

# A sensitive body or a sensitive mind? Associations among somatic sensitization, cognitive sensitization, health worry, and subjective health complaints

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## Abstract

**Objectives:** Psychobiological sensitization and health worry appear to be involved in the etiology of clinical manifestations of subjective health complaints (SHCs) via amplified processing of health-related information. However, it is not clear whether sensitization and health worry are also associated with *common* SHCs, which are extremely prevalent and are responsible for a large part of both human suffering and health care costs. In this study, we investigated whether SHCs are associated with health worry and two types of sensitization: cognitive health-related sensitization and somatic sensitization. We also examined whether health worry mediates the relationship between cognitive sensitization and SHCs and whether both levels of sensitization interact. **Methods:** A nonclinical sample of 47 female students completed questionnaires about their recent subjective health as well as health worry and underwent tests for cognitive sensitization, operationa-

lized as Stroop interference and free recall performance, and somatic sensitization, operationalized as pain tolerance and pain threshold in a cold pressor task. **Results:** Severity of health complaints was positively related with recall of health-related stimuli, but not with Stroop interference, and with worrying about health complaints. In addition, worry mediated the relationship between recall bias and severity of health complaints. Both the number and severity of recent health complaints were associated with pain tolerance. Pain threshold was associated with Stroop interference for health-related information. **Conclusions:** The results suggest that specific types of cognitive sensitization and somatic sensitization are associated with common health complaints and that worrying about one's complaints might play a role by enhancing biased memory of health-related information.

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**Keywords:** Cognitive bias; Health worry; Sensitization; Pain tolerance; Subjective health complaints

## Introduction

Subjective health complaints (SHCs) are extremely common and are responsible for a large part of both human suffering and health care costs [1–3]. Moreover, SHCs and self-rated health (SRH) significantly predict mortality over and above objective measurements of health

[4,5]. Most SHCs concern difficult-to-diagnose vague symptoms, such as low back pain, headache, and fatigue, and they are responsible for the majority of visits to general and other medical practitioners [6]. Typically, physicians can only find an organic basis for 10–20% of the most common symptoms, while only a small number of symptoms receive a psychiatric diagnosis (e.g., somatoform disorder) [7]. Clearly, it is essential to elucidate the processes underlying the reporting of health complaints.

Research concerned with clinical manifestations of SHCs—somatoform or functional syndromes—suggested that these syndromes are characterized by *sensitization*, operating at somatic, cognitive, and even behavioral as well

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as social levels [8–11]. Sensitization is the increased reactivity of a single neuron or neural systems, caused by their repeated usage, and is thought to be a basic mechanism underlying the formation of memory [12]. More recently, it has been put forward as a process that could explain how somatic sensations develop into somatoform or functional syndromes [8–11]. *Somatic sensitization* is manifested as the amplification of somatic sensations, especially the lowering of pain thresholds and reduced tolerance for pain. It appears to be implied in chronic conditions such as irritable bowel syndrome [13,14], whiplash [15], and fibromyalgia [16–18]. Furthermore, Edwards [19] suggested that heightened pain somatic sensitization, combined with reduced pain-inhibitory capacity, may predict chronic pain syndromes in initially healthy and pain-free people. At a higher *cognitive* level, sensitization is manifested as *cognitive bias* [9] (i.e., selective processing of information that is of high relevance for individuals [20]). Cognitive biases for information related to complaints, including pain, have been found in several clinical groups that are difficult to diagnose and treat, including somatoform patients, chronic pain patients, fibromyalgia patients, and persons with high health anxiety [21–28], as well as in patients with medically explained conditions that are influenced by stress, such as psoriasis [29] and asthma [30].

However, these clinical conditions represent only “the tip of the iceberg” of SHCs. Only recently have studies begun to address whether sensitization is implicated in common SHCs (i.e., SHCs that are experienced by most of us) [8–11]. One study [31] showed an attentional bias for health-related information in students scoring high on a 14-item SHC checklist and with low SRH. However, this study has some limitations, including failure to control for the possibility that the bias was in fact a general negative emotional bias. In another study [32], somatic sensitization, as indicated by pain intensity ratings during pressure-controlled palpation, was found to be related to the frequency of tension-type headache in the general population. The first purpose of the present study was to replicate and extend these studies by examining whether the number and severity of SHCs are associated with somatic sensitization and cognitive sensitization while controlling for a general negative emotional bias (see Materials and methods for further details). Furthermore, two elementary propositions from the sensitization theory [9] were tested.

First, the occurrence and severity of common SHCs might also be influenced by health-related worry [9,33,34]. Health worry has been found to predict the occurrence of health complaints [35,36], and a particularly intense form of health worry, catastrophic thinking, has been associated with increases in pain [37] and other somatic complaints [38]. Furthermore, health worry has been associated with consulting a physician [39] and with intensive health care utilization [40,41], suggesting that health worry is closely associated with the reporting of complaints. It is possible that bodily sensations trigger

cognitive networks related to health, which promote selective cognitive processing and misinterpretations of these bodily sensations [9,33,34]. In turn, highly accessible cognitive networks increase the likelihood of reporting SHCs by causing worries about these complaints. Thus, the second aim of the present study was to investigate whether health worry is related to SHCs and whether health worry mediates—at least in part—the relationship between cognitive sensitization and SHCs.

Second, it has been proposed that the effects of somatic sensitization, cognitive sensitization, and health worry on SHCs are closely related and add up or even strengthen each other [9]. It seems quite adaptive that frequent and intense bodily signals not only are enhanced by somatic sensitization but also are given priority at higher levels of information processing and thus accompanied by cognitive sensitization [9]. A possible downside, however, is that paying more attention to bodily sensations and worrying about them could result in increased reporting of symptoms [9,33]. Indeed, the widespread pain complaints of fibromyalgia patients are associated with both reduced pain thresholds and tolerance (indicating somatic sensitization [16–18]) and hypervigilance (indicating cognitive sensitization [42,43]). Additional support for the multilevel view of sensitization comes from findings showing that sensitization of the spinal cord is under cognitive control [44]. Still, the multilevel theory has not been tested directly by showing that cognitive sensitization and somatic sensitization are related *to each other* and have additive or interacting effects on common SHCs. Showing such evidence was therefore the third aim of the present study.

In summary, the present study was designed to test the following hypotheses: (1) SHCs are associated with somatic sensitization, cognitive sensitization, and health worry; (2a) health worry is associated with cognitive sensitization and somatic sensitization and (2b) the relationship between cognitive sensitization and SHCs is mediated by health worry; and (3) somatic sensitization is related to cognitive sensitization and the effects of both levels of sensitization on SHCs interact.

## Materials and methods

### *Subjects and procedure*

Fifty-one female students from Leiden University were invited to participate in the study. Four participants who indicated that they suffer from a chronic medical condition were removed from the analyses. The ages of the final 47 subjects ranged from 18 to 33 years, with a mean of 20.5 years.

After being introduced to the laboratory, participants gave informed consent and performed three tasks in the following order: a cold pressor task (CPT), a modified Stroop task, and

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