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BRIEF NOTES

ATTRIBUTES OF DESIRABLE ACOUSTIC ENVIRONMENTS IN SOME ROOMS

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Normal hearing native Polish speaking subjects were asked to choose attributes of a desirable acoustic environment, which were presented in a list. The subjects were asked to describe the attributes that would be desirable while listening to a lecture hall, reading a book in a living room and listening to a musical performance in concert hall. Results indicate that the methods used to derive the attributes is valid, that women apply more and slightly different attributes then men and some attributes are uniformly used across the environments tested.

1. Introduction

It is well known that both silence and excessive noise can have harmful effects on human health [1, 3]. The literature also has reports of attempts to define the concept of *acceptable acoustic environment* for specific environments. For example, the research reported in BERANEK and VER [2] which resulted in Noise Criteria Curves, specifies the sound spectra that would be acceptable for human activities in a variety of environments. The concept of acceptable acoustic environment is based primarily on the sound level across an acoustic spectra and does not directly incorporate measures of sound quality, pleasantness, or the information carrying load of the sounds heard. These latter measures are elusive to quantify because people differ in their expectations in different listening environments. For example, an environment which might be acceptable for listening to a lecture, might be unacceptable for silently reading a book.

In order to better account for the differences in expectations of listeners, the concept of desirable or supportive acoustic environment is proposed. Using this concept, it is believed that specific attributes of a desirable acoustic environment for a variety of human activities can be developed. In order to test this belief, the purpose of this study was to determine the attributes of a desirable lecture hall, living room and musical concert hall.

We propose that the concept of an acceptable acoustic environment be replaced with a concept of a *desirable* or even *supportive acoustic environment*. Examples of research questions are:

1. What is the contribution of each perceptual attribute in the overall (global) evaluation by perceivers and how do the profile of attributes differ among individuals for specific environments?

2. How kind of usefulness influences estimation of perceptual attributes?

In our preliminary research we want to find the answer to the part of sounds question only and find the perceived attributes of desirable acoustics environments in some rooms (lecture room, concert hall, living room)

2. Experiments

In all, 63 native Polish speaking took in the test, 39 women and 24 men, aged between 20 and 26. The first task of the subjects was to characterise verbally the attributes of a desirable acoustic environment given a three locations (living room, lecture room and a concert hall) and create a definition list of the appropriate attributes (descriptors). The Table 1 show attributes and their definitions creative by subjects.

Table 1. Definitions of the adjectives used to desirable acoustic climate.

Lp.	ATTRIBUTES	DEFINITIONS
1.	**coloured**	contains differentiated sounds
2.	**quiet**	of low intensity level
3.	**warm**	rich in bass, which dominate over medium frequency tones
4.	**pure**	undistorted
5.	**mild**	not many strong, predominant components of high frequency
6.	**powerful**	all the sound components are perceived, as opposed to a narrow sound
7.	**spatial**	perceived as originating not from a single source, it has a breadth and depth, fills up the site, yields an impression of a sound surrounding the listener
8.	**muffled**	deaden sound, hard to describe and characterise acoustically
9.	**diffused**	sound comes from various sources and directions
10.	**uniform**	good balance of the intensities of sound components, none of which is unnaturally enhanced
11.	**clear**	sound is well defined, pure. An opposite of indefinite, blurred, obscured
12.	**regular**	steady in time, stationary, no occurrences of sound level bursts

Table 2. Ratings of the adjectives used to desirable acoustic climate.

1.	**coloured**	0----------5----------10 very little differentiated sounds — very much differentiated sounds
2.	**quiet**	0----------5----------10 low intensity — very low intensity level
3.	**warm**	0----------5----------10 no bass — medium bass — enhanced bass level
4.	**pure**	0----------5----------10 low distortion — very low distortion — no distortion
5.	**mild**	0----------5----------10 small content of high frequency — total lack of high frequencies
6.	**powerful**	0----------5----------10 weakly perceived components — all the components are perceived clearly
7.	**spatial**	0----------5----------10 low spatiality — high spatiality
8.	**muffled**	0----------5----------10 scarcely definable acoustically — impossible to describe acoustically
9.	**diffused**	0----------5----------10 not diffused — very diffused
10.	**uniform**	0----------5----------10 uneven, not uniform — very uniform
11.	**clear**	0----------5----------10 barely defined — well defined
12.	**regular**	0----------5----------10 small changes of the level — no change in the level

The next task of the subjects was to estimate these attribution on the scales $0-10$ (Table 2) in living room, lecture room and concert hall.

3. Results

1. For the given sites (the three locations), haven't been noticed differences (on the significance level $\alpha = 0.05$) between the following descriptors: *warm, mild, muffled, uniform and regular* for men (Fig. 1), and *mild, uniform, clear, regular* for women (Fig. 2).

2. For given listening room have been notice differences (on the significance level $\alpha = 0,05$) between men and women for following descriptors:

- in the living : room *powerful, muffled, diffused, and clear* (Fig. 3)
- in the lecture room : *coloured, mild, and uniform* (Fig. 4)
- concert hall : *coloured, powerful, muffled, clear* (Fig. 5).

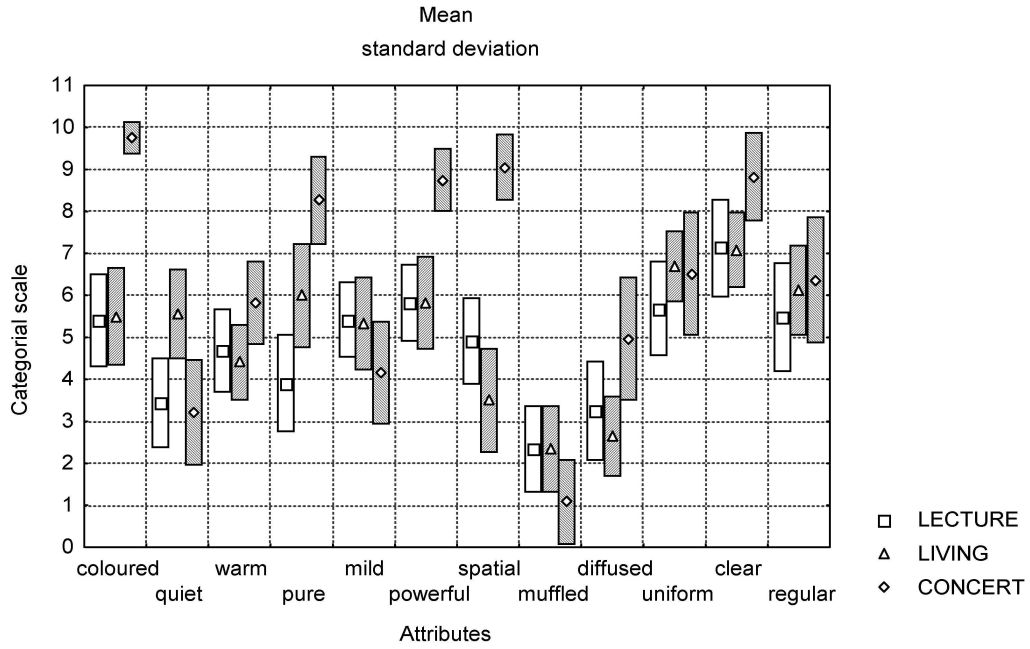

Fig. 1. The three location for men.

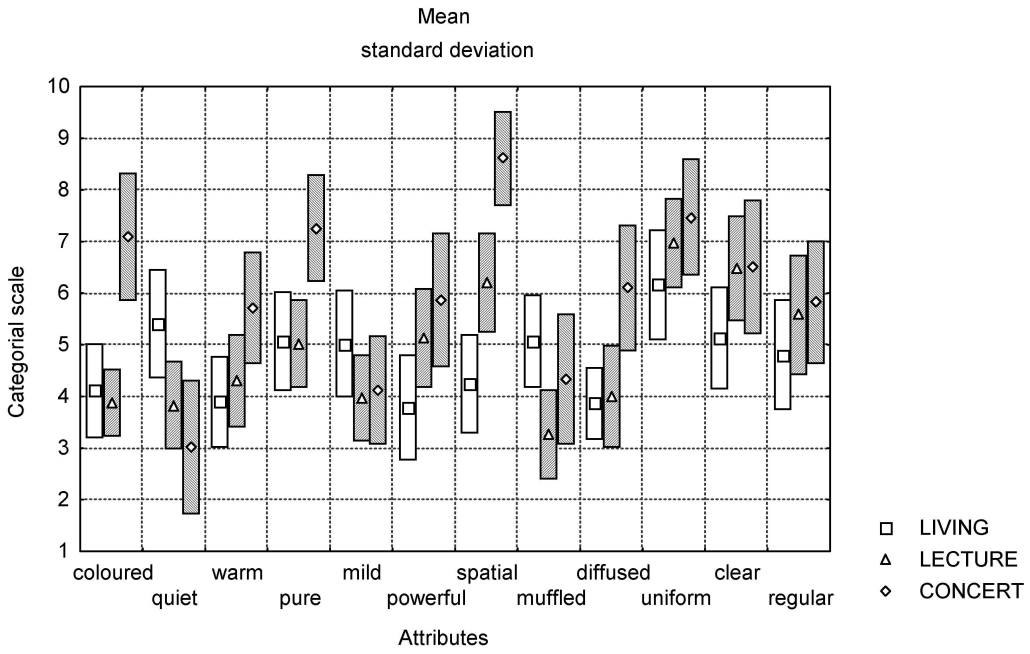

Fig. 2. The three location for women.

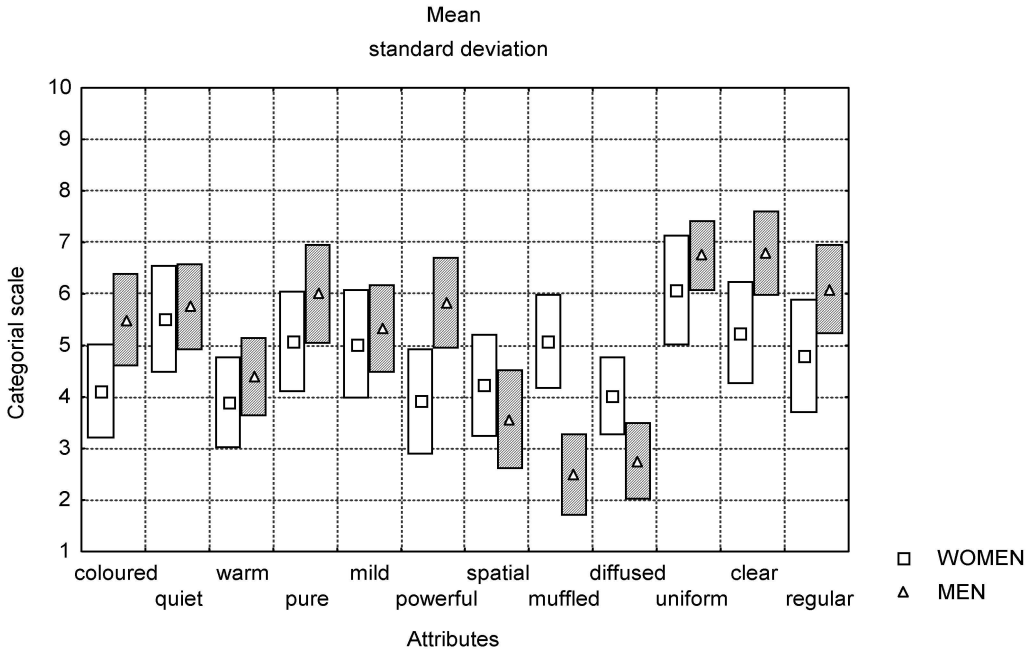

Fig. 3. Living room.

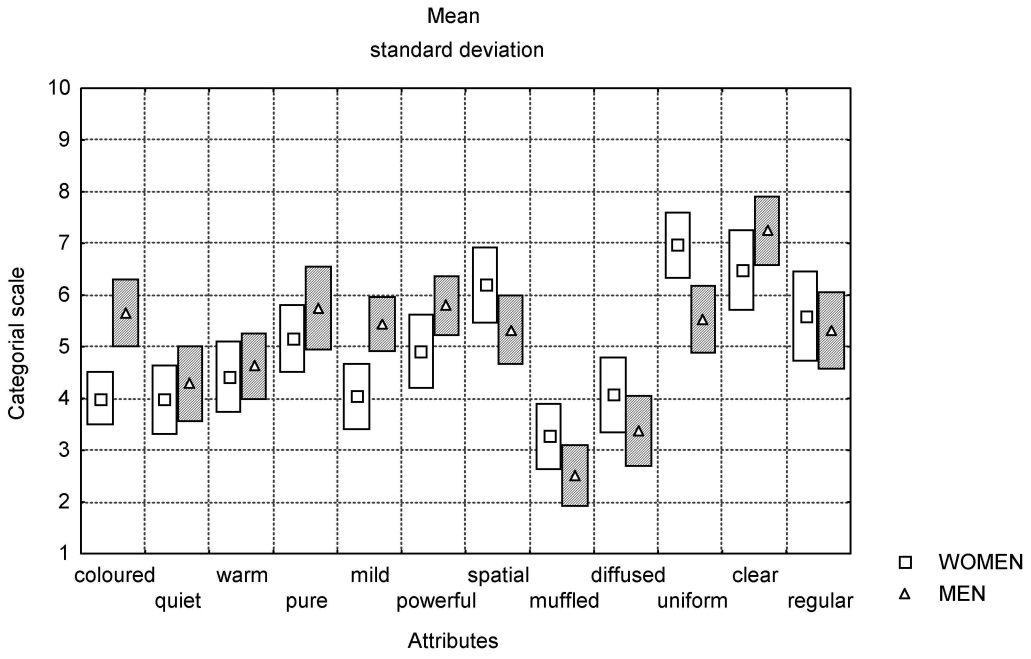

Fig. 4. Lecture room.

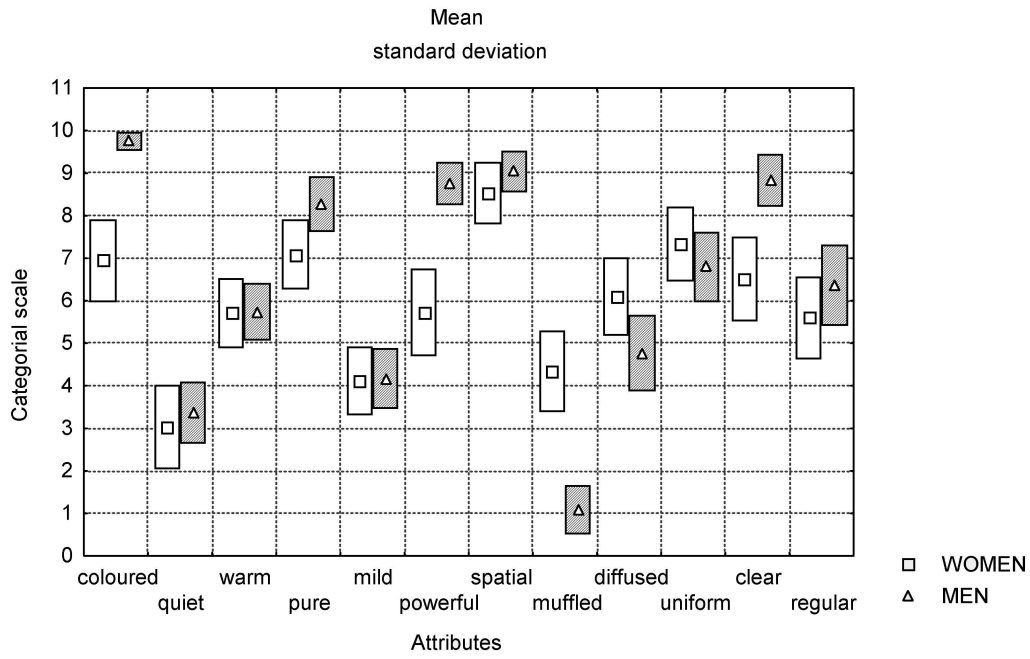

Fig. 5. Concert hall.

3. With reference to the living room and lecture room rating 5 was the most frequented rating on the categorial scale

4. Two extreme ratings, 0 and 10 occurred only with reference to the concert hall.

4. Conclusions

1. Perceptual characterisation of the *desired acoustic environment* (DAE) was achieved and defined for lecture room, living room and concert hall.

2. The two extreme ratings of the attributes on 0 to 10 scale are only used in the context of the concert hall.

3. For given listening room have been notice differences (on the significance level $\alpha = 0.05$) between men and women.

4. With reference to the living room and lecture room rating 5 was the most frequented rating on the categorial scale.

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