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Electromagnetic hypersensitivity (EHS) in occupational and primary health care: A nation-wide survey among general practitioners, occupational physicians and hygienists in the Netherlands

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ABSTRACT

Subjects who attribute health complaints to every day levels of non-ionizing electromagnetic fields (EMF) have been referred to as electrohypersensitive (EHS). Previous surveys in Europe showed that 68–75% of general practitioners had ever been consulted on EHS. Given the lack of data on EHS in the Netherlands in the general population and on EHS in occupational settings, we performed a national survey among three professional groups that are likely in the first line of being consulted by EHS individuals. Results show that about one third of occupational hygienists, occupational physicians and general practitioners had ever been consulted by one or more EHS subjects. Many of these professionals considered a causal relationship between EMF and health complaints to some degree plausible, and their approach often included exposure reduction advice. Given the lack of scientific evidence for EHS and how low level EMF exposure could cause reported health complaints and given the finding that the majority of these professionals felt insufficiently informed about EMF and health, targeted information campaigns might assist them in their evidence based dealing with subjects who attribute symptoms to EMF.

1. Introduction

The term electromagnetic hypersensitivity (EHS) has been used widely to indicate people who attribute symptoms to non-ionizing electromagnetic fields at every day exposure levels (EMF). A growing body of scientific data from experimental and epidemiological studies has not confirmed that exposure to EMF at every day levels could cause such health complaints (WHO, 2004; Rubin et al., 2010; Röösli et al., 2010; Baliatsas et al., 2015; Eltiti et al., 2015). Therefore, the more neutral term idiopathic environmental intolerance (IEI) attributed to EMF has been coined (WHO, 2004), yet EHS is more common among those suffering from such health complaints.

Surveys in European countries show that about 1.5-10% of the general population report EHS (Hillert et al., 2002; Schreier et al., 2006; Blettner et al., 2009; van Dongen et al., 2014), indicating the potential public health relevance of EHS. Previous surveys in Austria, Germany, Switzerland and France evaluated consultations of general practitioners (GPs) by EHS persons (Leitgeb et al., 2005; Huss and Röösli, 2006; Kowall et al., 2010; Lambrozo et al., 2013). In general, these studies showed that the majority of the GPs reported to have been consulted by EHS subjects. The most frequently reported sources suspected to be underlying the symptoms were usually mobile phone base stations, power lines and the use of mobile phones. The reported symptoms were usually non-specific with the most frequently listed problems being fatigue, headaches, sleep disorders and concentration difficulties. These previous surveys also showed that many GPs (29–95%) regarded such associations to be plausible to some extent and often provided advice directed at exposure reduction (Huss and Röösli, 2006; Berg-Beckhoff et al., 2010), yet the majority (72-89%) felt moderately or insufficiently informed about EMF and health (Huss and Röösli, 2006; Lambrozo et al., 2013).

Abbreviation: EHS, electromagnetic hypersensitivity.

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As yet, no data exists for the Netherlands on the risk perceptions of GPs and the extent to which they are consulted on EHS, characteristics of such cases and how they deal with them. Furthermore, it is conceivable that people who feel exposed to EMF at work or experience their health problems mostly at work would turn to an occupational physician or occupational hygienist and not necessarily to their GP. To the best of our knowledge, no data exists regarding consultations for EHS in occupational settings and to what extent EHS leads to work absence. To this aim, we performed a nation-wide survey among occupational hygienists, occupational physicians and general practitioners (GPs). In particular, we wanted to assess their current views and risk perceptions, work experiences and work practice with respect to EMF and EHS in the Netherlands and their evaluation of the plausibility of EMF causing such symptoms and factors associated with this evaluation. This knowledge can contribute to assess if effective preventive measures including risk communication should be developed targeted at these professionals.

2. Materials and methods

2.1. Survey

In October 2013, paper questionnaires were sent out to all occupational hygienists (N = 478) and occupational physicians (N = 1665) registered with their respective national association (Nederlandse Vereniging voor Arbeidshygiene NVvA and Nederlandse Vereniging voor Arbeids- en Bedrijfsgeneeskunde NVAB). We also sent paper questionnaires to all GPs enlisted in the national digital telephone directory (CDfoon, version 2013/1, N = 8462). All questionnaires inquired about the same ('core') items, and a few more items were added per professional group. The core items included 1) characteristics of the professional (sex, age, years of professional experience, type of practice/work at present); 2) five general opinions on EMF and health ("I'm sufficiently informed about the subject EMF and health", "Health complaints attributed to EMF are mainly psychosomatic", "Exposure to EMF can lead to health complaints", "Existing health complaints can aggravate due to exposure to EMF" and "Exposure to EMF in combination with other factors can cause health complaints"; see Fig. 1 for original questions in Dutch), with answer categories on a 6-point Likert scale from fully disagree to fully agree; 3) personal experience with EMF and health ("Have you ever had symptoms that you attributed to EMF?" yes/no); 4) professional experience with EMF and health ("have you ever been consulted on the topic EMF and health" and if so, "how many cases in total and in the past 12 months?", "Did a patient/client ever attribute symptoms to EMF?" and if so, "how many cases did you have in total and in the past 12 months?", and "Did you ever consider EMF to cause symptoms of a patient?" yes/no); 5) professionals reporting ever having been consulted on EMF and health were subsequently asked about the characteristics of the most recent case, in particular the type of reported symptoms and suspected sources (multiple symptoms and sources could be selected from a predefined list with the option of reporting additional items in free text), the plausibility rating of the association (6 point Likert scale from very likely to very unlikely) and the type of treatment or advice given. Regarding their most recent client or patient, GPs were asked about encountered difficulties in daily or social activities (no, somewhat, quite strongly), while occupational hygienists and occupational physicians were additionally asked about the level of functional limitation at work (nearly none, some, quite strong, unknown) and work absence (none, sometimes, a lot, unknown) and the type of workplace. Finally, occupational physicians and GPs were asked whether they practiced complementary medicine (such as homeopathy, acupuncture, or another alternative medicine), given that previous surveys indicated differences in risk perceptions (Huss and Röösli, 2006; Lambrozo et al., 2013; Kowall et al., 2015) and consultations rates (Huss and Röösli, 2006) among those practicing complementary medicine. Because our focus was on EHS, we asked occupational hygienists to report on their experience with health complaints attributed to background EMF levels separately from their potential experience with specific high-exposure situations where EMF exposure limits could be reached.

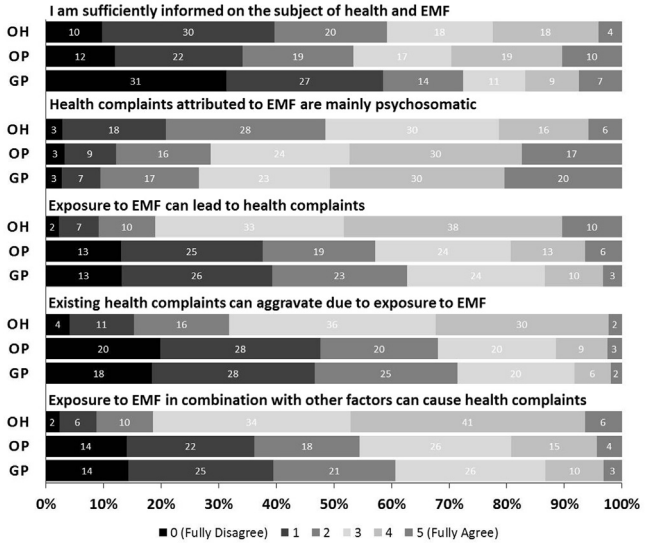

Fig. 1. Opinions regarding health complaints and EMF.
Opinions on EMF and health complaints grouped by occupational hygienists (OH), occupational physicians (OP) and general practitioners (GP). The original opinions in Dutch were in order from top to bottom: (A) Ik ben als arbeidshygiënist voldoende op de hoogte over het onderwerp 'gezondheid en elektromagnetische velden'; (B) Gezondheidsklachten die in verband gebracht worden met elektromagnetische velden zijn in de eerste plaats psychosomatisch; (C) Blootstelling aan elektromagnetische velden kan leiden tot gezondheidsklachten; (D) Bestaande gezondheidsproblemen kunnen verergeren door blootstelling aan elektromagnetische velden; (E) Blootstelling aan elektromagnetische velden kan in samenspel met andere factoren gezondheidsproblemen veroorzaken (English translation given in methods section).

2.2. Data analysis

Data from returned paper questionnaires until the end of January 2014 were evaluated. Comparisons of proportions between the three professional groups were done using chi-square tests. Group differences on 6-point Likert scales were tested using non-parametric Kruskal-Wallis tests. For those professionals reporting their latest consult concerning EMF, we evaluated differences in reported sources and symptoms. We used multiple logistic regression to explore factors associated with the plausibility ratings of professionals, i.e. to what level they regarded EMF to be a cause for the reported symptoms in their most recent case, comparing the upper to the lower three answer categories of the plausibility rating. As potential explanatory factors, we considered age and sex of the professional, years of professional experience, their self-rated information level with regard to health effects from EMF (sufficiently informed versus insufficiently informed; i.e. the upper versus lower three answer categories), whether the GP/occupational physician practiced complementary medicine (yes versus no), and the type of EMF source suspected by the patient to be causing the health problem (in three categories: radiofrequency EMF only, both, versus extremely low frequency EMF only). The logistic regression models were run stratified by professional group. The presented odds ratios and 95% confidence intervals are

Table 1
Characteristics of the professionals participating in the survey.

	Occupational Hygienists	Occupational Physicians	General Practitioners
Response, % (N)	37% (n = 177)	35% (n = 569)	29% (n = 2398)
General characteristics			
Age, average (SD)	48 (9)	53 (7)	50 (10)
Sex (% female)	38%	36%	43%
Practicing as OH, OP, GP, respectively.	88%	95%	100%
Years of professional experience, average (SD)	16.5 (9)	20.5 (8)	17.9 (10)
Additional training in complementary medicine, e.g. homeopathy	n.a.	2.7%	3.5%
Personally ever experienced symptoms in relation to EMF	4%	2.1%	1.8%
Professional EMF experience			
Ever been consulted on EMF	n.a.	47%	35%
Professionals ever consulted by client/patient(s) who attributed health complaints to EMF	34%	38%	32%
Professional him/herself ever considered a relationship between client/patient's health complaints and EMF	10%	13%	5.4%

Abbreviations: EMF electromagnetic fields; GP general practitioner; n.a. Not applicable; OH occupational hygienist; OP occupational physician; SD standard deviation.

based on the full models, with all the mentioned factors, regardless of their statistical significance. Data analysis was done using SAS/STAT software, version 9.2 of the SAS System for Windows. Copyright 2002–2008 by SAS Institute Inc., Cary, NC, USA.

3. Results

3.1. General characteristics of the participating professionals

Table 1 shows response rate and general characteristics of the participating professionals, which were similar across the three professional groups. Response rates varied from 29% (general practitioners) to 37% (occupational hygienists). The minority was female (36–43%), mean age varied from 48 to 50 years and the years of professional experience varied from 17 to 21 years between the three groups. Only about 3% of the occupational physicians and GPs had received additional training in complementary medicine. A similar small minority (2–4%) of the professionals had ever experienced health complaints themselves that they had related to EMF. Of the occupational hygienists, 39% was employed at a single company, 24% worked for a company's health and safety department, while 15% was self-employed. For occupational physicians this was 10%, 54%, and 23%, respectively. The rest reported another form of employment. Among the GPs, 22% worked in a practice with one GP, while 77% worked with other GPs in for example a group practice or a health care centre.

3.2. Opinions on EMF and health

Fig. 1 shows the opinion ratings on EMF and health per professional group. Overall, a considerable proportion of respondents felt insufficiently informed about EMF and health, in particular the GPs (72%) compared to the occupational hygienists (60%) and occupational physicians (53%). Regarding the other opinions, occupational hygienists were somewhat less inclined to agree that EMF-attributed health problems are medically unexplained physical symptoms (psychosomatic), and somewhat more inclined to agree that EMF exposure can lead to health problems, can aggravate existing health problems and can cause health problems if combined with other factors. Compared to GPs, these differences were all statistically significant (all $p < 0.03$). The opinions of occupational physicians were more similar to those of the GPs, although occupational physicians tended to agree more often that exposure to EMF can lead to health complaints ($p = 0.03$) and can cause health problems if combined with other factors ($p = 0.01$) compared to the GPs.

3.3. Professional experience with EMF and health

In each professional group, about a third (32–38%) reported at least one patient/client attributing health complaints to EMF (Table 1). Most professionals had few of such cases, while about 9% of both the occupational physicians and the GPs reported more than 10 cases. The estimated median total number of cases was very similar across the groups: 2 (interquartile range [IQR] 1–5; 95th percentile 10) for occupational hygienists, 2 (IQR 1–3; 95th percentile 11) for occupational physicians, and 2 (IQR 1–3; 95th percentile 15) for GPs. Regarding recent cases in the past 12 months (2013), these figures were 0.5 (IQR: 0–2; 95th percentile 5), 0 (IQR: 0–1; 95th percentile 2), and 1 (IQR: 0–1; 95th percentile 5), respectively. From the perspective of the professional, a minority (5–13%) had ever considered a relationship between EMF and the health complaints reported by a patient/client themselves (so without the patient/client attributing the health complaints to EMF).

3.4. Characteristics of the most recent patient/client who attributed health problems to EMF

3.4.1. Demographics, health impact, symptoms and EMF sources

Characteristics of their most recent patient/client attributing health complaints to EMF are shown in Table 2. The workplace was an office in more than half of the cases reported by occupational hygienists (62%) and occupational physicians (52%). In 44% of the cases reported by occupational hygienists, the client only had EMF-health complaints at work, while 24% also had complaints in other places, while 32% did not know. For occupational physicians these figures were 15%, 68% and 16%, respectively. About half of the cases reported by occupational hygienists and occupational physicians were between 30 and 40 years old and 30–42% were female.

The majority of reported cases were limited in their work or daily functioning to some extent (Table 2), yet severe limitations were more common in cases reported by occupational physicians and GPs than those reported by occupational hygienists (29%, 24% and 3.7%, respectively, as a percentage of the reported cases for which such information was known to the professional). Similarly, frequent absence from work or absence for a long period of time due to the reported health complaints was reported in 19% and 35%

Table 2
Characteristics of the most recent EHS case who attributed health complaints to EMF.

	Occupational hygienists		Occupational physicians		General practitioners	
n cases[a]		62		217		758
Age of most recent case[b]	<30 yrs	5.7%	<30 yrs	4.3%	n.a.	n.a.
	30–40 yrs	54.7%	30–40 yrs	52.4%		
	40–50 yrs	32.1%	40–50 yrs	31.6%		
	>50 yrs	7.6%	>50 yrs	11.7%		
Gender of most recent case[b]	Female	30%	Female	42%	n.a.	n.a.
Impact on client/patient	Restricted in Functionality?		Restricted in Functionality?		Difficulties in daily or social activities?[c]	
	No	31%	No	23%	No	25%
	Somewhat	47%	Somewhat	44%	Somewhat restricted	51%
	Severe	3%	Severe	27%	Quite strongly	24%
	Unknown	19%	Unknown	6%		
Top 5 health complaints attributed to EMF by most recent case[d]						
1.	Headache	55%	Fatigue	56%	Fatigue	62%
2.	Fatigue	39%	Malaise	51%	Malaise	59%
3.	Difficulties concentrating	29%	Headache	46%	Difficulties concentrating	41%
4.	Malaise	21%	Difficulties concentrating	43%	Headache	41%
5.	Perceives EMF	16%	Sleep disorders	25%	Sleep disorders	39%
Top 5 EMF sources suspected to cause symptoms by most recent case[d]						
1.	WIFI	25%	Mobile phone base station	37%	Mobile phone base station	51%
2.	Mobile phone base station	21%	Mobile phone	30%	Power lines	31%
3.	Mobile phone	14%	Power lines	25%	Mobile phone	30%
4.	TV/computer	12%	WIFI	18%	WIFI	17%
5.	ELF	12%	TV/computer	13%	DECT/cordless phone	12%

n.a. not available.

[a] Figures are given for the most recent electrohypersensitive cases i.e. attributing health complaints to EMF exposure, excluding high exposure scenarios and excluding reported cases where no health complaints were reported.

[b] Age and gender not available for the most recent case reported by general practitioners for reasons of questionnaire length/burden. Among occupational hygienists and occupational physicians, some cases seemed to represent more than 1 subject, e.g. a group of colleagues, i.e. when more than one gender or age category was ticked; in these cases the age and gender are missing while the other characteristics are included.

[c] No answer category 'unknown' included in the GP questionnaire.

[d] Respondents could tick multiple answers including 'other, namely' (free text).

of the cases reported by occupational physicians, while for occupational hygienists these figures were 15% and 6%, respectively.

Table 2 also shows the top 5 most frequently reported symptoms and EMF sources (multiple answers per case possible), which were similar across the three occupational groups. Among occupational hygienists, the top 5 reported symptoms did not include sleep disorders but instead included the ability to perceive EMF. Occupational hygienists reported fewer symptoms per case, i.e. on average 2.6 symptoms (maximum 8), compared to 4.1 (maximum 20) and 4.9 (maximum 25) reported by occupational physicians and GPs, respectively. With respect to EMF sources, the top 5 in the cases of occupational hygienist included extremely low frequency EMF in general but not power lines, as was the case in the other two professional groups. For GP patients, the top 5 of EMF sources included DECT/cordless phones, which was not the case for the other two groups. No clear patterns between the reported health complaints and their suspected sources emerged, other than combinations of the top 5 most often reported health complaints and EMF sources. For example, mobile phone base stations and fatigue were also the most often reported combination of an EMF source and a symptom for both occupational physicians and GPs. In each professional group, the suspected sources and the reported health complaints were not materially different in those cases where the association was judged plausible compared to those where it was judged implausible (data not shown).

3.4.2. *Approach taken to deal with case attributing health complaints to EMF*

The three professional groups differed somewhat in how they handled their most recent case attributing health problems to EMF (Table 3). Occupational hygienists and occupational physicians mainly advised to reduce exposure (42% and 25%, respectively) or they gave information regarding EMF and health (36% and 22%, respectively). For GPs these figures were 15% and 17%, respectively. The most common approach taken by GPs were directed at other causes for their health problems (30%) and at better coping with symptoms (25%), which were both rarely or not reported by the occupational hygienists and physicians. However, in 17% of the cases, occupational physicians reported to have "offered reassurance" or similar wordings. Referral to medical specialists or mental health care was more common in both physician groups than among occupational hygienists. Conversely, occupational hygienist more often performed exposure assessments or consulted exposure experts than the physicians did. If the association between the health complaint and the EMF source was evaluated as plausible by the professional, occupational hygienist more often reported advising assessing the exposure, and occupational physicians and GPs more often advised exposure reduction (data not shown). If the association was evaluated implausible, occupational physicians and GPs more often referred the patient to mental health care (data not shown).

3.4.3. *Plausibility ratings of relationship between EMF and reported symptoms*

In 37% of the most recent cases, occupational hygienists judged it plausible that reported health complaints were related to EMF. This was higher compared to occupational physicians (22%) and GPs (18%). Logistic regression modelling on potential factors associated with cases being judged to be plausible versus implausible showed only few significant associations. There was a tendency in all three professional groups to evaluate the association as implausible if they rated themselves as sufficiently informed on the subject of EMF and health (OR [95% confidence intervals] 0.30 [0.05–1.8] for occupational hygienists, 0.67 [0.27–1.6] for occupational physicians and 0.39 [0.23–0.66] for GPs). In addition, GPs and occupational physicians trained in complementary medicine

Table 3
Approach taken by professional in most recent EHS case who attributed health complaints to EMF.

	Occupational hygienists	Occupational physicians	General practitioners
Advice directed at exposure reduction	42.0%	25.0%	15%[a]
- *Change workplace*	*36.0%*	*10.0%*	[a]
Provide information about EMF and health	36.0%	22.0%	17.0%
Exposure assessment/consult exposure expert	22.0%	3.9%	6.0%
Referral to e.g. medical specialist, psychologist	6.8%	17.0%	21.0%
Workplace assessment	5.1%	8.8%	n.a.
Advice/treatments directed at other causes	3.4%	2.0%	30.0%
Advice/treatments directed at better coping with complaints	0.0%	0.5%	25.0%
Other, namely "offer reassurance"	n.a.	13.0%	n.a.

n.a. not applicable.

[a] Among the general practitioners (n = 112) who gave advice directed at exposure reduction, 44% reported 'switch off appliance (source)', 15% 'reduce usage of appliance (source)', 30% 'sleep in another room', 35% 'move house', 11% 'work in another room', 4.5% 'find another job', 17% 'other'.

seemed more likely to evaluate the association as plausible (9.6 [4.8–19.0] and 6.6 [0.98–44.0], respectively). Furthermore, GPs considered cases that suspected only radiofrequency (RF) EMF sources less likely to be plausible (0.51 [0.30–0.86]) compared to cases that suspected extremely low frequency (ELF) EMF sources only. For those suspecting both RF and ELF sources this was not statistically significant (0.65 [0.37–1.15]). In each professional group, age, sex and years of professional experience of the respondents were not significantly associated with the plausibility ratings of their most recent case, which was also the case for the suspected EMF source (data not shown) for occupational physicians and occupational hygienists.

4. Discussion

We performed a survey among occupational hygienists, occupational physicians and GPs to assess their opinions on symptoms attributed to EMF, consultation rates for health problems attributed to EMF and the way they are dealt with in occupational and general practice. A considerable proportion of respondents felt not sufficiently informed about EMF and health. Regarding opinions on symptoms attributed to EMF, overall, occupational hygienist more often held the opinion that exposure to EMF alone or in combination with other factors could cause or aggravate symptoms, while GPs and occupational physicians more often evaluated symptoms attributed to EMF as primarily psychosomatic. About a third in each of the three professional groups had ever had one or more patients/clients who attributed health problems to EMF exposure, yet a subgroup of about 9% of occupational physicians and GPs had been consulted by more than 10 of such cases. Overall, 18–37% of the professionals reporting on their most recent EHS case, evaluated a relationship between reported health complaints and EMF exposure as plausible.

To the best of our knowledge, there has been no previous report evaluating how often health problems due to EMF occur in the workplace and how they are evaluated and dealt with by occupational health specialists. We observed that about a third of the occupational hygienists and physicians had been consulted on EMF and health and that the majority of the considered EHS cases were affected in their functioning at work, resulting in part in frequent or long lasting work absence, especially among cases reported by occupational physicians. These figures translate into a proportion of affected persons in society that is not negligible. Our data suggests that a proportion of reported EHS cases (44% and 15% of occupational hygienists and physicians, respectively) only experienced the EHS complaints at work. We could not evaluate whether the reported cases by these occupational professionals had also consulted a GP or vice versa.

Overall, the results of occupational physicians were more similarto those of GPs than those of occupational hygienists. Potential explanations might be that occupational hygienists see a different case load and they also have a different training curriculum (usually no medical training) and a different role, e.g. they are likely consulted in selected cases and might be more inclined to evaluate the suspected exposure even if it was a priori considered unlikely. Occupational and general physicians may in turn focus more on the medical evaluation and other explanations for the reported symptoms, are more likely to devaluate the EMF attribution until scientifically proven otherwise, and are more used to dealing with patients with non-specific (medically unexplained) symptoms in general.

Our observed consultation rate (about a third) is lower compared to previous surveys among GPs in Austria (68% (Leitgeb et al., 2005), Switzerland (69% (Huss and Röösli, 2006)), and France (75% (Lambrozo et al., 2013). Nevertheless, our findings are in line with previous reports among GPs (Leitgeb et al., 2005; Huss and Röösli, 2006; Kowall et al., 2010; Lambrozo et al., 2013; Berg-Beckhoff et al., 2010), in that they indicate that a) a considerable proportion of professionals to some degree agree that EMF exposure can cause health complaints (37% among GPs in our sample versus 29% (Kowall et al., 2010), 33% (Lambrozo et al., 2013), 61% (Huss and Röösli, 2006), 95% (Leitgeb et al., 2005)), b) those GPs (and occupational physicians) practicing complementary medicine were more likely to believe that the association between health complaints and EMF exposure was plausible (Kowall et al., 2010; Lambrozo et al., 2013; Huss and Röösli, 2006), c) the type of sources and symptoms reported by (EHS) patients are similar internationally; d) a considerable proportion of the professionals assessed their level of knowledge on EMF and health as insufficient/moderate (73% among our GPs, versus 72% (Huss and Röösli, 2006)), and e) exposure reduction was often advised in EHS cases (15% among our GPs, versus 40% (Huss and Röösli, 2006)), including recommendations to change work place/job or to move place of residence. It is rather surprising that advice given to EHS cases included quite far-reaching and possibly costly interventions directed at exposure reduction, given that several scientific reviews and international expert panels concluded that exposure to EMF is unlikely to result in symptoms (WHO, 2004; Rubin et al., 2010; Röösli et al., 2010). In this way, our results underline the need for these professional groups to address their training curriculum and policy/approach to dealing with EHS, for example drawing from established approaches for 'somatically insufficiently explained symptoms' ('SOLK' in Dutch) such as the national practice guidelines for general practitioners of the Dutch General Practitioners Association (Olde Hartman et al., 2013) and approaches in dedicated SOLK (outpatient) clinics in the Netherlands. It would be informative to evaluate such approaches for EHS and other idiopathic environmental intolerances.

In any case, knowledge on EMF and health would be a starting point for evidence based practice. Previous surveys in Austria and France revealed that many of the GPs used public sources

(journals, tv, internet) rather than medical scientific literature or information from authorities as information sources for EMF and health (Leitgeb et al., 2005; Lambrozo et al., 2013). In our survey, a considerable proportion of GPs did not feel sufficiently informed about EMF and health, and we observed that those who did feel well-informed were less likely to assess the relation as plausible. This means that there may well be an information gap that would be useful to address, and that information should be targeted at these professional groups. In the Netherlands, for knowledge dissemination the 'Knowledge Platform on Electromagnetic Fields and Health' (http://www.kennisplatform.nl/english/) has been established. The associated organisations with expertise on EMF aim to answer societal questions and concerns about EMF and health by providing scientific information in a comprehensive way. However, it is unknown whether the professional groups in our survey use this as a source of information and if they feel sufficiently informed by it. In any case, at the time of our survey, this Knowledge Platform did not yet offer information on EHS.

A strength of our survey is its national approach, and the fact that we addressed different professional groups that are likely in the first line of consultation when people consider EMF as a cause of their health complaints. However, consultation rates should not be interpreted as prevalence rates of EHS in the general or working population. In addition, these cases are not necessarily representative. For example, these professionals might only see or remember a selective (more severe) tip of the iceberg, which might be reflected in the percentages of impairment in daily or working functioning and work absence.

A limitation of our survey is the response rates of 29–37% across the three professional groups, which is low yet comparable to similar postal questionnaire or telephone surveys on this topic among GPs in other countries (23% Kowall et al., 2010; 28% Huss and Röösli, 2006; 36% Leitgeb et al., 2005). There were fewer female respondents, yet these numbers among GPs and occupational physicians are representative for the Netherlands (Schepman et al., 2011; van Hassel et al., 2016). The percentage of GPs with additional training in complementary/alternative medicine seems low compared to the mentioned studies in other countries, yet in line with expectation and comparable to the 4% reported previously in a sample of GPs (n = 1992), i.e. the GPs registered in the database of one insurer in the region of the city of The Hague, the Netherlands (Kooreman and Baars, 2012). However, previous analyses in surveys on this topic have reported very similar results, e.g. when weighing the answers of somewhat overrepresented complementary medicine practicing GPs by their proportion in the total population of the GPs (Huss and Röösli, 2006), or when comparing a short and long version of the survey questionnaire which resulted in different response rates yet similar estimates (Berg-Beckhoff et al., 2010). We therefore would not expect such selection bias to strongly affect our results. Another limitation is that it remains unknown how effective and useful the reported approaches taken by these professionals were for the EHS cases, and to what extent they turned to other resources for help.

5. Conclusions

About a third of occupational hygienist, occupational physicians and general practitioners in the Netherlands are consulted by patients attributing symptoms to EMF exposure. Many of these professionals consider a causal relationship between EMF and health complaints to some degree plausible, and their approach often also includes exposure reduction advice. Given the lack of a scientific evidence basis for EMF to cause symptoms and the finding that the majority of these professionals feels insufficiently informed about EMF and health, targeted information campaigns might assist them in their evidence based dealing with patients who attribute symptoms to EMF.

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