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Deepti Gupta¹ and Koraly Pérez-Edgar¹

Abstract

We examined a temperament-driven construct in relation to broad patterns of somatic behavior among young females ($N = 215$, 18–23 years). A multidimensional construct, socio-affective vigilance (SAV), encompassing affective, behavioral, and cognitive traits, along with sensitivity to sensory stimuli (low threshold), were used as predictors. SAV positively predicted somatic behavior and a low sensory threshold was associated with somatic complaints over and above SAV effects. A multidimensional construct, coupled with a low threshold, could underlie a vulnerability to somatization. These findings create a more comprehensive view of the temperament-somatization link by predicting a pattern of somatic behavior rather than individual symptom complaints.

Keywords

anxiety, low threshold, somatic complaints, temperament, thought suppression

Introduction

Somatization is defined as the tendency to present pain and/or physical symptoms that are not sufficiently explained by a specific medical condition. *Somatizers* are emotionally aroused individuals who express their distress physiologically by channeling their ‘emotional’ distress through their bodies. They differ from non-somatizers in having increased levels of self-defeating, depressive, and negativistic personality traits. As such, they score higher on measures of neuroticism and lower on agreeableness (Noyes et al., 2001). The symptoms experienced by somatizers (e.g. abdominal pain, headache, backache, nervousness) are diverse, and few are related to a defined diagnosis or disease. They persist over time and linger

well past the potential triggering event. These bodily changes are believed to accompany emotions such as anxiety, frustration and the corresponding motivational state of avoiding distress (Kirmayer and Robbins, 1991).

Tull and colleagues (2004) suggest that a tendency to avoid emotional experiences (especially distressing emotions) may contribute to the presence of general psychiatric symptoms

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among individuals. Somatic complaints could therefore be seen as a physical manifestation of such cognitive and emotional avoidance. This link is supported in a recent meta-analysis of coping strategies linking emotion-focused coping methods to increased psychological distress (Littleton et al., 2007). Conversely, the suppression of emotional expression is associated with increased physiological arousal (Gross and Levenson, 1997).

Similarly, guarded cognitive appraisal of social encounters can lead to anxious states. Thought suppression, defined as the process of consciously trying to prevent specific classes of thoughts from entering the stream of consciousness, has been found to correlate positively with measures of emotional vulnerability as well as measures of depressive and anxious affect (Spinhoven and Does, 1999). Thought suppression is also marked by persistent vigilance towards bodily states (Kirmayer and Robbins, 1991). A vulnerability to anxiety, coupled with thought suppression and excessive attention to one's physical state, may manifest in a broad and shifting series of complaints that are not rooted in a clear medical cause.

Somatization is associated with subjective distress and disability (Kellner, 1990) and much of the research has focused on potential individual differences in personality. One personality construct previously linked to somatic problems is alexithymia (Mattila et al., 2008), which is characterized by difficulties in experiencing and verbalizing emotions, impoverishment of fantasy, and a poor capacity for symbolic thought. Alexithymia may be associated with somatization by amplifying somatic sensations associated with emotional arousal or by misinterpreting these sensations as symptoms of illness (Mattila et al., 2008). However, a recent meta-analysis by De Gucht and Heiser (2003) has revealed a small to moderate association between alexithymia and self-reports of somatic complaints (as cited in Waller and Scheidt, 2006). Thus, the current study looked to see if a broader multi-dimensional profile could enhance our understanding of the traits

underlying somatization. As an initial investigation, we focus on self-reported patterns of somatic complaints (as opposed to 'symptoms') in a sample of young women.

We do so through a novel multidimensional construct, socio-affective vigilance (SAV), which brings together the core constructs thought to contribute to somatic behavior. Here neuroticism is the *affective* component, which is defined as the feeling of worry, anxiety, suspicion and uncertainty. Social avoidance is the *behavioral* component, reflecting an individual's active avoidance of people, places and unfamiliar situations. Thought distortion is seen as the *cognitive* characteristic, in which there are disturbing thoughts and negative evaluation of situations and people around the self. Thus, SAV is a superordinate multidimensional construct (Edwards, 2001) that represents a general theoretical concept manifested in co-existing temperamental dimensions.

In addition to SAV, an individual's low threshold for environmental stimuli could further contribute to their vulnerability to somatic complaints. Low threshold is defined as the *perceptual* quality of an individual who is very sensitive to, and highly aware of, slight changes in the environment. This sensitivity may make an individual more vulnerable to negative events in the environment, thus triggering distress and the accompanying somatic response. Our novel formulation of this factor (see below) is rooted in previous literature linking somatic awareness and perceptual sensitivity to individual differences in hypochondriasis (Hollifield et al., 1999), anxiety (Steptoe and Vögel, 1992), and temperament (Evans and Rothbart, 1997). Together, SAV and low threshold may help provide a holistic representation of a comprehensive set of temperamental dimensions that exist within an individual and make him or her prone to somatic behavior.

Temperament is a biologically driven component of personality, an innate attribute which reflects individual differences in activity, reactivity, and sociability (Thomas and Chess, 1997) and influences one's sensitivity and

response to stressful situations. Children with high levels of anxiety sensitivity reported more pain problems and somatization (Tsao et al., 2009). Temperamentally anxious individuals tend to perceive increased levels of threat and danger, be it real or imagined (Beck, 2008). This tendency to display somatic symptoms is modified and crystallized through self-generated modes of regulation as well as environmental influences (e.g. parenting and peer socialization). The manner in which one perceives and attends to cues from the environment is influenced by temperamental traits such as negative affectivity (NA) and anxiety sensitivity (Tsao et al., 2009). For instance, an intrinsic tendency to experience NA towards the self has the potential to produce somatic symptoms in the absence of disease or structural damage (Clark et al., 1994). Indeed, individuals with high NA experience greater levels of distress and dissatisfaction with themselves and others; they tend to pay selective attention to symptoms (Kirmayer and Looper, 2006); they reinforce their negative mood through ruminative processes and tend to emphasize the negative aspects of their daily experiences, including their health condition (Pennebaker and Watson, 1991; Vassend and Skrandal, 1999).

Another temperamental trait that is relevant to understanding somatic behavior is behavioral inhibition or shyness. Shy individuals are likely to experience significant psychophysiological reactivity in social situations, such as increased systemic cortisol levels and increased heart rate (Miller and Coll, 2007). Temperamental shyness is an early appearing trait marked by displays of poor emotional information processing and negative self-schemas (Scarpelli-Dwyer, 2001). Consequently, research has found that a childhood history of behavioral inhibition or shyness may be strongly associated with adolescent (Chronis-Tuscano et al., 2009) and adult (Mick and Telch, 1998) social anxiety. High levels of social anxiety are associated with less assertive behavior, avoidance of conflict, greater interpersonal dependency (Davila and Beck, 2002), and somatic complaints (Jellesma et al., 2008).

Traits such as neuroticism, negative affectivity, anxiety sensitivity and shyness have been repeatedly associated with higher numbers of somatic complaints and anxiety diagnoses (Miller and Coll, 2007). Thus, these temperament traits seem to co-exist and the magnitude of their relationships may be represented in our proposed multidimensional factor, SAV.

In addition to temperament, gender appears to play an important role in somatization. Research has consistently shown that girls are more prone to somatic complaints than boys (e.g. Burgess and Younger, 2006; Piccinelli and Simon, 1997). As early as preschool, girls exhibit more fearfulness and anxiety compared to boys (Zahn-Waxler et al., 2008), and thus present susceptibility to somatic problems, both in adolescence (e.g. Honkinen et al., 2009) and in adulthood (e.g. Piccinelli and Simon, 1997). Such gender differences in somatic behavior may be due to disparities in symptom perception and appraisal.

There is strong evidence that females tend to use more situational and circumstantial clues in evaluating bodily sensations compared to males (Piccinelli and Simon, 1997). Young adolescent girls may be particularly inclined to perceive their health status through the prism of their socio-emotional needs (McBeth et al., 2002). For instance, girls' play is nurturing and affiliative in nature, and they tend to use relational aggression in peer relations rather than physical harm. Consequently, girls often internalize their problems (Zahn-Waxler et al., 2008) and therefore may be more prone to developing somatic symptoms (Burgess and Younger, 2006). Thus, a focus on how the temperament-somatic behavior link plays out in women may be a particularly useful first step in this line of research.

As discussed, somatic problems in daily living can be both indicative and predictive of mental distress (McBeth et al., 2002). Conscious or unconscious attempts to suppress emotions could lead to displacement and subsequent bodily symptoms. Somatic symptoms are often multiple, persistent and disabling in their nature (Wessely and White, 2004). However, the

temperamental dimensions that contribute to the occurrence of somatic symptoms are not fully understood. Past research has indicated that individual personality traits such as neuroticism make one prone to somatic behavior (Vassend and Skrondal, 1999). Social anxiety, thought suppression, and sensitivity to the environment have been separately associated with somatic distress. However, there are gaps in the literature in understanding how these factors together contribute to somatization.

First, is this association driven by a single trait or are there multiple temperament dimensions that make one vulnerable to somatic behavior? The tendency to experience anxiety, negative emotions (Neelman et al., 2004), thought suppression (Purdon, 1999) and acute awareness of bodily sensations (Kirmayer and Robbins, 1991) could be co-occurring mechanisms that, as a group, make an individual prone to somatizing behavior. The approach used in the current study expands on previous studies that focus on single trait markers.

Second, are there clusters of somatic complaints that are common products of these temperamental profiles? Previous studies have examined specific somatic complaints individually, such as skin allergy or abdominal pain (Walker et al., 2006b as cited in Beck, 2008). However, there is a paucity of literature on profiles of somatic complaints. A somatizer would likely use numerous symptoms to express his or her distress in varying situations, as illness behaviors reinforce multiple symptoms often involving secondary gains. As such, it appears artificially limiting to examine only a single symptom. This would likely decrease the ability to effectively capture the extent of somatic complaints.

The purpose of the current study was to examine the role of a temperament-driven multidimensional construct, SAV, and low threshold as potential predictors of young females' somatic behavior during everyday social situations. Herein, temperament was assessed through a latent factor derived from the primary factors of neuroticism, social anxiety, and thought suppression. These factors were included in the

multidimensional construct based on theoretical reasoning that somatic problems arise due to one's inability to deal with affective and cognitive distress. Thus, it specifically tapped the ABC (affective, behavioral and cognitive) mechanisms underlying somatization. We also explore whether low threshold for environmental stimuli contributes to this prediction. It was hypothesized that SAV is a predictor of increased levels of somatic problems in the young adults. In addition, individuals with low threshold or high sensitivity towards bodily sensations and external stimuli would exhibit more somatic behavior.

Methods

Participants

Participants were 301 females recruited from the undergraduate psychology research pool at a large public research university. Only females were recruited because the male to female ratio in these courses would not allow us to recruit a sufficiently large sample of males. In addition, our behavior of interest is more prevalent in females. Participants were compensated with course credit. They responded to the online survey created for this study. Students were excluded from the study based on poor participation and age. First, individuals who took less than 20 minutes to complete the full battery were excluded ($N = 50$), based on pilot testing showing that this was the minimum time required to thoughtfully answer all questions. Second, participants less than 18 years old and greater than 23 years old, or missing age data, were also excluded from analysis ($N = 36$). The final sample included data from 215 participants (mean age = 19.65 yrs). The participants excluded from the sample due to age did not differ from the remaining participants on their somatic score, $F(1, 296) = 0.02$, $p = 0.89$. The participants excluded from the sample due to completion time did not differ from the remaining participants on age, $F(1, 296) = 1.35$, $p = 0.25$, or somatic score, $F(1, 299) = 1.72$, $p = 0.19$.

Procedure

Six questionnaires were used to collect data on demographic information, behavioral inhibition, social anxiety, thought suppression and somatic complaints. After an online consent form approved by the Human Subjects Review Board (HSRB) at George Mason University (GMU) was completed by the participants and confidentiality was assured, participants completed the surveys using SurveyMonkey software (SurveyMonkey Corporation, San Francisco, CA). Once all the data were collected, specific questions tapping the target characteristics of somatic behavior, neuroticism, social anxiety, thought suppression and low threshold were used to generate factor scores (see Appendix, Table A.1).¹

Measures

The *Adult Temperament Questionnaire* (ATQ; Rothbart et al., 2000) is a 77-item scale adapted from the Physiological Reactions Questionnaire developed by Derryberry and Rothbart (1988). The instrument addresses three general constructs of effortful control, negative affect, and orienting sensitivity. These come from items that make the 13 sub-factors, which are rated on a scale from 1 (extremely untrue) to 7 (extremely true) and then averaged to create the factor score.

The *Adult Measure of Behavioral Inhibition* (AMBI; Gladstone and Parker, 2005) is a 16-item instrument developed to measure subjective reports of contemporaneous trait inhibition. Items included responses such as hyper-vigilance, non-approach, nervousness, physiological anxiety, observing unfamiliar people from a safe distance, reluctance to initiate social contact, and novelty and risk avoidance. The instrument provides a dimensional measure after averaging items scored on a 3-point scale (0 = *no/hardly ever*; 1 = *some of the time*; 2 = *yes/most of the time*).

The *Retrospective Measure of Behavioral Inhibition* (RMBI; Gladstone and Parker, 2005)

is an 18-item instrument for the retrospective reporting of remembered inhibited behavior in childhood. It is constructed to capture behavioral reactions and responses such as: hiding; withdrawing; fearfulness; clinging to a familiar base; reticence; reduced mobility; crying; standing back; freezing in response to unfamiliarity; and avoidance of risk activities. Measures are rated on a 3-point scale (i.e., 0 = *no/hardly ever*; 1 = *some of the time*, or 2 = *yes/most of the time*) and items are summed to create total dimensional scores. The RMBI is the measure of key interest for the present study, used to investigate the relationship between reports of childhood inhibition and later anxiety.

The *White Bear Suppression Inventory* (WBSI; Wegner and Zanakos, 1994) is a 15-item, self-report measure designed to assess the extent to which individuals suppress and experience the intrusion of thoughts. Prior, factor analyses of the WBSI revealed a one-factor solution. Furthermore, the WBSI was found to correlate positively with measures of emotional vulnerability and psychopathological symptoms. The WBSI has strong test-retest reliability (average $r = 0.77$). WBSI was included in the present study to assess thought distortion.

The *Social Anxiety Scale – Adolescents* (SAS-A; La Greca and Lopez, 1998) contains 22 items where 18 items are self-statements such as ‘I worry about what others think of me’, and four are filler items (e.g., ‘I like to play sports’). Each item is rated on a 5-point Likert scale according to how much the item ‘is true for you’, ranging from 1 (not at all) to 5 (all the time).

The *Symptom Questionnaire* (SQ; Kellner, 1987) consists of 92 Yes/No items, out of which 68 items indicate anxiety, depression, anger-hostility and somatic symptoms, and 24 items indicate corresponding well-being scale. Particular attention was paid to the anxiety and somatic subscales (17 items each). Respondents were asked to describe symptoms they have experienced during the past week. In this study, the score on the somatic subscale served as the outcome variable of interest (see Appendix, Table A.1).

Table 1. (a) Descriptive measures of the main study factors, noting mean scores and standard deviations. For the measures involved in our central temperament factor alphas and factor loadings are also noted. (b) Zero-order correlations between primary factors used in principal component analysis (Ns = 215).

FACTORS	Mean	SD	Alpha	Factor loading (SAV)
Somatization score	.0593	.99		
SAV	0.0000	1.00		
Neuroticism	.0072	.516	.83	.91
Social Avoidance	-.0091	.542	.72	.84
Distorting Thoughts	-.0112	.494	.82	.01
Low Threshold	.0013	.466	.57	

SAV = socio-affective vigilance

FACTORS	Neuroticism	Social Avoidance	Distorting Thoughts	Low Threshold
Somatization score	.231**	.200**	.244**	.222**
SAV	.901**	.844**	.766**	-.013
Social Avoidance	.653**			
Distorting Thoughts	.573**	.409**		
Low Threshold	.225**	.085	.243**	

** $p < .01$

SAV = socio-affective vigilance

Results

Factor formation

Scores on the somatic and anxiety subscales of Symptom Questionnaire were significantly correlated, $r(233) = 0.64$, $p < 0.001$. This is in line with the literature indicating that somatic behavior is often co-occurring with anxiety (Creed, 2009). In order to answer the current research questions, four primary factors were created through the items pooled from the completed questionnaires. The factors had acceptable alphas reflecting the internal consistency of the items and the behavior these items were tapping. See Table 1.

Neuroticism consisted of 19 items with an $\alpha = 0.83$, social avoidance employed 11 items with an $\alpha = 0.72$, thought distortion contained 17 items with an $\alpha = 0.82$, and low threshold had 8 items with an $\alpha = 0.57$. Next, a correlation matrix was generated between these four factors. It was found that 3 factors out of 4 correlated significantly with each other.

Owing to the presence of commonly shared variance among these factors, a factor analysis was run to obtain a general factor, which accounted for 52.95% of the variance in the variables and had an eigenvalue of 2.1. Bartlett's Test of Sphericity was found to be significant indicating that principal component analysis was appropriate. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was .64 indicating that factor analysis could be applied to these data. The factor analysis indicated that Neuroticism, Social Avoidance and Distorting Thoughts items loaded highly on factor 1, contributing 0.91, 0.84 and 0.77 respectively to the extracted factor, while another factor named 'low threshold' contributed nothing to this factor (i.e. 0.013). However, low threshold loaded heavily on the second factor contributing 0.997 to its extraction.

The first factor was labeled SAV, reflecting the underlying cognitions and behaviors characterizing the original composite factors. Thus, it was found that there were two predictors,

Table 2. Regression model predicting somatization scores as a function of socio-affective vigilance and low threshold. Beta weights, R square change and rate of F change for each predictor in the regression model are presented.

Predictor	Somatic		
	β	ΔR^2	ΔF
SAV	0.264**	0.069	15.49**
Low Threshold	0.194*	0.037	8.758*

$F(2,211) = 12.41, p < 0.001, R^2 = 0.106$

** $p < 0.01$, * $p < 0.05$

SAV and standardized Low Threshold, for a regression model with Somatic scores from the Symptom Questionnaire as dependant variable.

Regression analysis

A multiple linear regression analysis was conducted to examine the full model. The SAV factor was used in the regression along with the z-score of low threshold. For the analysis, the predictors were entered hierarchically into the regression equation in the following order: (i) SAV (factor from the PCA), and (ii) low threshold. The dependent variable was somatic score obtained from the SQ (Kellner, 1987). Predictive measures were standardized to z-scores for use in the regression.

When predicting somatic behavior, the full model accounted for 10.6% of the total variance: $F(2, 209) = 12.41, p < 0.001$. SAV significantly predicted somatic behavior, accounting for almost 7% of the variance, $\Delta F(1, 210) = 15.49, p < 0.001$. See Table 2.

The primary factor of low threshold also predicted somatic behavior, accounting for an additional 3.7% of the variance: $\Delta F(1, 209) = 8.76, p < 0.005$. As such, there was a 0.265 point increase in somatic score for an individual with a single point increase in SAV. Similarly, there was a 0.215 point increase in somatic score with a single point increase in low threshold level. Thus, SAV positively predicted somatic behavior in the sample. In addition, individuals with low threshold or high sensitivity

towards bodily sensations and external stimuli exhibited more somatic behavior.

Discussion

The present study examined the relation between a multidimensional construct of temperament and an individual's tendency to exhibit somatic behavior in the face of everyday stressors. The findings suggest that the multidimensional construct, SAV, characterized by neuroticism, social avoidance and thought distortion, may help to predict vulnerability to somatic complaints in young college females. Moreover, the tendency to have high sensitivity to environmental stimuli and display low threshold for one's environment could further enhance vulnerability to somatic complaints in daily life. Until now, few studies have examined the link between temperament and somatic behavior (Karvonen et al., 2006).

In the broader literature, the data indicate that positive peer relationships may serve as a protective factor against internalizing problems for at-risk shy children by socializing them into the normative peer group and promoting effective socio-emotional information-processing (Miller and Coll, 2007). Thus, anxious individuals who have someone to whom they can express their feelings are better able to cope with anxiety and avoid somatic concerns. Yet, individuals who lack a ready venue for emotional articulation may be more vulnerable to somatic problems as they suppress underlying socioemotional difficulties. Individuals high in our construct of SAV may have particular difficulty in creating these buffering social relationships. Our current model, rooted in a multidimensional construct, adds to our understanding of somatic behavior among young females. However, more research needs to be done with larger, heterogeneous samples from different populations to substantiate the individual role of SAV and its interaction with potential moderating factors, particularly social support within the individual's environment.

The present study was predicated on the assumption that somatic complaints are not simply a mechanism for 'seeking attention'. Rather, somatic behavior is used to cope with an individual's difficulties in social situations and overcome the adverse effects of ineffective self-expression. Moreover, our findings suggest that a broad temperament-driven construct, SAV, rather than a single measured trait, contributes to somatic behavior (Clark et al., 1994). This study tapped affective, behavioral, and cognitive biases involved in shaping coping strategies. Interventions that focus on training appropriate coping skills may therefore play an important role in reducing an individual's reliance on somatic complaints as a mechanism for relieving distress. Such interventions may include exposure to social situations to overcome social anxiety and the explanation and resolution of symptoms rather than symptomatic treatments such as psychotropic medication (Barsky and Borus, 1995).

The extent to which the current findings can be generalized is somewhat limited. First, the data were collected from an undergraduate pool, using only a student sample potentially restricts the application to broader samples. Second, we lacked a clinical group that could have served a suitable comparison point. This is coupled with a lack of information regarding the participants' physical condition, which might influence the experience of physical sensations that mirror somatic complaints. Third, we only applied self-report instruments and participants may have responded in a biased fashion. Self-report data are usually susceptible to personal biases, distortion in recall (Stone and Shiffman, 2002) and shared method variance. Lastly, somatization is believed to have some foundation in familial factors (Karvonen et al., 2006) and this study was unable to assess family influences. Input from the participants' family members would have not only validated the available self-report measures but also told us about the role of family environment in promoting somatizing as a coping skill. The nature of peer interaction has been found to influence the prevalence of

somatic problems in childhood and adolescence (Jellesma et al., 2008). Thus assessing the participants' peer relations and friendship quality could have substantiated our intuition concerning the role of social support.

Overall, there is a paucity of literature on the potential risk factors for the broad tendency to endorse somatic symptoms (Beck, 2008). This study was unique as it attempted to identify temperamental dimensions that are associated with a wide set of self-reported somatic complaints as well as to understand characteristics beyond singular temperamental markers, like NA, that may make individuals prone to somatic behavior. This study also examined a broad set of somatic complaints that included headaches, heavy arms/legs, muscle pains, upset stomach/bowels, cramps and nausea. Thus, this study begins to meet the need for a comprehensive view of somatic problems in the normal population as single symptom studies may fail to capture the temperament linked collective trends simply due to idiosyncratic symptom reporting. A more inclusive, and perhaps more stable, view of the relations between trait profiles and somatic behavior may therefore better inform efforts to predict, assess, and target patterns of somatic distress.

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Note

1. Specific items incorporated into each factor can be obtained through the first author.

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Appendix

Table A.1. Items from the Somatic scale (SQ, Kellner, 1987) used to characterize somatic behavior patterns

Feeling of not enough air
 Heavy arms or legs
 Appetite poor
 Tight head or neck
 Choking feeling
 Feeling of pressure in head or body
 Weak arms or legs
 Breathing difficult
 Parts of the body feel numb or tingling
 Heart beating fast or pounding
 Pressure on head
 Nauseated, sick to stomach
 Upset bowels or stomach
 Muscle pains
 Headaches
 Cramps
 Head pains
