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# Abnormalities in cognitive-emotional information processing in idiopathic environmental intolerance and somatoform disorders

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### ABSTRACT

Idiopathic environmental intolerance (IEI) represents a functional somatic syndrome marked by diverse bodily complaints attributed to various substances in the environment. Evidence for abnormalities in affective information processing similar to somatoform disorders (SFD) has recently been found in people with IEI. In order to further investigate these cognitive-emotional abnormalities, we compared people with IEI ( $n = 49$ ), SFD only ( $n = 43$ ), and non-somatoform controls ( $n = 54$ ) with respect to their performance in the extrinsic affective Simon task (EAST). This task allowed us to dissociate indicators of automatic affective associations and emotional intrusion effects of both bodily complaints and IEI-trigger words. Negative association effects toward IEI-trigger words were strongest for IEI participants. Emotional intrusion effects of symptom words were larger both in IEI and SFD than in controls. The results of enhanced negative automatic evaluations of IEI-trigger words and greater attention allocation to symptom words support cognitive models of IEI.

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## 1. Introduction

Idiopathic environmental intolerance (IEI), formerly called multiple chemical sensitivity (MCS), is marked by an unspecific pattern of various medically unexplained complaints (e.g., headache, fatigue,

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muscle pain, arthralgia, sleep disturbance) attributed to diverse chemical environmental substances like dental amalgam, lead, metals, organic solvents, wood preservatives, pesticides, and strong odors in general (Bailer, Witthöft, Paul, Bayerl, & Rist, 2005; Bornschein, Hausteiner, Zilker, & Förstl, 2002). The etiology of IEI is still unknown and the pathogenesis remains poorly understood (Labarge & McCaffrey, 2000). Between 15% and 30% of respondents in population based studies report minor problems with environmental chemicals, between 1% and 6% meet more restrictive criteria of a disabling chemical intolerance in the sense of IEI (e.g., Bell & Schwartz, 1993; Meggs, Dunn, Bloch, Goldman, & Davidoff, 1996; Reid et al., 2002).

### 1.1. Theoretical approaches to IEI

Theories of IEI have favored either a toxicological mechanism (e.g., Miller, 2001), a primarily psychological mechanism (based on cognitive fear-like reactions and Pavlovian conditioning processes; e.g., Staudenmayer, Binkley, Leznoff, & Phillips, 2003b) or a complex psychophysiological interaction of both (e.g., the olfactory-limbic model: Bell, Miller, & Schwartz, 1992). Little evidence exists for a simple toxicological notion of IEI or an involvement of toxicological factors in more complex psychophysiological models as limbic kindling or sensitization (Staudenmayer et al., 2003a, 2003b). Neither an elevated toxic burden in environmental patients (e.g., Bornschein, Hausteiner, Konrad, Förstl, & Zilker, 2006), nor lowered olfactory thresholds or abnormalities in olfactory information processing parameters are typically found (e.g., chemosensory event-related potentials; Papo et al., 2006). In contrast to toxicological or organic conceptualizations of IEI, empirical evidence about the involvement of psychological factors in IEI is accumulating.

### 1.2. Psychological mechanisms in IEI

Among the most promising psychological processes involved in IEI are conditioning processes: in a series of experiments, van den Bergh and colleagues have demonstrated that psychosomatic complaints can easily be associated with and subsequently triggered by unpleasant odors (Van den Bergh et al., 2001; Van den Bergh, Stegen, & Van de Woestijne, 1997; Van den Bergh, Winters, Devriese, & Van Diest, 2002). Furthermore, cognitive psychological aspects have been hypothesized to be involved in IEI, as for instance selective attention and hypervigilance to bodily changes and specific fear-networks and mental representations concerning IEI-trigger substances (e.g., Barsky & Borus, 1999). However, only few studies have experimentally addressed cognitive variables in IEI. In a provocation test study with a non-clinical sample, expectations about the effects of a chemical agent alone systematically influenced both the report of complaints and perceived irritation (Dalton, Wysocki, Brody, & Lawley, 1997).

Regarding cognitive psychological aspects, we consider the model of medically unexplained symptoms (MUS) proposed by Brown (2004) as useful for our understanding of symptom chronicity in individuals with IEI, because of the growing evidence that IEI might best be understood as a variant of somatoform disorders (e.g., Bailer et al., 2005; Bailer, Rist, Witthöft, Paul, & Bayerl, 2004). According to Brown (2004), the chronification of (functional) somatic complaints is mainly a function of the amount of attention allocated to prior formed cognitive symptom representations (e.g., as the result of physiological disorders or traumatic experiences). The repeated attention allocation to complaints decreases the threshold for the automatic selection of symptom representations and fosters the experience of subjectively “real” but actually “rogue” symptoms.

### 1.3. Previous findings regarding cognitive abnormalities in IEI

Evidence for enhanced attention allocation to symptom words in patients with traditional somatoform disorder (SFD) and IEI has recently been demonstrated (Witthöft, Gerlach, & Bailer, 2006). In this study, participants with IEI were compared to participants with SFD and non-somatoform controls (CG) regarding their performance in an emotional Stroop task (e.g., Algom, Chajut, & Lev, 2004; Bar-Haim et al., 2007; Williams, Mathews, & MacLeod, 1996). Members of the SFD and IEI group took longer to name colors of symptom words (e.g., headache, fatigue, dizziness) than of neutral words. This

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