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Symptoms, personality traits, and stress in people with mobile phone-related symptoms and electromagnetic hypersensitivity

Amanda Johansson[a,*], Steven Nordin[b,c], Marina Heiden[d], Monica Sandström[a]

[a]Department of Public Health and Clinical Medicine, Umeå University, Umeå, Sweden
[b]Department of Psychology, Umeå University, Umeå, Sweden
[c]Department of Occupational and Environmental Medicine, Örebro University Hospital, Örebro, Sweden
[d]Centre for Musculoskeletal Research, University of Gävle, Umeå, Sweden

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Abstract

Objective: Some people report symptoms that they associate with electromagnetic field (EMF) exposure. These symptoms may be related to specific EMF sources or to electrical equipment in general (perceived electromagnetic hypersensitivity, EHS). Research and clinical observations suggest a difference between mobile phone (MP)-related symptoms and EHS with respect to symptom prevalence, psychological factors, and health prognosis. This study assessed prevalence of EMF-related and EMF-nonrelated symptoms, anxiety, depression, somatization, exhaustion, and stress in people with MP-related symptoms or EHS versus a population-based sample and a control sample without EMF-related symptoms. **Methods:** Forty-five participants with MP-related symptoms and 71 with EHS were compared with a population-based sample (n=106) and a control group (n=63) using self-report questionnaires. **Results:** The EHS group reported more symptoms than the MP group, both EMF-related and EMF-nonrelated. The MP group reported a high prevalence of somatosensory symptoms, whereas the EHS group reported more neurasthenic symptoms. As to self-reported personality traits and stress, the case groups differed only on somatization and listlessness in a direct comparison. In comparison with the reference groups, the MP group showed increased levels of exhaustion and depression but not of anxiety, somatization, and stress; the EHS group showed increased levels for all of the conditions except for stress. **Conclusion:** The findings support the idea of a difference between people with symptoms related to specific EMF sources and people with general EHS with respect to symptoms and anxiety, depression, somatization, exhaustion, and stress. The differences are likely to be important in the management of patients.

Keywords: Anxiety; Environmental illness; Environmental intolerance; Symptomatology; Stress

Introduction

Symptoms attributed to exposure to electromagnetic fields (EMF) have been reported at least since the 1970s [1–5]. Epidemiological studies suggest a prevalence of 1.5–4% in the general population [6–8]. People with EMF-related symptoms commonly report skin symptoms, neurasthenic symptoms (e.g., dizziness, fatigue, headache), sleeping disorders, and cognitive disturbances [9,10]. However, no causal relationship between EMF exposure and symptoms has been established, nor are there indications that individuals with EMF-related symptoms would detect EMF at lower levels than most people [11]. There is to date no widely accepted explanation model for the development of EMF-related symptoms.

Apart from those who experience symptoms attributed to electrical equipment in general (referred to as perceived electromagnetic hypersensitivity, EHS), there are people who report symptoms that they attribute to specific EMF sources, mainly mobile phones (MP) or visual display terminals (VDT). Previous studies have shown that

* Corresponding author. Department of Public Health and Clinical Medicine, Occupational and Environmental Medicine, Umeå University, SE-901 87 Umeå, Sweden. Tel.: +46 0 90 785 27 89; fax: +46 0 90 77 96 30.
E-mail address: amanda.johansson@envmed.umu.se (A. Johansson).

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individuals with EHS generally report a higher number of symptoms than do those with VDT-related symptoms. They are also often more disabled by their symptoms with respect to both working capability and everyday life and do not improve with time to the same extent as individuals with VDT-related symptoms [10,12–14]. VDT-related symptoms have been observed to precede general EHS in several cases, but it is uncertain why the symptoms generalize in some individuals and not in others [10,15].

Signs of mental distress have repeatedly been observed in people with EMF-related symptoms, e.g., elevated levels of perceived stress, stress susceptibility, anxiety, and depression [12,16–18]. Comparisons of individuals with EHS and those with VDT-related symptoms indicate higher levels of distress among individuals with EHS, and it has been proposed that this difference may contribute to the observed differences in degree of disability and prognosis [10,12]. Attempts to treat EMF-related symptoms, e.g., with cognitive behavior therapy, have in many cases proven to be effective, but the results from intervention studies are inconclusive [19]. The heterogeneity of the study groups has been mentioned as one of the reasons for this inconclusiveness, and a case-by-case approach has been recommended for the practical management of patients [20,21].

Since MP-related symptoms are of more recent date they are less well described than VDT-related symptoms and EHS, but the clinical impression is that people with MP-related symptoms differ from those with EHS with respect to symptom picture as well as to attitudes and behavior in relation to exposure sources and may constitute another subgroup. This is supported by recent results [17,22].

One objective of the present study was to compare individuals with EHS and individuals with MP-related symptoms with respect to prevalence of EMF-related and EMF-nonrelated symptoms, and to compare both groups with a population-based sample. A second objective was to compare individuals with MP-related symptoms and EHS with respect to levels of anxiety; depression; and somatization, exhaustion, and stress, as well as to compare both groups with a population-based sample and with a healthy control group. It was hypothesized that the mentioned conditions would be more pronounced in the groups with EMF-related symptoms compared with the reference group and in the EHS group in particular.

Methods

Participants

Individuals who reported symptoms that they associated with the use of MP, VDT, or electrical equipment in general were invited to participate through advertisements in eight Swedish newspapers. Those who responded to the advertisements were sent a set of questionnaires. For each person with EMF-attributed symptoms who returned completed questionnaires, two reference participants, matched with respect to age and sex, were recruited through the Swedish population register and sent the same set of questionnaires. Nonresponders in both groups received one reminder. One hundred and seventeen (73%) of the 160 persons with EMF-related symptoms who responded to the advertisement, and 106 (45%) of the 234 reference participants completed the study.

The cases were classified into subgroups based on the EMF sources they reported as symptom-provoking (see further the section "Questionnaires"). An individual was considered as having "MP-related symptoms" ("MP group") if he or she reported symptoms associated with MP use only, as having "VDT-related symptoms" ("VDT group") if symptoms were associated with VDT use only, and as having "electromagnetic hypersensitivity" (EHS group) if symptoms were associated also with other kinds of equipment. This symptom-based classification did not always agree with the label adopted by the participant. Symptoms associated with VDT use was reported by one participant only, and this category was therefore excluded from further analysis. Some participants (n=19) reported primarily symptoms associated with MP use, but also some symptoms associated with VDT use. Because of low numbers, they were not treated as a separate group, but were assigned to the MP group, due to the predominance of the MP-related symptoms. For comparison with the MP and EHS groups (collectively referred to as the "case groups"), we used both the entire population-based sample of 106 participants that were considered as a fairly representative sample of the general population (population based group) and a subsample of the reference group where the reference participants reporting EMF-related symptoms were excluded (control group). The population-based group and the control group are collectively referred to as the "reference groups." The use of both a population-based normal sample and a sample screened for EMF-related symptoms to constitute a healthy control sample enables a more elaborate comparison.

The data collection was carried out during a period of 5 months (December 2005–April 2006). A signed informed consent form was obtained from each participant. Participants were paid for their participation. Ethical approval of the study was given by the Regional Ethical Research Board at Umeå University.

Questionnaire instruments

The questionnaire set included a questionnaire mainly comprised of questions about symptoms occurring or aggravated in relation to use of MP, VDT, or electrical equipment in general (EMF-related symptoms). An individual was defined as having a certain symptom if it occurred at least once a week. Since the symptoms asked for are common, it was asked separately, to which extent the symptoms reported in association with perceived EMF exposure were experienced also in the absence of EMF