



PSYCHOMETRIC NORMALIZATION OF A HYPERACUSIS QUESTIONNAIRE

ORL 2002;64:436-442

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INTRODUCTION

- Pathological auditory hypersensitivity commonly termed hyperacusis
- no universal agreement the definition, assessment or interpretation of hyperacusis test data
- a marked intolerance to ordinary environmental sound, while hearing thresholds are normal
- exceptionally acute sense of hearing, the hearing threshold being unusually low



- a patient reports discomfort for sounds that would be acceptable to most normally hearing people
 - most current definition of hyperacusis



- In order to normalize subjects' reports, quantify and evaluate auditory hypersensitivity
- hyperacusis questionnaire
 - subjective perception of environmental noise and other sounds
 - how this perception disturbs their everyday life



- types of sounds causing discomfort are highly variable in intensity and frequency
- electrical noises
 - washing machine or vacuum cleaner
- traffic noise
- distant dog bark
- newspaper being folded



- behavioral and adaptative consequences of noise
- cognitive and emotional aspects
- Chemtob et al.
 - sensory hypersensitivity in US military veterans suffering from posttraumatic stress disorder
 - hyperacusia may be entirely emotional
 - sound tolerance was influenced by stress and tiredness -> physical pain and nerve grating



- Environmental noises -> stress -> emotional reactions, cognitive reactions
- concentration in noise which is decreased in hyperacusic patients



- Three main dimensions arise:
- behavioral and adaptative consequences of noise
- cognitive aspects
- emotional aspects



- Goal of this study
- test and normalize the hyperacusis questionnaire
- whether this questionnaire is sensitive enough to discriminate subjects according to 14 items
- the gender and age effects corresponding to the questionnaire results
- origin of hyperacusis
 - patient's history of noise exposure
 - change in auditory oversensitivity with time
 - any other auditory problems



MATERIALS AND METHODS - THE QUESTIONNAIRE

- Hearing sensitivity questionnaire
- first part
 - general information on auditory disorders and noise exposure
- second part
 - 14 self-rating items
 - ranging from 'no' (scoring 0 points), 'yes, a little' (scoring 1 point), 'yes, quite a lot' (scoring 2 points) to 'yes, a lot' (scoring 3 points)



Appendix 1: Hyperacusis Questionnaire

Surname, first name:

Sex: Male Female

Age:

Profession or studies:

Place (town or area) of residence:

Telephone:

Are you or have you been exposed to noise?

Do you tolerate noise less well as compared to a few years ago?

Have you ever had hearing problems? If so, of what kind?



	No	Yes, a little	Yes, quite a lot	Yes, a lot
1 Do you ever use <u>earplugs</u> or earmuffs to reduce your noise perception (Do not consider the use of hearing protection during abnormally high noise exposure situations)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2 Do you find it harder to ignore sounds around you in everyday situations?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3 Do you have trouble <u>reading</u> in a noisy or loud environment?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4 Do you have trouble <u>concentrating</u> in noisy surroundings?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



- 5 Do you have difficulty listening to conversations in noisy places?
- 6 Has anyone you know ever told you that you tolerate noise or certain kinds of sound badly?
- 7 Are you particularly sensitive to or bothered by street noise?
- 8 Do you find the noise unpleasant in certain social situations (e.g. night clubs, pubs or bars, concerts, firework displays, cocktail receptions)?
- 9 When someone suggests doing something (going out, to the cinema, to a concert, etc.), do you immediately think about the noise you are going to have to put up with?
- 10 Do you ever turn down an invitation or not go out because of the noise you would have to face?



- 11 Do noises or particular sounds bother you more in a quiet place than in a slightly noisy room?
- 12 Do stress and tiredness reduce your ability to concentrate in noise?
- 13 Are you less able to concentrate in noise towards the end of the day?
- 14 Do noise and certain sounds cause you stress and irritation?

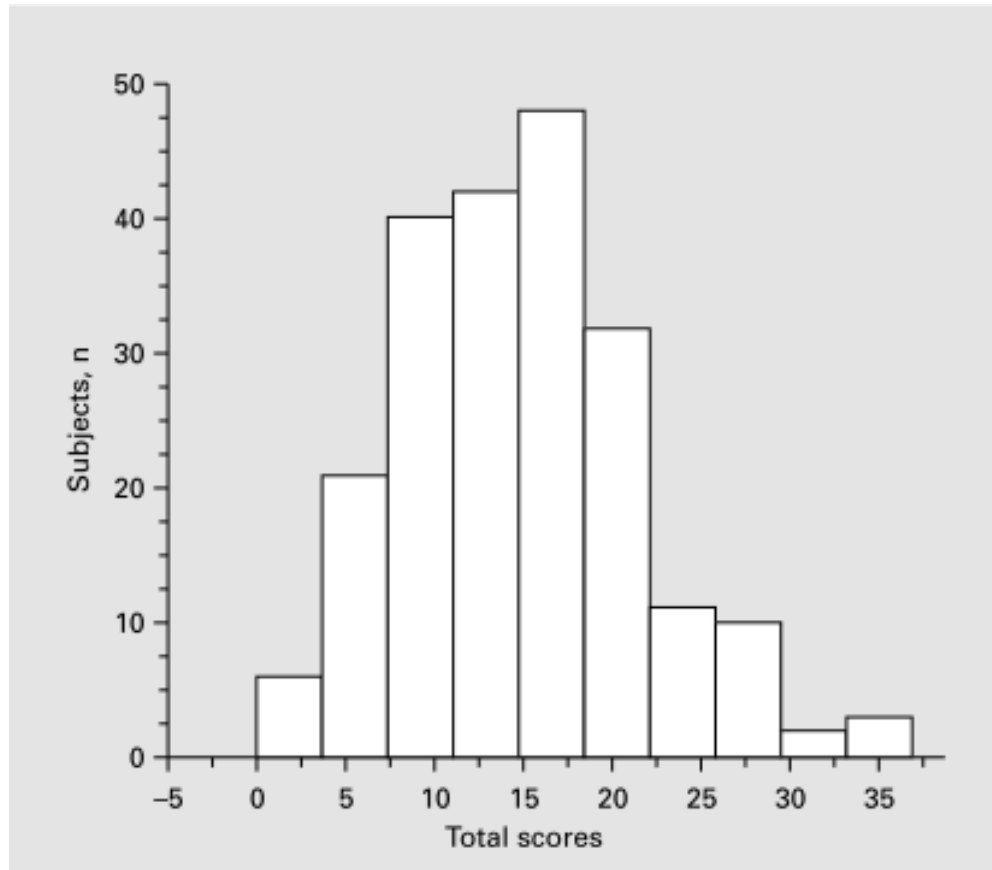


MATERIALS AND METHODS - SUBJECTS

- 201 subjects, 132 females and 69 males
- mean age: 28.4 years (17-72 years)
- Randomly selected after responding to an advertisement posted for subject recruitment
- no specific criterion
 - evaluate the sensitivity of the questionnaire among the general population
- subjects filled out the questionnaire anonymously



RESULTS – RELIABILITY AND DIMENSIONS OF THE QUESTIONNAIRE



- distribution of total scores appears normal
- Mean \pm SD = 15 ± 6.7



	Attentional dimension	Social dimension	Emotional dimension
<i>Attentional dimension</i>			
Item 4: concentration	0.82		
Item 3: reading	0.80		
Item 1: earplug	0.48		
Item 2: set aside noise	0.41	0.37	
<i>Social dimension</i>			
Item 9: fear of noise		0.77	
Item 10: social consequences		0.76	
Item 8: social situations		0.63	0.40
Item 6: noise tolerance		0.57	
Item 5: intelligibility in noise		0.45	
Item 7: street noise	0.31	0.42	
<i>Emotional dimension</i>			
Item 14: noise effect			0.68
Item 13: diurnal effect			0.74
Item 12: influence of stress			0.68
Item 11: disturbance in noise			0.62

- Principal Component Analysis
- loading of the three components, i.e., dimensions



- The internal consistency reliability of the questionnaire on the tested sample
 - 0.66 for component 1
 - 0.68 for component 2
 - 0.67 for component 3
 - by the Cronbach coefficient alpha



- Total score reflects the phenomenon of hyperacusis
- Component 1 (questions 1–4)
 - attentional dimension
- Component 2 (questions 5–10)
 - social dimension
- Component 3 (questions 11–14)
 - emotional dimension
- The mean \pm SD total score is 15 ± 6.7



GENDER EFFECT

Table 3. Means \pm SD of total hyperacusis questionnaire scores and scores for each dimension, according to gender

	Females	Males	F test, p
Attentional dimension	5.49 \pm 2.94	3.91 \pm 2.72	F(1, 199) = 13.71; <u>p = 0.0003</u>
Social dimension	3.22 \pm 2.68	2.69 \pm 3	F(1, 199) = 1.59; p = 0.20
Emotional dimension	6.99 \pm 3.29	5.79 \pm 2.8	F(1, 199) = 8.83; <u>p = 0.003</u>
Total score	15.7 \pm 6.18	12.4 \pm 6.55	F(1, 199) = 12.38; <u>p = 0.0005</u>

- Females show significantly higher total, emotional and attentional scores than males




AGE EFFECT

- In general, scores do not significantly correlate with age
- Age is significantly correlated with the social dimension scores ($p = 0.0001$)



PRELIMINARY QUESTIONS

	Question 1: past or current exposure to noise	Question 2: time influence	Question 3: past or present hearing impairments
Attentional dimension	F(1, 171) = 0.62 p = 0.42	F(1, 170) = 14.85 <u>p = 0.0002</u>	F(1, 172) = 0.25 p = 0.87
Social dimension	F(1, 170) = 0.19 p = 0.65	F(1, 169) = 33.75 <u>p = 0.0001</u>	F(1, 171) = 6.3 <u>p = 0.01</u>
Emotional dimension	F(1, 171) = 0.074 p = 0.78	F(1, 170) = 3.34 p = 0.07	F(1, 172) = 0.000008 p = 0.99
Total score	F(1, 170) = 0.51 p = 0.47	F(1, 169) = 25.3 <u>p = 0.0001</u>	F(1, 171) = 0.96 p = 0.32

- Past or current noise exposure has no influence on scores
 - Decrease in tolerance to noise over time, affects the total, attentional and social scores
 - Past or present hearing problems, only has influence on the social dimension
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DISCUSSION - RELIABILITY AND MULTIDIMENSIONAL ASPECTS OF HYPERACUSIC QUESTIONNAIRE

- The hyperacusis questionnaire is highly sensitive in discriminating subjects in the general population
- mean \pm SD score greater than 28.4 ± 2 can be considered as hyperacusic



- Three dimensions
- attentional dimension
 - questions 1–4
- social dimension
 - questions 5–10
- emotional dimension
 - questions 11–14
- the dimension scores may be used as independent subscores



- Each dimension was considered individually
- Attentional dimension
 - detecting attentional deficits due to noisy conditions
- Emotional dimension
 - loudness tolerance correlate with the emotional state of anxiety
 - hyperacusis has been reported in pathologies including emotional disorders such as autism
 - benefit in studying patients with psychiatric disorders



○ Social dimension

- hyperacusic patients often report avoiding social interactions
- understanding of the distress and isolation experienced by hyperacusic patients in social interactions



AGE AND GENDER EFFECTS

- Age uniquely influences the social dimension
 - increases with age, and the same tendency observed with the total score
- music or noise exposure is one of the possible causes of hyperacusis



- Both the emotional and attentional dimension scores are affected with gender
 - Scores are lower in males than females
- Two studies indicating that 80% out of 30, and 65.4% out of 104 hyperacusis patients were females
- hyperacusis is either more prevalent in females
- females express their discomfort more readily than males



INFLUENCE OF THE PRELIMINARY QUESTIONS ON THE QUESTIONNAIRE SCORES

- noise exposure does not directly influence the hyperacusis score
- some hyperacusis patients reported auditory hypersensitivity began following acoustic stimulations
- noise exposure is not a major cause of hyperacusis



- hearing impairments do not influence the overall questionnaire scores
 - exception of the social dimension score
- majority of hyperacusis patients have normal hearing



- ‘Do you tolerate noise less well as compared to a few years ago?’)
 - influences total, attentional and social dimension scores
- hyperacusis is not a constant phenomenon with time
- may arise following musical stimulation, acoustic trauma, anxiety disorders , and head trauma
- information concerning the progression of hyperacusis is valuable to uncovering the origin of the disorder



CONCLUSION

- hyperacusis questionnaire with statistical reliability and consistency
- three major dimensions: attentional, social and emotional
- detect clinical hyperacusis
- for the evolution of hyperacusis treatment
- prevalence of hyperacusis in the general population is estimated to be superior to 1.25%



- Thanks for your attention.

