The Self-Fitting Hearing Aid

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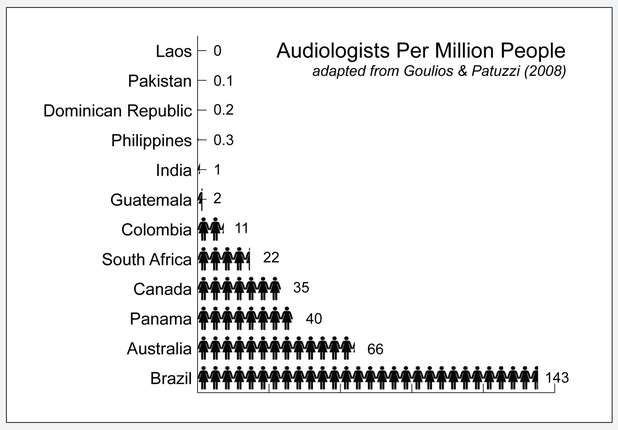
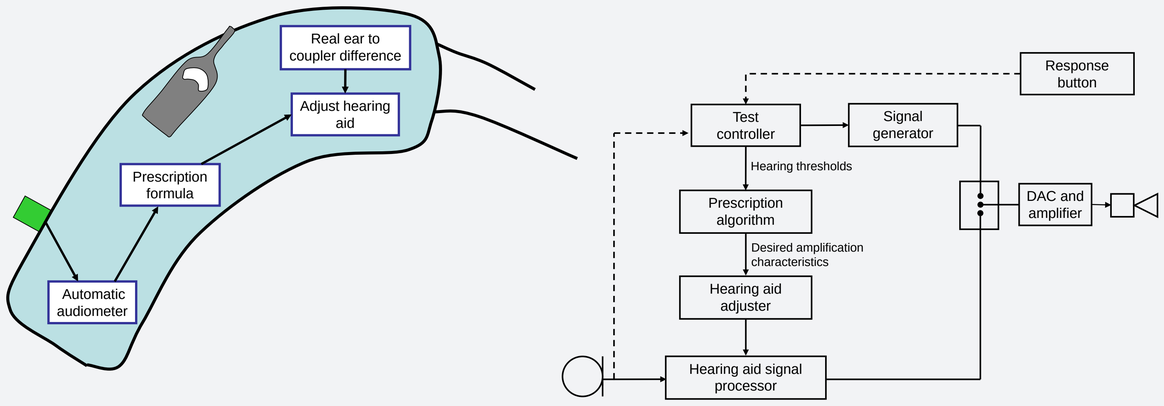
Introduction



Of the 278 million people in the world with bilateral moderate to profound hearing loss, two-thirds live in developing countries (WHO, 2004). Most could benefit from amplification, but fewer than 3% of people in developing countries who need a hearing aid actually have one. More than 30 million hearing aids – and staff to fit them – are needed annually in developing countries, but current annual provision is less than 1 million. Annual production of hearing aids is estimated to meet less than 10% of global need. Barriers to effective hearing rehabilitation services in developing countries include the cost of hearing aids relative to income, the availability and cost of batteries and repairs, the lack of a professional infrastructure, and the stigma associated with hearing loss and the use of amplification (Brouillette, 2008).

What is a Self-Fitting Hearing Aid?

A self-fitting hearing aid is an amplification device that users can program themselves, without direct input from an audiologist. The proposed device incorporates an *in situ* adaptive measurement of the user's hearing thresholds, to which an onboard prescriptive algorithm is applied to determine an appropriate gain/frequency response and compression parameters. Optionally, users can then train the settings to their own listening preferences in a variety of acoustic environments.



Advantages

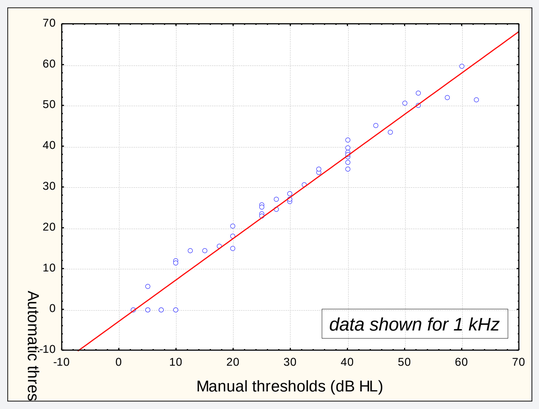
- ✓ low cost
- ✓ direct professional input not required
- ✓ real-world environments used in fitting process
- ✓ greater psychological ownership of fitting process and outcome

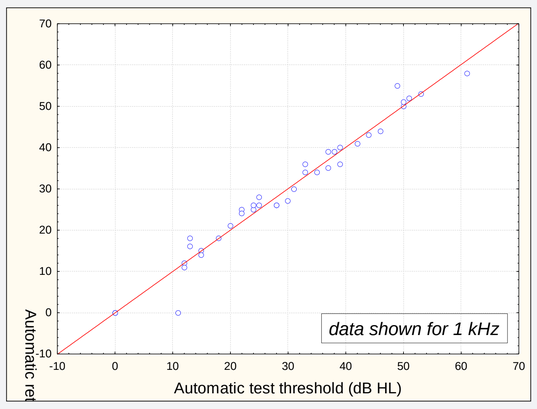
Disadvantages

- × risk of audiologically inappropriate fitting
- × risk of aid-induced hearing loss
- × high level of cognitive function required

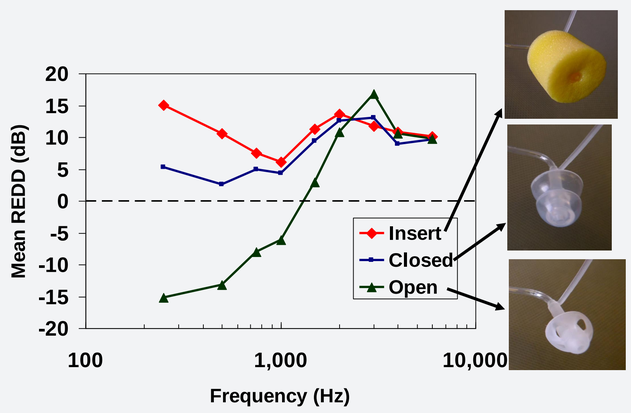
Supporting Research

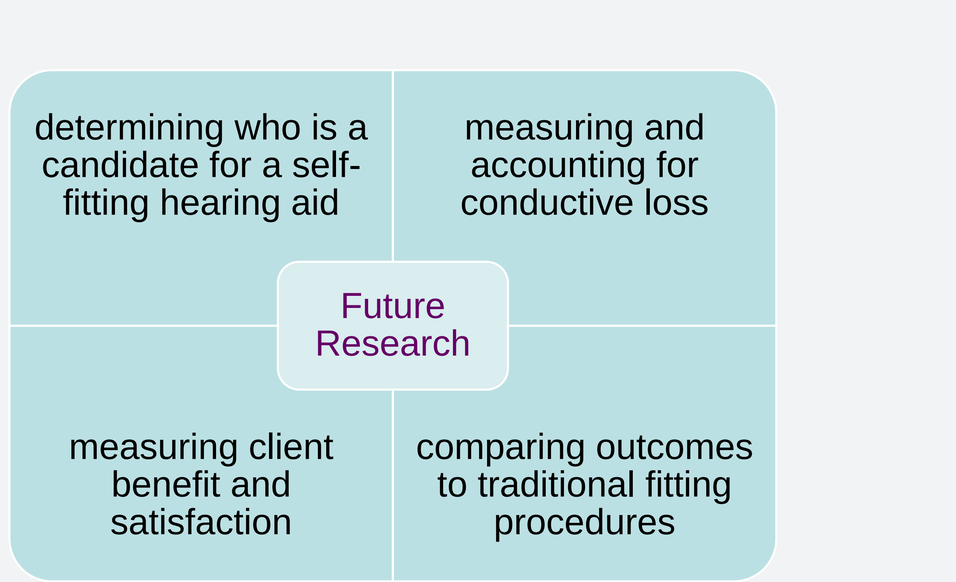
Two issues that are fundamental to the design of a self-fitting hearing aid are the reliability and validity of (1) automatic audiometry, and (2) audiometric threshold measurement using stimuli generated by the hearing aid. The results of a recent study conducted at NAL demonstrated that an automatic measurement of thresholds, performed by elderly clients without the assistance of an audiologist, yields results that are as valid as those obtained with manual audiometry (Carter et al., unpublished data). Test-retest reliability was also found to be high.





A second NAL study confirmed that reliable *in situ* measurement of air conduction thresholds can be made using stimuli that are generated by the hearing aid itself, as long as transducer- and coupling-specific correction factors are applied and ambient noise does not exceed the level of the test stimuli (O'Brien et al., submitted).





References

Brouillette R. (2008) Rehabilitation of hearing loss: challenges and opportunities in developing countries. In B. McPherson, R. Brouillette. Audiology in Developing Countries. New York: Nova Science Publishers, Inc.

Carter L, Dillon H, Zhou D. Unpublished automatic audiometry data.

Goulios H, Patuzzi R. (2008) Education and practice of audiology internationally: affordable and sustainable education models for developing countries. In B. McPherson, R. Brouillette. Audiology in Developing Countries. New York: Nova Science Publishers, Inc.

O'Brien A, Keidser G, Yeend I, Hartley L, Dillon H. (submitted) Validity and reliability of *in situ* air conduction thresholds measured through hearing aids coupled to closed and open instant-fit tips.

WHO (2004) Guidelines for hearing aids and services for developing countries. Geneva: World Health Organization.