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Subgrouping outpatients of an environmental medicine unit using SCL-90-R and cluster analysis

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Abstract

Between 1999 and 2003 all consecutive outpatients of the environmental medicine unit of the Charité hospital in Berlin were invited to participate in a study on environmentally related disorders. One hundred and sixty-nine of the patients completed a psychosocial questionnaire which comprised SCL-90-R and 14 other tests. When compaired with clinical controls, SCL-90-R mean scores of the environmental patients (EP) were found to lie in between those of inpatients of a psychosomatic clinic and melanoma aftercare patients; but they were, with exception of the somatisation dimension, much closer to the latter. Application of the TwoStep Cluster[TM] component of SPSS resulted in three subgroups with high, moderate and low scores which were significantly different ($p < 0.001$) although separation was incomplete (87% correct identification; cross-validated discriminant analysis). With all subgroups, scores for somatisation, depression and obsessive compulsion were highest and those for phobic anxiety and psychoticism were lowest. SCL-90-R scores correlated well with results of the Freiburg Personality Inventory, Whiteley Index of hypochondriasis, the short form health questionnaire (SF-36), and the Composite International Diagnostic Interview (CIDI). Hierarchical grouping (average linkage between groups), performed with involvement of SCL-90-R data from literature, resulted in a dendrogram with three distinct groups and three outliers. EP with low SCL-90-R scores were assigned to a group which comprised also general populations (USA, Germany), allergy patients, and melanoma controls. Those with moderate SCL-90-R scores were placed in a group together with chronic pain patients, and 26 'environmentally ill' subjects. The third subgroup of EP formed a cluster with our psychosomatic controls, psychosomatic patients from another study, depressed people, and patients undergoing psychotherapy. The three outliers of the dendrogram, however, were SCL-90-R profiles obtained from persons with toxic waste exposure, neurotoxic workplace exposure or with solvent-induced chronic toxic encephalopathy.
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Introduction

Most of the outpatients attending university departments of environmental medicine are convinced that

their disorders are caused by environmental substances. They complain about, e.g., self-reported chemical sensitivity, self-reported electromagnetic hypersensitivity or chemically induced chronic fatigue. The increasing number of environmental patients (EP) and the manifold symptoms presented by them led to the postulation of a number of 'environmental syndromes' like MCS, SBS and CFS. However, the clinical uncertainty of these

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'syndromes' and the vagueness of the symptoms led to controversy and to sometimes vehemently fought disputes within the medical community. Roughly spoken are there two sides: proponents of clinical ecology consider exposure to environmental factors like chemicals as the main or even sole cause whereas representatives of scientific medicine rather prefer psychosomatic models (Eis, 1998/99). None of these hypotheses is unambiguously proven, but it is generally accepted now that environmental 'syndromes' have a greater or lesser psychosomatic dimension (Eis et al., 2005a; Henningsen and Priebe, 2003; Huss et al., 2004; Fishbein, 1996; Papo et al., 2004; Poonai et al., 2001; Staudenmayer, 1998; Wiesmüller et al., 2003). Objective physical findings and consistent laboratory results are most typically not existent (Labarge and McCaffrey, 2000). Apart from this, EP are considered a rather heterogeneously composed group (Eberlein-König et al., 2002), corresponding to the vast amount and diversity of the complaints. Black et al. (1993) concluded that those receiving a diagnosis of environmental illness probably belong to several subgroups. Some may suffer from real physical disorders, others may suffer from real psychic disorders, and some may have no recognisable illness at all.

The results presented here are part of the Berlin study which will be described in more detail elsewhere. An online description and detailed results of the Berlin study are already available (Eis et al., 2006). In short, the Berlin study was aimed to collect data from outpatients of a university environmental medicine unit (Charité, Berlin) about complaints, incriminated chemicals (and other agents), symptoms and treatment success. The present paper deals with the subgrouping of the patients into more homogeneous subgroups by means of psychic distress and strain assessed by SCL-90-R and cluster analysis. We hypothesise that (i) EP attending a university department of environmental medicine are a rather heterogeneous group, (ii) that they can successfully be subgrouped on the basis of psychometric tests, and (iii) that it is possible to identify a subgroup within them that shows similarity to psychosomatic patients.

Methods

Recruiting of patients and controls

From 1999 to 2003 all consecutive patients of the Charité environmental medicine unit were invited to participate in the study. If they agreed and informed consent was signed, they passed a physical examination and completed two comprehensive self-report questionnaires: an environmental medicine questionnaire and a psychosocial health questionnaire. Additionally, a medical base-line documentation was completed by a trained physician.

A total of 289 patients agreed to participate from whom 196 completed the psychosocial questionnaire which included SCL-90-R plus 14 other test instruments, including Freiburg Personility Inventory (FPI), Whiteley Index of hypochondriasis (WI), and the short form health questionnaire (SF-36). Additionally, a specially trained physician conducted the Composite International Diagnostic Interview (CIDI) with most of the patients who completed the psychosocial questionnaire (114 of 196). Although it was intended to interview all patients this was not possible. Missing interviews were due to refusal or withdrawal on the part of the patient.

Mean age was 48.7 years and the female to male ratio was approximately 67:33. Patients were compared to three control groups. Control 1 was recruited from the consecutive attending patients of five family practitioners located in Berlin ($n = 102$); group-wise gender and age matched to the EP. The second control group consisted of cured melanoma patients attending an aftercare at the Charité university hospital ($n = 41$). On average control 2 patients were 6.4 years older than the EP and the fraction of female patients was smaller (53.7%). The age difference was statistically significant ($p < 0.01$) whilst the different gender ratio was not ($p > 0.05$, Mann–Whitney U test). The third control group was recruited among the inpatients of a psychosomatic clinic in Berlin ($n = 56$). These patients were about 8.5 years younger than the EP and the fraction of females was higher (76.8%). Again, the age difference was statistically significant ($p < 0.001$) whilst the gender difference was not ($p > 0.05$; Mann–Whitney U test). According to Franke (2002) increasing age is correlated with lower hostility scores, lower interpersonal sensitivity but higher somatisation.

Since EP are having some kind of symptoms or illness we considered clinical controls more appropriate than healthy controls to reduce bias. Furthermore, the different aspects of the Berlin study required different control groups (cf. Eis et al., 2006).

The ethics commission of the Charité university hospital approved the study without additional requirements. No monetary incentives were paid to the participants.

Assessment of MCS status

Firstly, patients were asked whether they assume to suffer of MCS or not (self-reported MCS; sMCS). In addition, the patients were classified being MCS positive or MCS negative by applying a newly developed scoring system based on the criteria of Cullen (1987). In its short form this formalised MCS (f1MCS) used information from the questionnaires completed by the patients, while