Loudness Evaluation of Various Musical Genres and Types of Listening Behavior

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1 Introduction

The perception of sound depends on a wide variety of factors. Particularly in the field of music there are many unsolved queries.

In this study a psychoacoustic experiment was performed to examine the influence of preference for a musical genre on its favored presentation level.

2 Questionnaire: Listening Behaviors

Within the scope of the experiment the participants were asked where and with what equipment they listened to music:

Tab. 1

place to listen to music	
at home	66.67 %
in a concert hall	1.11 %
in public transportation	26.67 %
in a car	2.22 %
other	4.44 %
equipment	
live	3.33 %
recorded music via loudspeaker	47.78 %
recorded music via head-/earphones	36.67 %
broadcasted by Radio or TV	12.22 %
others	2.22 %
statistics	
sex: female	83.33 %
male	16.67 %
age (mean):	19.37
total number:	90

According to the results listed in *Tab.1*, young people usually prefer to listen to recorded music at home or in public transportation, using loudspeakers or head-/earphones. Maybe due to the expensive admission charges they don't go to concerts regularly, so they seldom enjoy live music. Probably just a few own or use a car, at least they don't listen to music in it. Also the music broadcasted by TV or radio stations seems to play a minor role.

3 Experiment
3.1 Stimuli

In an experiment 60 musical pieces with duration of 5 *sec.* at four different levels (L_{Aeq} = 60 *dB*, 65 *dB*, 70 *dB*, 75 *dB*) were presented at random, divided by pauses of 10 *sec.* Altogether results in 240 samples of music with a total duration of 15 *sec.* (sample + pause), so the experiment lasted exact one hour, additional breaks kept up participants' concentration.

3.2 Procedure, Equipment, Participants

The 88 participants (female/male: 75/13, mean age: 19.38) had to fill in a questionnaire rating for each musical piece the perceived loudness by placing a mark on a 5-step-line:

- too soft (= -2)
- slightly too soft (= -1)
- appropriate to listen to (= 0)
- slightly too loud (= +1)
- too loud (= +2)

The preference was valuated on also a five step scale by filling in a number:

- I like it very much (= 1)
- I like it (= 2)
- I neither like nor dislike it (= 3)
- I dislike it (= 4)
- I dislike it very much (= 5)

The music was presented in a lecture hall of the Osaka University played back from DAT via the installed loudspeakers.
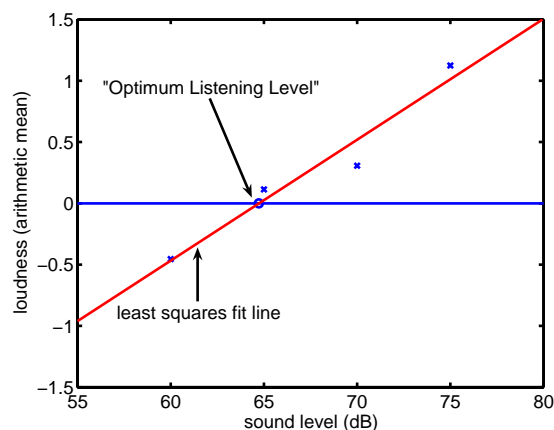
3.3 Results

Fig. 1

The arithmetic mean value of the loudness rating produces one data point for each level. As depicted in *Fig. 1,* the optimum listening level is obtained as the *x*-value of the intersection between the zero-loudness line and the least-squares-fit line of the data points.

Fig. 2 shows the optimum listening level for each piece, the bar on the far right together with the horizontal line represent the overall optimum listening level, which is 65.1 *dB*. The bars are already grouped by musical styles.
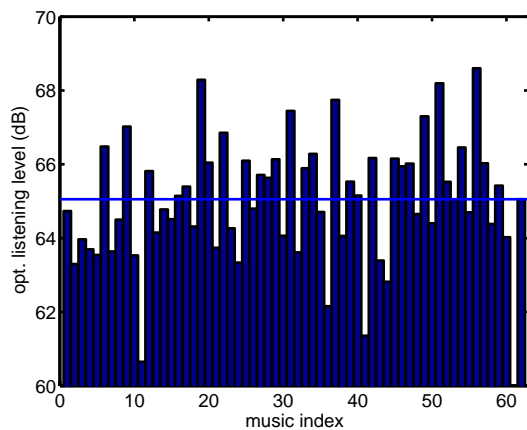

Fig. 2

However there is no direct relation between optimum listening level and the averaged preference as can be gathered from *Fig. 3*:
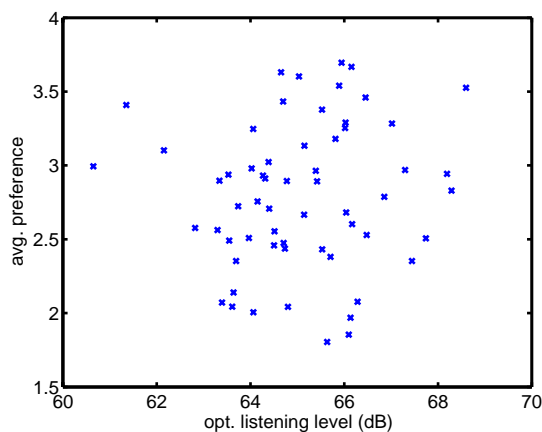

Fig. 3

As a consequence of that result, the loudness data can be divided into two groups, according to the grade of preference.

Fig. 4 visualizes the direct relation between the optimum listening levels, evaluated among each group. Every cross marks the data of one piece; the *x*-value is the optimum listening level of the participants with a high preference and the

y-coordinate represents the subjects with a low preference.

On the diagonal line the optimum listening level would be identical for both groups.
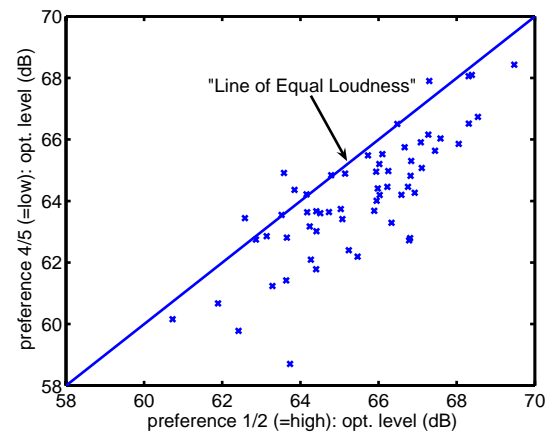

Fig. 4

It is also possible to aggregate the data by the different musical styles, which is displayed in *Fig. 5*. The optimum listening levels for each presented genre are indicated by the different bars for the three groups with high, middle and low preference. Without exception the level decreases along with the preference.
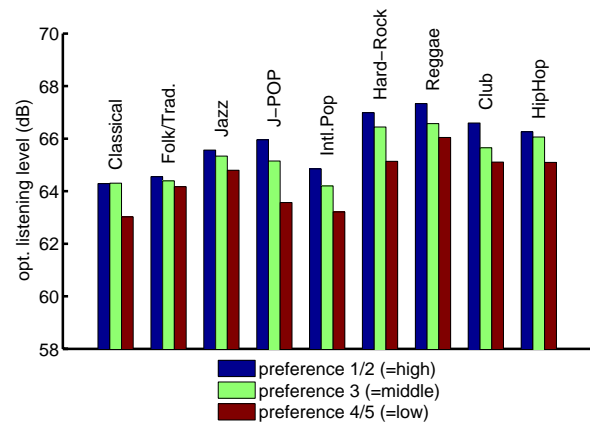

Fig. 5

4   Conclusion

To sum up briefly, there seems to be a tendency that persons want to hear their preferred music at a little higher levels.

Calculating the averages for the high and the low preference group reveals a mean difference of:

$$65.5 \ dB - 64.1 \ dB = 1.4 \ dB$$