



NOISE SENSITIVITY AND MULTIPLE CHEMICAL SENSITIVITY

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OBJECTIVE

Noise sensitivity is considered to be a self-perceived indicator of vulnerability to stressors in general and not noise alone. Multiple chemical sensitivity (MCS) encompasses a wide range of subjective symptoms provoked by exposure to low levels of chemicals. MCS has to some extent been accompanied by noise sensitivity indicating a moderate correspondence between them. The aim of this study was to investigate if the Weinstein's Noise Sensitivity Scale and Quick Environmental Exposure and Sensitivity Inventory's (QEESI) Chemical Intolerance Subscale differentiate noise sensitivity and MCS as different entities and if there are overlaps in their characteristics.

SUBJECTS

The study is based on the Finnish Twin Cohort. In 1988 a questionnaire was sent to 1005 twin pairs discordant for hypertension. 1495 individuals (688 men, 807 women) replied. In 2002 a new questionnaire was sent to a sample of 405 subjects who had replied to the 1988 questionnaire. 327 individuals (166 men, 161 women) replied, yielding a response rate of 81%. The age range was 45–66 years. They are the participants of the present study. In the 2002 questionnaire Weinstein's Noise Sensitivity Scale and QEESI's Chemical Intolerance Subscale were used. Other somatic, psychological and lifestyle factors were obtained from the earlier questionnaire studies for the same individuals.

STATISTICAL METHODS

Both confirmatory factor analysis (CFA) and exploratory factor analysis (EFA) were used. Correlations and stepwise regression analyses were used to study the associations of factor scores with somatic and psychological factors. Variance inflation factors (vif) for the independent variables were used in regression post-estimation to check for collinearity.

RESULTS

Scale reliability coefficient (Cronbach alpha) for Weinstein's Noise Sensitivity Scale was 0.855 and for QEESI's Chemical Intolerance Subscale 0.904. Factor analyses (CFA and EFA) were first conducted for both scales separately and then for items from both scales in the same analysis, and sex differences were tested. Factor loadings of ≥ 0.4 were considered to be of major impact.

Among all subjects in factor analysis of the questionnaire items of Weinstein's Noise Sensitivity Scale after orthogonal varimax Kaiser off rotation two factors were formed. In the factor analysis of the questionnaire items of QEESI's Chemical Intolerance Subscale one factor was formed. In the factor analysis of the questionnaire items of both Weinstein's Noise Sensitivity scale and QEESI's Chemical Intolerance Subscale among all subjects three factors were formed (Table 1). Factor 1 included twelve noise sensitivity questionnaire items and was named as Noise Sensitivity Factor. Factor 2 included all eight chemical sensitivity questionnaire items and was named as Chemical Sensitivity Factor. Factor 3 included five noise sensitivity items and was considered to describe ability to concentrate and named as Ability to Concentrate Factor.

Table 1: Factor loadings of the items of Weinstein's Noise Sensitivity Scale and QEESI's Chemical Intolerance Subscale

Item	Factor1	Factor 2	Factor 3
Weinstein's Noise Sensitivity Scale			
1) I wouldn't mind living on a noisy street if the apartment I had was nice	0.097	0.102	0.644
2) I am more aware of noise than I used to be*	0.449	0.157	-0.201
3) No one should mind much if someone turns up his stereo full blast once in a while	0.007	0.076	0.650
4) At movies, whispering and crinkling candy wrappers disturb me*	0.327	0.127	-0.245
5) I am easily awakened by noise*	0.591	0.059	0.048
6) If it's noisy where I'm studying, I try to close the door or window or move somewhere else*	0.669	0.183	0.018
7) I get annoyed when my neighbours are noisy*	0.637	0.103	-0.029
8) I get used to most noises without much difficulty	0.177	0.148	0.638
9) How much would it matter to you if an apartment you were interested in renting was located across from a fire station?*	0.356	0.158	0.128
10) Sometimes noises get on my nerves and get me irritated*	0.672	0.166	0.090
11) Even music I normally like will bother me if I'm trying to concentrate *	0.560	0.062	-0.087
12) It wouldn't bother me to hear the sounds of everyday living from neighbours (footsteps, running water, etc.)	-0.021	0.030	0.245
13) When I want to be alone, it disturbs me to hear outside noises*	0.695	0.090	-0.045
14) I'm good at concentrating no matter what is going on around me	0.311	0.021	0.539
15) In a library, I don't mind if people carry on a conversation if they do it quietly	-0.040	0.016	0.393
16) There are often times when I want complete silence*	0.665	0.185	-0.009
17) Motorcycles ought to be required to have bigger mufflers*	0.437	0.228	-0.057
18) I find it hard to relax in a place that's noisy*	0.748	0.143	0.177
19) I get mad at people who make noise that keeps me from falling asleep or getting work done*	0.728	0.229	0.188
20) I wouldn't mind living in an apartment with thin walls	0.090	0.212	0.521
21) I am sensitive to noise*	0.758	0.175	0.153
QEESI's Chemical Intolerance Subscale:			
1) Diesel or gas engine exhaust	0.322	0.693	0.111
2) Insecticide (sprays and repellents)	0.127	0.790	0.042
3) Paint or paint thinner	0.143	0.733	0.074
4) Certain perfumes, air fresheners or other fragrances	0.089	0.656	-0.025
5) New furnishings such as new carpeting, a new soft plastic shower curtain or the interior of a new car	0.073	0.732	-0.015
6) Smell of mould (like in ground cellar) in mouldy damage	0.107	0.814	0.073
7) Dustiness	0.170	0.701	0.147
8) Tobacco smoke	0.179	0.580	0.025

*Item scored in opposite direction before responses are summed. Factor loadings of ≥ 0.4 are considered to be of major impact

The factor analytic scales, Noise Sensitivity Factor and Chemical Sensitivity Factor, were not correlated (corr = 0.005), in contrast to the 0.39 correlation of Weinstein's Noise Sensitivity Scale with QEESI's Chemical Intolerance Subscale.

In regression analyses among all subjects Noise Sensitivity Factor was associated with neuroticism (Coef. 0.069, 95 % CI 0.007, 0.132) and smoking (current) (Coef. -0.339, 95 % CI -0.657, -0.021). Chemical Sensitivity Factor was associated with allergies (Coef. 0.439, 95 % CI 0.201, 0.677) and alcohol use (Coef. 0.043, 95 % CI 0.011, 0.075). Because of substantial gender difference among other variables, and the possibility that there are biological and social reasons for gender differences, the analyses were also conducted separately in men and women (Table 2).

Table 2: Non-standardized regression coefficients for Noise Sensitivity Factor and Chemical Sensitivity Factor in relation to psychological, life-style and medical factors among men and women

	Noise Sensitivity Factor		Chemical Sensitivity Factor	
	Men	Women	Men	Women
Age	Coef -0.002 95 % CI -0.031, 0.028	-0.023 -0.056, 0.010	0.011 -0.022, 0.044	-0.012 -0.042, 0.017
Neuroticism	Coef 0.129 95 % CI 0.050, 0.208			
Stress	Coef -0.058 95 % CI -0.118, 0.003			
Allergies	Coef 0.308 95 % CI 0.029, 0.587		0.463 0.158, 0.767	0.317 0.045, 0.589
Anger in	Coef -0.038 95 % CI -0.088, 0.012			
Anger control	Coef -0.068 95 % CI -0.120, -0.017			
Depression Mild	Coef 0.636 95 % CI 0.124, 1.148		0.569 -0.026, 1.164	
At least moderate	Coef 0.111 95 % CI -0.707, 0.929		1.097 0.135, 2.059	
Hostility	Coef 0.054 95 % CI -0.023, 0.131		-0.025 -0.094, 0.044	
Alcohol use	Coef 0.045 95 % CI 0.008, 0.081		0.080 0.008, 0.152	
Smoking Former	Coef -0.061 95 % CI -0.447, 0.326	0.006 -0.506, 0.517	-0.051 -0.512, 0.411	
Current	Coef -0.275 95 % CI -0.662, 0.112	-0.393 -0.966, 0.180	-0.538 -0.995, -0.082	
Any use of pain relievers	Coef 0.129 95 % CI -0.055, 0.312			

CONCLUSIONS

Combined factor analyses of the questionnaire items of Weinstein's Noise Sensitivity Scale and QEESI's Chemical Intolerance Subscale indicated the presence of three factors – Noise Sensitivity, Chemical Sensitivity and Ability to Concentrate Factors. Noise Sensitivity Factor was not correlated with Chemical Sensitivity Factor, in contrast to the modest correlation of Weinstein's Noise Sensitivity Scale with QEESI's Chemical Intolerance Subscale. The association profiles of Noise Sensitivity Factor and Chemical Sensitivity Factor with medical, psychological and life-style factors were mainly different.

The present study indicates that Weinstein's Noise Sensitivity Scale and QEESI's Chemical Intolerance Subscale differentiate noise sensitivity and MCS as different entities. Further large-sample studies are needed to investigate if noise sensitivity and MCS are a part of general environmental sensitivity. The underlying mechanisms of noise sensitivity and MCS should also be studied.

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