

# Hyperventilation in patients with chronic fatigue syndrome: The role of coping strategies

Katleen Bogaerts<sup>a</sup>, Morgane Hubin<sup>b</sup>, Ilse Van Diest<sup>a</sup>,  
Steven De Peuter<sup>a</sup>, Boudewijn Van Houdenhove<sup>b</sup>, Peter Van Wambeke<sup>b</sup>,  
Geert Crombez<sup>c</sup>, Omer Van den Bergh<sup>a,\*</sup>

<sup>a</sup>Research Group on Health Psychology, Department of Psychology, University of Leuven, Tiensestraat 102, 3000 Leuven, Belgium

<sup>b</sup>University Hospital Gasthuisberg, Herestraat 49, 3000 Leuven, Belgium

<sup>c</sup>Department of Psychology, Ghent University, Henri Dunantlaan 2, 9000 Ghent, Belgium

Received 19 April 2007; received in revised form 8 July 2007; accepted 16 July 2007

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## Abstract

Hyperventilation has been suggested as a concomitant and possible maintaining factor that may contribute to the symptom pattern of chronic fatigue syndrome (CFS). Because patients accepting the illness and trying to live with it seem to have a better prognosis than patients chronically fighting it, we investigated breathing behavior during different coping response sets towards the illness in patients with CFS ( $N = 30$ , CDC criteria). Patients imagined a relaxation script (baseline), a script describing a coping response of hostile resistance, and a script depicting acceptance of the illness and its (future) consequences. During each imagery trial, end-tidal  $PCO_2$  (Handheld Capnograph, Oridion) was measured. After each trial, patients filled out a symptom checklist. Results showed low resting values of  $PetCO_2$  overall, while only imagery of hostile resistance triggered a decrease and deficient recovery of  $PetCO_2$ . Also, more hyperventilation complaints and complaints of other origin were reported during hostile resistance imagery compared with acceptance and relaxation. In conclusion, hostile resistance seems to trigger both physiological and symptom perception processes contributing to the clinical picture of CFS.

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**Keywords:** Hyperventilation; Chronic fatigue syndrome; Imagery; Coping; Acceptance; Interoception

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## Introduction

The chronic fatigue syndrome (CFS) is a condition characterized by persistent medically unexplained fatigue, lasting for at least 6 months, the co-occurrence of several other unexplained symptoms, and severe functional disability (Fukuda et al., 1994).

Hyperventilation is defined as a breathing pattern in excess of metabolic needs (Gardner, 1996). Because more  $CO_2$  is being exhaled than is produced by the body, arterial partial  $CO_2$  pressure decreases. This state of

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\*Corresponding author. Tel.: +32 16 32 60 58; fax: +32 0 16 32 61 44.

E-mail address: [omer.vandenbergh@psy.kuleuven.be](mailto:omer.vandenbergh@psy.kuleuven.be) (O. Van den Bergh).

hypocapnia induces an increased blood pH and causes a wide range of bodily symptoms, largely overlapping with those characterizing CFS (e.g. fatigue, feeling of exertion, muscle pain, sore throat, headache, loss of concentration, etc.). This overlap has led researchers to consider the role of hyperventilation in CFS. Yet, the literature on this topic is limited and inconsistent. Some researchers believe that hyperventilation is an epiphenomenon of CFS (Bazelmans, Bleijenberg, Vercoulen, van der Meer, & Folgering, 1997; Riley, O'Brien, McCluskey, Bell, & Nicholls, 1990; Saisch, Deale, Gardner, & Wessely, 1994; Tweeddale, Rowbottom, & McHardy, 1994), whereas others conceive of it as an important perpetuating factor (Neerinckx, Lysens, Van Houdenhove, & Vertommen, 1999) or even as an etiological factor (Rosen, King, Wilkinson, & Nixon, 1990; for discussion, see Laviates, Natelson, Cordero, Ellis, & Tapp, 1996). Due to methodological differences, direct comparisons across studies are difficult, but the best conclusion seems that hyperventilation occurs in some CFS patients under some circumstances. The important question, therefore, is which type of patient hyperventilates in which type of situation.

The tendency to hyperventilate typically occurs during action tendencies characterized by high arousal (Van Diest et al., 2001), suggesting that specifically CFS patients who anticipate a distressing and demanding activity may be vulnerable to disproportionate breathing. Therefore, hyperventilation in CFS patients may only show up in contexts evoking emotions relevant to them and may not appear as a stable characteristic of patients across situations. This perspective may explain the difference between literature suggesting a limited or non-existing role for hyperventilation in CFS (Bazelmans et al., 1997; Riley et al., 1990; Saisch et al., 1994; Tweeddale et al., 1994) and the study of Neerinckx et al. (1999). Whereas the former studies registered breathing behavior within an emotionally neutral context, the patients in the study of Neerinckx were preparing for a demanding exercise test. Hyperventilation was observed in 45% of the patients. Hence, hyperventilation is not likely to be a causal factor for CFS, but it might be an important perpetuating factor for some of the patients.

It is known that strategies to cope with a chronic disease may influence the clinical picture and ultimately the course of the illness. For example, studies on chronic pain have demonstrated a positive relationship between acceptance of the disease and lower subjective pain intensity, less anxiety/depression, less avoidance of activity, less impairment, more engagement with daily activities, less attention to pain, fewer health-care visits for pain, and less medication consumption (McCracken, 1998; McCracken & Eccleston, 2005; Viane et al., 2003; Viane, Crombez, Eccleston, Devulder, & De Corte, 2004).

Research on the role of acceptance in CFS is at an early but promising stage. For example, Van Damme, Crombez, Van Houdenhove, Mariman, and Michielsen (2006) showed that acceptance was associated with better quality of life in a CFS population, whereas it was negatively correlated with fatigue, functional disability, and psychological problems. In the present study, we used an imagery paradigm to compare the breathing behavior during two different action sets, namely acceptance vs. hostile resistance, towards the illness in CFS patients. Script-driven imagery is considered a valid and generally accepted tool to elicit emotions both in psychophysiological studies (Lang, 1979; Van Diest et al., 2001) and in PET studies on the neuroanatomy of emotions (Dougherty et al., 1999; Lane, Reiman, Ahern, Schwartz, & Davidson, 1997). In accordance with definitions in the area of pain, we defined acceptance of chronic fatigue as a willingness to live with fatigue without reactance, disapproval, or attempts to reduce or avoid it. Accepting CFS means giving up the battle against the illness along with unproductive attempts to control it, adopting a realistic approach towards the illness, learning to live with it without losing engagement in positive everyday activities, and not letting oneself be reduced to the patient's status (Hayes, Jacobson, Follette, & Dougher, 1994; Risdon, Eccleston, Crombez, & McCracken, 2003). Conversely, hostile resisting was defined as fighting the illness and undertaking incessant attempts to control it. Resisting patients want to become as healthy and energetic as before, have difficulties with the chronic character of the disease, and do not want to make any concession. Because the latter strategy is more likely associated with the mobilization of action tendencies, we expected to observe the tendency to hyperventilate particularly in the mental set of hostile resistance towards one's own illness.

We also explored the role of worrying, as it is a maladaptive coping strategy, implying attentional vigilance and exaggerated inference of threat (MacLeod & Rutherford, 2004). Worrying has been defined as repetitive thought activity, characterized by an automatic, negative, and unrealistic interpretation of feared future events. Excessive worry produces negative emotional states (Borkovec, Ray, & Stöber, 1998) and is associated

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