**	.020	.129
Pains in heart or chest	1.1 (.993–1.306)	.063	**1.1 (1.029–1.185)**	**.006**	1.0 (.970–1.112)	.275	.004	.731
Pains in lower back	1.0 (.852–1.064)	.386	1.0 (.991–1.090)	.113	**1.1 (1.028–1.126)**	**.002**	.004	.770
Nausea or upset stomach	1.0 (.952–1.229)	.226	**1.1 (1.067–1.203)**	**.001**	1.0 (.921–1.036)	.436	−.002	.888
Soreness of the muscles	1.0 (.869–1.126)	.870	**1.1 (1.028–1.152)**	**.003**	1.0 (.991–1.105)	.104	.006	.684
Trouble getting breath	1.1 (.943–1.294)	.216	**1.1 (1.011–1.181)**	**.046**	1.0 (.961–1.130)	.313	.014	.247
Hot or cold spells	1.0 (.966–1.233)	.162	**1.1 (1.022–1.148)**	**.007**	**1.2 (1.119–1.251)**	**.001**	**.071**	**.001**
Numbness or tingling in parts of the body	1.0 (.897–1.163)	.748	1.0 (.983–1.110)	.163	**1.2 (1.106–1.244)**	**.001**	.020	.103
A lump in the throat	1.0 (.966–1.246)	.152	**1.1 (1.019–1.153)**	**.010**	1.0 (.969–1.091)	.363	−.012	.295
Feeling weak in parts of the body	.9 (.746–1.014)	.074	**1.1 (1.018–1.166)**	**.014**	**1.1 (1.001–1.141)**	**.048**	.015	.345
Heavy feelings in the arms or legs	**1.2 (1.029–1.354)**	**.018**	**1.1 (1.032–1.171)**	**.003**	**1.2 (1.116–1.260)**	**.001**	.022	.134

[a] Multivariable binary logistic regression analysis with dependent variable "*dysphoric* temperament"; the predictive values were calculated based on the probability of having "*dysphoric* temperament" and the cut-off value between "*dysphoric*" and "non-*dysphoric*" temperament was .500. The analysis correctly classified 96.4% of the cases with a Nagelkerke *R* square=.234 in the total sample.

[b] Multivariable logistic regression analysis with dependent variable "*somatization* defense"; the predictive values were calculated based on the probability of having "*somatization* defense" as predominant defense and the cut-off value between "predominant *somatization*" and "non-predominant" *somatization* defense was .500. The analysis correctly classified 71.1% of the cases with a Nagelkerke *R* square=.198.

[c] Multivariable logistic regression analysis with dependent variable "*displacement* defense"; the predictive values were calculated based on the probability of having "*displacement* defense" as predominant defense and the cut-off value between "predominant *displacement*" and "non-predominant" *displacement* defense was .500. The analysis correctly classified 66.1% of the cases with a Nagelkerke *R* square=.127.

[d] Multiple linear regression analysis with dependent variable the interaction term "*dysphoric* temperament × *displacement* defense"; *R* square adjusted=.166, $p<.001$; CI=Confidence Interval.

may hold when bodily symptoms are either medically "explained" or "unexplained".

We also found that an interaction of *dysphoric* temperament with *displacement* defense further contributes to somatic symptoms severity, indicating that an individual with a *dysphoric* temperament who copes with adversities relying predominantly on *displacement* may be prone to develop multiple bothersome bodily symptoms. Along the same lines, we have previously shown that individuals with *hyperthymic* or *euthymic* temperaments may be constitutionally more "resilient" to stress, and, therefore, less likely to develop depressive symptoms, regardless of the maturity of their defenses, whereas mature defenses had a protective role in depressive symptoms formation only in those individuals without *hyperthymic* or *euthymic* temperaments (Carvalho et al., 2013).

Specific somatic complaints have been reported to be associated with neuroticism (Van Diest et al., 2005; Johnson, 2003), but others had found that neuroticism was indistinctly associated with all somatic symptoms assessed (Rosmalen et al., 2007). Somatic symptoms may also be positively correlated to harm avoidance (Russo et al., 1994). Our findings showed that the *dysphoric* temperament was most closely associated with symptoms indicating a tendency to feel tense and anxious (*faintness or dizziness, heavy feelings in the arms or legs*) (Rapee et al., 1992), especially when it is combined with use of the *displacement* defense (where *headaches* and *hot or cold spells* were added). Interestingly, *displacement* alone was additionally associated with *pains in lower back, numbness or tingling in parts of the body and feeling weak in parts of the body*, but not with symptoms resembling problems in specific systems outside the nervous system such as *pains in heart or chest, nausea or upset stomach or trouble getting breath*. Accordingly, *displacement* is closely related to conversion (Brenner, 1981) which is mostly associated with motor or sensory (i.e., neurologic) symptoms (American Psychiatric Association, 1994).

These findings may have clinical implications. Akiskal and Akiskal (2005) argue that affective temperaments need to be taken into consideration when providing an effective treatment plan for patients with mood disorders. Our results potentially expand these applications to people with multiple bothersome somatic symptoms. Studies have shown that psychodynamically-oriented psychotherapies may be effective for those patients with functional somatic syndromes (e.g., irritable bowel syndrome) who do not respond to standard medical treatment (Guthrie et al., 1991; Hyphantis et al., 2009). Our findings raise the possibility that psychological interventions targeting neurotic defenses may be especially effective in alleviating multiple bodily symptoms in individuals with more vulnerable temperaments (e.g., *dysphoric* temperament).

This study has some limitations that need to be addressed. First, its cross-sectional design does not allow causal inferences to be drawn. Second, this study recruited a web-based convenience sample. However, this survey included validation questions and provided reliable data from the entire Brazilian territory (see Lara et al., 2012b for a broader discussion). Third, we have no information as to which amount of somatic symptoms score is due to objective somatic ill health. However, some reports have shown that the occurrence of physical diseases is not necessarily associated with high somatic symptom severity (Schaefert et al., in press; Zhu et al., 2012). Fourth, although we controlled for age, gender, and education, other intervening variables not measured in the present study might have influenced our results (Creed et al., 2012). On the other hand, strengths of our study include the recruitment of a large sample and the inclusion of reliable instruments with widespread use in the scientific community. Furthermore, anonymous internet participation provides a setting with very low desirability bias to answer these instruments.

In conclusion, our study showed that predominant affective temperaments and defense styles have unique roles in the formation of multiple somatic symptoms in a large web-based sample from the general population, and these associations are independent of concurrent depressive symptomatology. Furthermore, the interaction of *dysphoric* temperament with *displacement* defense further contributes to multiple bodily symptoms. Our investigation advances in the formulation of an integrative approach for the psychopathological formation of common bodily symptoms with therapeutic implications. Future research is needed in samples of

individuals with and without established physical illnesses to better elucidate the pathways underlying the contributory roles of affective temperaments and defense mechanisms for the development of widespread somatic symptoms.

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Not applicable.

Conflict of interest

AFC is a speaker of Libbs Farmacêutica, Abbott and Glaxo Smith Kline (GSK). DRL is a board member and speaker for AstraZeneca, Abbott and Novartis.

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References

Akiskal, H.S., Akiskal, K., Allilaire, J.F., Azorin, J.M., Bourgeois, M.L., Sechter, D., Fraud, J.P., Chatenet-Duchene, L., Lancrenon, S., Perugi, G., Hantouche, E.G., 2005a. Validating affective temperaments in their subaffective and socially positive attributes: psychometric, clinical and familial data from a French national study. Journal of Affective Disorders 85, 29–36.

Akiskal, H.S., Akiskal, K.K., Haykal, R.F., Manning, J.S., Connor, P.D., 2005b. TEMPS-A: progress towards validation of a self-rated clinical version of the temperament evaluation of the Memphis, Pisa, Paris, and San Diego Autoquestionnaire. J. Affect. Disord. 85, 3–16.

Akiskal, K.K., Akiskal, H.S., 2005. The theoretical underpinnings of affective temperaments: implications for evolutionary foundations of bipolar disorder and human nature. Journal of Affective Disorders 85, 231–239.

Albuquerque, S.C., Carvalho, E.R., Lopes, R.S., Marques, H.S., Macêdo, D.S., Pereira, E. D., Hyphantis, T.N., Carvalho, A.F., 2011. Ego defense mechanisms in COPD: impact on health-related quality of life and dyspnoea severiity. Quality of Life Research 20, 1401–1410.

American Psychiatric Association, 1994. Diagnostic and Statistical Manual of Mental Disorders — DSM-IV, 4th ed. American Psychiatric Association, Washington DC.

Andrews, G., Singh, M., Bond, M., 1993. The defense style questionnaire. Journal of Nervous and Mental Disease 181, 246–256.

Bai, M., Tomenson, B., Creed, F., Mantis, D., Tsifetaki, N., Voulgari, P.V., Drosos, A.A., Hyphantis, T.N., 2009. The role of psychological distress and personality variables in the disablement process in rheumatoid arthritis. Scandinavian Journal of Rheumatology 38 (6), 419–430.

Blaya, C., Kipper, L., Heldt, E., Isolan, L., Ceitlin, L.H., Bond, M., Manfro, G.G., 2004. Brazilian–Portuguese version of the Defense Style Questionnaire (DSQ-40) for defense mechanisms measure: a preliminary study. Revista brasileira de psiquiatria 26, 255–258.

Bond, M., 1992. An empirical study of defense styles. In: Vaillant, G.E. (Ed.), Ego Mechanisms of Defense: A Guide for Clinicians and Researchers. American Psychiatric Press, Washington DC, pp. 139–140.

Bond, M., 2004. Empirical studies of defense style: relationships with psychopathology and change. Harvard Review of Psychiatry 12 (5), 263–278.

Brenner, C., 1981. Defense and defense mechanisms. Psychoanalytic Quarterly 50, 557–569.

Carissimi, A., 2011. Examinando fatores causais de sintomas psicologicos atraves do SCL-90 R em pacientes com apneia do sono grave (Master's degree dissertation). Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil.

Carvalho, A.F., Hyphantis, T.N., Taunay, T.C., Macêdo, D.S., Floros, G.D., Ottoni, G.L., Fountoulakis, K.N., Lara, D.R., 2013. The relationship between affective temperaments, defensive styles and depressive symptoms in a large sample. Journal of Affective Disorders 146, 58–65.

Cramer, P., 1991. The Development of Defense Mechanisms: Theory, Research and Assessment: Empirical Studies in Psychoanalytic Theories, vol 10. Springer, New York, NY pp. 81–127.

Creed, F., Guthrie, E., Fink, P., Henningsen, P., Rief, W., Sharpe, M., White, P., 2010. Is there a better term than "medically unexplained symptoms"? Journal of Psychosomatic Research 68, 5–8.

Creed, F.H., Barsky, A., Leiknes, K.A., 2011. Epidemiology: prevalence, causes and consequences. In: Creed, F.H., Henningsen, P., Fink, P. (Eds.), Medically Unexplained Symptoms, Somatisation and Bodily Distress: Developing Better Clinical Services. Cambridge University Press, Cambridge.

Creed, F.H., Barsky, A., 2004. A systematic review of somatisation and hypochondriasis. Journal of Psychosomatic Research 56, 391–408.

Creed, F.H., Davies, I., Jackson, J., Littlewood, A., Chew-Graham, C., Tomenson, B., Macfarlane, G., Barsky, A., Katon, W., McBeth, J., 2012. The epidemiology of multiple somatic symptoms. Journal of Psychosomatic Research 72, 311–317.

Dell'Osso, L., Bazzichi, L., Consoli, G., Carmassi, C., Carlini, M., Massimetti, E., Giacomelli, C., Bombardieri, S., Ciapparelli, A., 2009. Manic spectrum symptoms are correlated to the severity of pain and the health-related quality of life in patients with fibromyalgia. Clinical and Experimental Rheumatology 27, S57–S61.

Derogatis, L.R., 1994. SCL-90-R: Administration, scoring, and procedure manual, 3rd ed. National Computer Systems, Minneapolis, MN.

Derogatis, L.R., Melisaratos, N., 1983. The brief symptom inventory: an introductory report. Psychological Medicine 13, 595–605.

Dimsdale, J., Creed, F., 2009. DSM-V workgroup on somatic symptom disorders. The proposed diagnosis of somatic symptom disorders in DSM-V to replace somatoform disorders in DSM-IV–a preliminary report. Journal of Psychosomatic Research 66 (6), 473–476.

Fox, H.M., 1959. The theory of the conversion process. Journal of the American Psychoanalytic Association 7, 173–181.

Freud, A., 1986. The Ego and the Mechanisms of Defense (Translated by Cecil Baines). Hogarth Press Ltd., London, UK.

Freud, S., 1914. On the history of the psychoanalyticalmovement. In: Strachey, J. (Ed.), The Standard Edition of the Complete Works of Sigmund Freud. Hogarth Press, UK, pp. 3–66.

Gonda, X., Rihmer, Z., Zsombok, T., Bagdy, G., Akiskal, K.K., Akiskal, H.S., 2006. The 5HTTLPR polymorphism of the serotonin transporter gene is associated with affective temperaments as measured by TEMPS-A. Journal of Affective Disorders 91, 125–131.

Gureje, O., Simon, G.E., 1999. The natural history of somatization in primary care. Psychological Medicine 29, 669–676.

Guthrie, E., Creed, F., Dawson, D., Tomenson, B., 1991. A controlled trial of psychological treatment for the irritable bowel syndrome. Gastroenterology 100, 450–457.

Gupta, S.C., Sinha, V.K., Praharaj, S.K., Gandotra, S., 2011. Factor structure of manic symptoms in adolescents. Annals of Clinical Psychiatry 23, 243–249.

Hauser, W., Schmutzer, G., Brahler, E., Glaesmer, H., 2009. A cluster within the continuum of biopsychosocial distress can be labeled "fibromyalgia syndrome" — evidence from a representative German population survey. Journal of Rheumatology 36, 2806–2812.

Hyphantis, T., Guthrie, E., Tomenson, B., Creed, F., 2009. Psychodynamic interpersonal therapy and improvement in interpersonal difficulties in people with severe irritable bowel syndrome. Pain 145 (1–2), 196–203.

Johnson, M., 2003. The vulnerability status of neuroticism: over-reporting or genuine complaints? Personality and Individual Differences 35, 877–887.

Körber, S., Frieser, D., Steinbrecher, N., Hiller, W., 2011. Classification characteristics of the Patient Health Questionnaire-15 for screening somatoform disorders in a primary care setting. Journal of Psychosomatic Research 71, 142–147.

Kraemer, H.C., Wilson, G.T., Fairburn, C.G., Agras, W.S., 2002. Mediators and moderators of treatment effects in randomized clinical trials. Archives of General Psychiatry 59, 877–883.

Kraepelin, E., 1921. Manic-depressive Insanity and Paranoia (M. Barclay, Trans.). Churchill Livingstone, Edinburgh, UK.

Kretschmer, E., 1936. Psychique und Character. Kegan, Paul, Trench, Trubner and Co. Ltd., London, UK.

Kroenke, K., Sharpe, M., Sykes, R., 2007. Revising the classification of somatoform disorders: key questions and preliminary recommendations. Psychosomatics, 277–285.

Kroenke, K., 2003. Patients presenting with somatic complaints: epidemiology, psychiatric comorbidity and management. International Journal of Methods in Psychiatric Research 12 (1), 34–43.

Ladwig, K.H., Marten-Mittag, B., Lacruz, M.E., Henningsen, P., Creed, F., 2010. MONICA KORA Investigators, 2010. Screening for multiple somatic complaints in a population-based survey: does excessive symptom reporting capture the concept of somatic symptom disorders? Findings from the MONICA-KORA Cohort Study. Journal of Psychosomatic Research 68 (5), 427–437.

Lara, D.R., Bisol, L.W., Brunstein, M.G., Reppold, C.T., de Carvalho, H.W., Ottoni, G.L., 2012a. The affective and emotional composite temperament (AFECT) model and scale: a system-based integrative approach. Journal of Affective Disorders 140, 14–37.

Lara, D.R., Ottoni, G.L., Brunstein, M.G., Frozi, J., Carvalho, H.W., Bisol, L.W., 2012b. Development and validity of the Brazilian internet study on temperament and psychopathology (BRAINSTEP). Journal of Affective Disorders 141 (2–3), 390–398.

Leiknes, K.A., Finset, A., Moum, T., Sandanger, I., 2007. Course and predictors of medically unexplained pain symptoms in the general population. Journal of Psychosomatic Research 62 (2), 119–128.

Miles, J., Shevlin, M., 2003. Issues in regression analysis. In: Miles, J., Shevlin, M. (Eds.), Applying Regression and Correlation. Sage, London, pp. 126–132.

Monsen, K., Havik, O.E., 2001. Psychological functioning and bodily conditions in patients with pain disorder associated with psychological factors. British Journal of Medical Psychology 74 (Part 2), 183–195.

Mulder, R.T., Joyce, P.R., Sellman, J.D., Sullivan, P.F., Cloninger, C.R., 1996. Towards an understanding of defense style in terms of temperament and character. Acta Psychiatrica Scandinavica 93, 99–104.

Neeleman, J., Bijl, R., Ormel, J., 2004. Neuroticism, a central link between somatic and psychiatric morbidity: path analysis of prospective data. Psychological Medicine 34, 521–531.

Pacchiarotti, L., Nivoli, A.M., Mazzarini, L., Kotzalidis, G.D., Sani, G., Koukopoulos, A., Scott, J., Strejilevich, S., Sánchez-Moreno, J., Murru, A., Valentí, M., Girardi, P.,

Vieta, E., Colom, F., Journal of Affective Disorders, http://dx.doi.org/10.1016/j.jad.2013.01.003, in press.
Rangell, L., 1959. The nature of conversion. Journal of the American Psychoanalytic Association 7, 632–662.
Rapee, R.M., Sanderson, W.C., McCauley, P.A., Di Nardo, P.A., 1992. Differences in reported symptom profile between panic disorder and other DSM-III-R anxiety disorders. Behaviour Research and Therapy 30 (1), 45–52.
Rihmer, Z., Akiskal, K.K., Rihmer, A., Akiskal, H.S., 2010. Current research on affective temperaments. Current Opinion in Psychiatry 23, 12–18.
Rodin, G.M., 1991. Somatization: a perspective from self psychology. Journal of the American Academy of Psychoanalysis 19 (3), 367–384.
Rosmalen, J.G., Neeleman, J., Gans, R.O., de Jonge, P., 2007. The association between neuroticism and self-reported common somatic symptoms in a population cohort. Journal of Psychosomatic Research 62 (3), 305–311.
Russo, J., Katon, W., Sullivan, M., Clark, M., Buckwald, D., 1994. Severity of somatization and its relationship to psychiatric disorders and personality. Psychosomatics 35, 546–556.
Sartorius, N., Jablensky, A., Regier, D.A., 1990. Sources and Traditions of Classification in Psychiatry. Hogrefe and Huber, Toronto, Canada.
Schaefert, N., Höner, C., Salm, F., Wirsching, M., Leonhart, R., Yang, J., Wei, J., Lu, W., Larisch, A., Fritzsche, K., Psychological and behavioral variables associated with the somatic symptom severity of general hospital outpatients in China. General Hospital Psychiatry, http://dx.doi.org/10.1016/j.genhosppsych.2012.11.001, in press.
Sharpe, M., Mayou, R., Walker, J., 2006. Bodily symptoms: new approaches to classification. Journal of Psychosomatic Research 60 (4), 353–356.
Tanaka, Y., Kanazawa, M., Fukudo, S., Drossman, D.A., 2011. Biopsychosocial model of irritable bowel syndrome. Journal of Neurogastroenterology and Motility 17, 131–139.
Vaillant, G.E., 1992. Ego Mechanisms of Defense: A Guide for Clinicians and Researchers. American Psychiatric Press, Washington, DC.
Van Diest, I., de Peuter, S., Eertmans, A., Bogaerts, K., Victoir, A., Van den Bergh, O., 2005. Negative affectivity and enhanced symptom reports: differentiating between symptoms in men and women. Social Science and Medicine 61, 1835–1845.
Zhu, C., Ou, L., Geng, Q., Zhang, M., Ye, R., Chen, J., Jiang, W., 2012. Association of somatic symptoms with depression and anxiety in clinical patients of general hospitals in Guangzhou China. General Hospital Psychiatry 34, 113–120.