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Abstracts

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Control of Headphone and Loudspeaker Characteristics in Online Experiments

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Background

In online experiments using acoustic stimuli, it is usually unknown which headphones or loudspeakers participants use. However, the sound transducing equipment could have an influence on the participants' responses. In a previous online study (Kopiez, Wolf, Platz, & Mons, 2016), participants had to distinguish between real orchestra sounds and sample-based orchestra sounds. Participants with much experience in sound evaluation were more likely to give the correct answer than less experienced subjects. The resulting question is whether this result was solely due to differences in listening expertise. It cannot be ruled out that the more experienced participants also used higher quality audio equipment. Not every test subject received signals with identical characteristics. Due to the modification in acoustic stimulus by different sound transducers and listening situations the test prerequisites vary. Consequently, a confounding variable which is currently hard to control by objective procedures must be assumed in this context.

Aims

To preclude the limited reliability of self-reports in the future, a simple and easy to implement procedure should be created to indirectly determine the playback characteristics of sound transducers used in online experiments. Additionally, the variety of transducers used in online studies should be obtained.

Method

The listening tasks were designed to determine headphone and loudspeaker characteristics and the listening situation based on listener response behavior. Features such as sound volume, headphone vs. loudspeaker playback, mono vs. stereo playback and cutoff frequency should be determined with an online survey. In total, 181 complete data sets could be used for the data analysis. 87 of the participants were female and 94 male. The average age was 34 years (SD = 12.4).

Results

The evaluation of the listening tasks showed that an objective procedure for the control of listening conditions and quality of audio equipment used in online surveys can already be created with eight subtasks. This procedure serves as a first try for a Headphone and Loudspeaker Test (HALT). A t-test for unequal variances showed a significant difference with a medium effect on the HALT score under the conditions of high expertise ($M = 10.27$, $SD = 1.01$) and low expertise ($M = 8.92$, $SD = 2.85$); $t(22.63) = -3.62$, $p = .0015$, $d = 0.49$. The calculation of a one-way ANOVA showed a significant difference between the transducer types (headphones, loudspeaker boxes, integrated loudspeakers) with regard to the HALT score; $F(1,179) = 17.5$, $p < .001$. There was a medium effect of $\eta 2 = .089$.

Conclusions

A simple and speedy test procedure may be helpful in reducing the confounding influence of transducers in online experiments. With modularly organized subtasks, the procedure can be adapted to the respective question with little additional effort on the part of either the examiner or the subject. In a next step, the stimuli are to be further improved and tested under controlled laboratory conditions.

References

Kopiez, R., Wolf, A., Platz, F., & Mons, J. (2016). Replacing the Orchestra? – The Discernibility of Sample Library and Live Orchestra Sounds. PLoS ONE, 11(7). https://doi.org/10.1371/journal.pone.0158324