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Microphone Angle and Speech in Noise performances

Bertrand Philippon Widex - Paris (France), Francis Kuk, Christopher Slugocki, Petri Korhonen, Heidi Peeters Wsa/orca - Lisle (United States)

Abstract

A key factor affecting the efficacy of a directional microphone is its directivity index (DI), or how much of the signal from the front is favored over signals from other directions. Microphones of the SmartRIC is designed to be flat so that the microphone angle can be less than 20° relative to the horizontal plane.

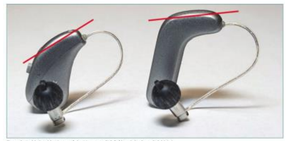
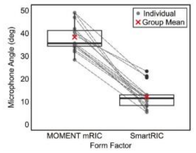


Figure 2. A side-by-side picture of the Moment mRIC (left) and the SmartRIC (right).



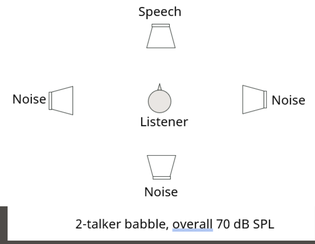
The current study showed that the design used in the SmartRIC hearing aid changed the microphone angle from an average of 37° (as in the mRIC) to an average of 12°, which significantly improved the SNR provided by the mRIC design used in the Moment mRIC hearing aid by 1.25 dB (from an average of 2.75 dB to 1.5 dB). It shows that it is possible to provide significative audiological improvement by working on the hearing aid mechanical design.

Aim of the study

The aim of this study is to compare the behavioral signal-to-noise ratio (SNR) performance offered by the SmartRIC in comparison of the Moment mRIC which has a microphone angle not as flat as the smart RIC in the directional mode when both were fully matched in frequency characteristics, with and without the use of noise reduction (NR).

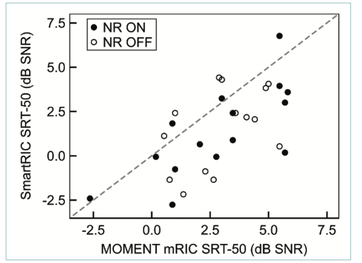
Materials and Methods

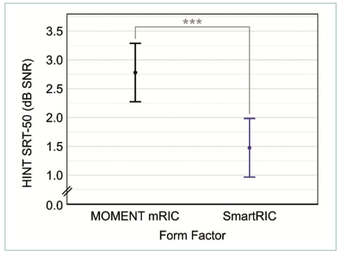
A total of 15 subjects with a moderate-to-severe degree of sensorineural hearing loss participated in the study. Subjects were tested with the SmartRIC and the Moment mRIC using the same properly sized instant double eartips with an m-receiver.
Hearing aids were programmed and matched using real ear measurements.
The angle formed by the two microphone openings was first estimated with a smartphone App (inclinometer).
The SNR improvement provided by the directional microphone and NR algorithm on the SmartRIC over the Moment mRIC was evaluated using the adaptive Hearing-In-Noise Test (HINT). A fixed, continuous 2-talker babble noise was presented at an overall level of 70 dB SPL from 90°, 180°, and 270°.



Results

Figure plots the speech reception threshold at 50% performance (SRT50) measured with the SmartRIC against the SRT50 measured with the Moment mRIC, for both NR on (filled) and NR off (unfilled). A parity line was also included for ease of visualization. Most of the data points were below the parity line, suggesting that the SRT50 measured with the Moment mRIC was higher (or poorer) than those measured with the SmartRIC. On the other hand, NR did not make a difference.





Results shows the SRT50 for each form factor. On average, the SRT50 measured with SmartRIC was about 1.25 dB smaller (or better) than that of the Moment mRIC.
It suggests a significant effect of form factor but no significant effects of noise reduction and trials or their interactions.

Conclusion

The current study showed that the design used in the SmartRIC hearing aid changed the microphone angle from an average of 37° (as in the mRIC) to an average of 12°, which significantly improved the SNR provided by the mRIC design used in the Moment mRIC hearing aid by 1.25 dB (from an average of 2.75 dB to 1.5 dB).
Furthermore, the impact of any vertical head movement (as in raising or lowering the head) is far smaller when the microphone angles are smaller (as in the SmartRIC) than when they are larger (as in the Moment mRIC). This suggests that the modern SmartRIC design not only improves SIN performance, but also ensures the consistency of SIN performance from inadvertent head movements.

Références

Powers T, Rogin C. MarkeTrak 10 (MT10): hearing aids in an era of disruption and DTC/OTC devices. Hearing Review. 26(8): 12-20.
Hakvoort C, Burton P. 2018. Increasing Style, Reducing Stigma: The Styletto Solution. Signia white paper. https://www.signia-library.com/scientific_marketing/styletto_solution/
Picou EM. MarkeTrak 10 (MT10) survey results demonstrate high satisfaction with and benefits from hearing aids. Semin Hear. 41(1): 21–36.