



Autonomic imbalance is associated with reduced facial recognition in somatoform disorders

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ABSTRACT

Objectives: Somatoform disorders are characterized by the presence of multiple somatic symptoms. While the accuracy of perceiving bodily signal (interoceptive awareness) is only sparsely investigated in somatoform disorders, recent research has associated autonomic imbalance with cognitive and emotional difficulties in stress-related diseases. This study aimed to investigate how sympathovagal reactivity interacts with performance in recognizing emotions in faces (facial recognition task).

Methods: Using a facial recognition and appraisal task, skin conductance levels (SCLs), heart rate (HR) and heart rate variability (HRV) were assessed in 26 somatoform patients and compared to healthy controls. Interoceptive awareness was assessed by a heartbeat detection task.

Results: We found evidence for a sympathovagal imbalance in somatoform disorders characterized by low parasympathetic reactivity during emotional tasks and increased sympathetic activation during baseline. Somatoform patients exhibited a reduced recognition performance for neutral and sad emotional expressions only. Possible confounding variables such as alexithymia, anxiety or depression were taken into account. Interoceptive awareness was reduced in somatoform patients.

Conclusions: Our data demonstrate an imbalance in sympathovagal activation in somatoform disorders associated with decreased parasympathetic activation. This might account for difficulties in processing of sad and neutral facial expressions in somatoform patients which might be a pathogenic mechanism for increased everyday vulnerability.

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Introduction

Somatoform disorders are a group of psychiatric disorders characterized by the presence of multiple somatic symptoms without an organic cause that completely explains the symptoms as defined in the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) [1]. They include somatization disorder, undifferentiated somatoform disorder, conversion disorder, pain disorder, hypochondriasis, body dysmorphic disorder and somatoform disorder not otherwise specified. There are three required clinical criteria common to each of the somatoform disorders: The physical symptoms [1] cannot be fully explained by a general medical condition, another mental disorder, or the effects of a substance; [2] are not the result of factitious disorder or

malingering; and [3] cause significant impairment in social, occupational, or other functioning. In recent years, the diagnostic category multisomatoform disorder (MSD) has been described for research purposes to characterize patients with a moderate to severe form of somatoform disorder suffering from more than three different currently bothersome medically unexplained symptoms that are present for more than 2 years [2]. The construct has a life time prevalence of 8% [3] and is associated with preferential use of medical services and high indices of disability [4]. MSD was used as an operational definition of somatization in a World Health Organization study on mental disorders in primary care conducted in 15 countries [5]. Summarized, besides anxiety and mood disorders, somatoform disorders are one of the most frequent psychiatric diagnoses referring to 12-month prevalence in Germany [6].

As in other well-known diseases such as diabetes or hypertension, there are some empirical data showing that in somatoform disorders respectively in patients suffering from medically unexplained symptoms autonomic dysfunction may be present [7,8]. Former studies could demonstrate reduced heart rate variability (HRV) [9] or altered

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baroreceptor sensitivity [7] as markers for impaired autonomic regulation in somatoform patients. In addition to these findings, negative correlation between HRV and somatic depressive symptoms [10] as well as worry in daily life [11] were reported. Laederach-Hofmann and colleagues [7] emphasize that in major depression as well as in anxiety disorders autonomic dysfunctions have been found frequently, and both mental diseases have a significant overlap to somatoform disorders. Possible factors involved in the development of somatization include functional alterations in physiological processes, dysfunctional adaptation due to changes in lifestyle as a result of disease, a catastrophizing interpretation style or abnormalities in the perception of somatic processes (interoception) in general [7]. Laederach-Hofmann and co-authors suggest that a dysfunctional autonomic nervous system may well contribute to misperceptions of bodily functions or even be a part of the disease influence on autonomic regulation. In line with these assumptions, Rief and colleagues [12] proposed that increased physiological arousal as demonstrated in somatoform disorders [13,14] may lead to a more intense perception of somatic processes and possibly enhance the probability of misinterpretations.

Concerning possible abnormalities in interoceptive processes in somatoform patients, Mussgay and co-workers [15] could demonstrate lower heartbeat perception in functional patients. This finding is very important as interoceptive processes and the extent of an individual's sensitivity to bodily signals ("interoceptive awareness") are considered to be an essential variable in many theories of emotions such as proposed by James [16], Schachter and Singer [17] or Damasio [18]. Within this theoretical framework, it is postulated that visceromotor feedback is closely linked to emotional experience and, furthermore, that feelings originate from the perception of these bodily changes. Persons who perceive bodily signals with a high level of accuracy should therefore experience emotions more intensely which was supported in several studies [19–25] assessing interoceptive awareness both in healthy persons as well as in clinical populations. Recent studies on the interaction between depression and interoception could demonstrate that interoceptive awareness is reduced in depressive patients [26] and correlated negatively with depressive symptoms [27]. Concerning anxiety, former research results are less consistent with some studies reporting elevated interoceptive awareness in anxiety disorders [28–30], while other studies did not find a systematic difference (see e.g. [30]). Summarized, interoceptive awareness may be altered in somatoform patients and these abnormalities may interact with the processing of emotions.

Emotions play an important role in human life, and people communicate their feelings via several channels including their facial expression. The ability to correctly classify this emotional information is necessary for social communication and interactions, and deficits thereby might create an increased vulnerability to social stress. To our knowledge there is one single study so far investigating facial recognition performance in somatoform disorders by Pedrosa and colleagues [31]. They could demonstrate that somatoform patients recognized a significantly lower proportion of emotional expressions than did the healthy controls. A similar result was reported by Buhlmann and co-workers [32] with patients suffering from body dysmorphic disorder. Besides of its high everyday relevance, emotional face recognition is known to interact with psychophysiological arousal [33–35] and is therefore an ideal process to investigate the interface between altered autonomic functioning and emotion processing in somatoform disorders. As in the study of Pedrosa and colleagues [31] psychophysiological arousal was not assessed, it is an open question whether there are abnormalities in psychophysiological arousal in somatoform disorders during the facial recognition and whether facial recognition deficits are indeed fully attributable to alexithymia. Concerning suspected increased psychophysiological arousal in somatoform disorders a model of neurovisceral integration as proposed by Thayer and Brosschot [36] is of great relevance: The

authors stated that autonomic imbalance and reduced parasympathetic tone may be the final common pathway linking negative affective states to ill health, probably modulated by interface regions like the prefrontal cortex which is a target region both for information from the central nervous system as well as from attention, emotion and motivated behavior networks [36]. Within this model it is hypothesized that when parasympathetic inhibitory action is withdrawn a relative sympathetic dominance emerges [36]. In this condition low heart rate variability (HRV) as a marker for low parasympathetic activation can be observed, which has been demonstrated to be linked to hypervigilance and inefficient allocation of attentional and cognitive resources [36].

The aim of the present study was therefore twofold: First, we wanted to clarify if interoceptive awareness is altered in somatoform disorder. Second, we wanted to elucidate whether facial recognition deficits are present in somatoform disorder and how such hypothesized deficits interact with autonomic reactivity, experienced feelings and psychometric variables like depression, anxiety and alexithymia. We hypothesized that an autonomic imbalance is existent in somatoform disorders and that a low parasympathetic activation as measured by HRV in somatoform patients is associated with difficulties in an emotional face recognition task.

Methods

Participants

Consecutive inpatients of a psychosomatic unit between 20 and 55 years with pain as their current lead symptom were screened for multisomatoform disorder (MSD). The diagnosis of MSD requires a minimum of three current somatoform symptoms (pains, functional complaints like dizziness or bowel dysfunction, fatigue, etc.) which cannot be sufficiently explained by concurrent organic disease or another mental disorders, together with a history of somatoform symptoms of at least 2 years present at least 50% of the days [2]. Patients were eligible for inclusion to the trial if they fulfilled criteria for MSD. Eighteen female and five male patients (aged between 22 and 54 years; $M=39.9$, $SD=8.8$) were included in the study. They were all inpatients from the University Department of Psychosomatic Medicine of the TU Munich. In average, they stayed 6–8 weeks in hospital and were included in the study in the second part of their stay in hospital. Exclusion criteria included the use of beta-blockers or acute psychosis other than depression. Reflecting clinical routine, diagnoses were determined according to International Classification of Diseases (ICD)-10 criteria based on semistructured clinical interviews administered by a senior staff member.

They were compared to 23 healthy controls matched concerning age (mean=36.5, $SD=7.2$, $T(df=44)=1.40$, $p=n.s.$), sex and educational level who were recruited from an introductory psychology course or from medical staff of the university clinic. All control participants were screened for health status using an anamnestic questionnaire and were only included if they did not have a history of any axis 1 disorders, in particular anxiety disorders or depression according to the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV, American Psychiatric Association, 1994). Additionally, regular drug intake (including alcohol) as well as any medication (except of contraceptives) were not allowed for the healthy controls. Experiments were conducted in accordance with the Declaration of Helsinki. Ethical approval from a local ethic board was obtained. All subjects gave their written informed consent.

Procedure

Upon arrival at the laboratory room in the clinic, all participants were given written information about the experiment and informed consent was obtained. All experiments were undertaken in the forenoon,

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