Comparing hearing aid programs using Ecological Momentary Assessment: direct versus indirect comparison

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Abstract

Small differences between hearing aids can be detected in controlled laboratory experiments, but often their relevance for everyday life is not clear. Ecological momentary assessment (EMA) is a method that can be applied in different ways to compare hearing aids or hearing programs in everyday life. Participants can rate one program at a time (indirect comparison) or can be given the possibility to switch between programs to do a direct comparison in the moment. While under controlled conditions a direct comparison often yields higher discriminatory power, it is less clear if this method is also superior in EMA, especially if there is a transition time (TT) when switching between the programs under test. Here we investigate whether direct (with and without controlling for TT) or indirect comparison method is more sensitive for comparing hearing aid programs.

Nine experienced bilateral hearing aid users (age: 71 ± 7 years) with moderate to severe hearing loss were included in this randomized cross-over study. They were fitted with hearing aids comprising two programs, a high directionality (HD) and low directionality (LD) program. Two phases of the trial followed a one-week acclimatization period. In phase one, the hearing program changed daily, and participants listened to the same program during the day over one week. The participants answered an EMA questionnaire rating the program in their current listening situation several times per day. In phase two, which lasted two weeks the participants were asked to switch between programs within the questionnaire and compare them in the moment several times per day in the first week. During the following week, participants were also asked to compare programs in the moment, but rating was blocked for a TT of 10 seconds to ensure programs were not rated before reaching the stable state. The order of the two phases was randomized.

Median completion time of the questionnaires was lower for the indirect comparison method (47s) than direct comparison (116s without and 162s with control for TT). The total number of completed questionnaires per participant per day was higher for the indirect comparison method (5.9 ± 2.4) than for the direct comparison without (4.5 ± 1.5) and with control for TT (4.5 ± 2.6). Burden ratings at the end of each study week were lower for the indirect comparison (2.2 ± 0.8) than for the direct comparison without (4.6 ± 2.8) and with control for TT (5.1 ± 2.8).

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For sound quality and satisfaction, the indirect method resulted in the highest contrast between the two programs. All three methods pointed towards a preference of the LD program. For speech understanding, the direct comparison without TT provided a clear preference for the HD program, while the other two methods showed a trend in the opposite direction.

As the methods provided results at different sensitivity for different outcome variables, it should be carefully considered which method to use for a given research question. The higher burden when using direct comparison with control for TT coupled with no significant program preference suggests that controlling for TT should be avoided when possible.