Modeling Speech Production in Noise for the Assessment of Vocal Effort for Use with Communication Headsets

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Objectives
- Understand and model speech production in noise while wearing HPDs.
- Improving the experience of communication in noisy environments while wearing communication headsets.

Introduction
Improving communication for persons wearing HPDs with radio capabilities.

Advantages: Practical and affordable
Disadvantages: Lack of designated receivers

Solution: A Radio Acoustical Virtual Environment

Experimental Setup
- Equipped with intra-aural communication earpiece
- 5 different communication distances: 1 m, 5 m, 10 m, 20 m, and 30 m
- 4 noise conditions: Quiet, 70 dB (SPL), 80 dB (SPL), 90 dB (SPL)
- Task: Given a set of geographical maps, speakers are instructed to direct the listener from start to finish in one minute

Conclusions
Modeling speech production while wearing HPDs as a function of the noise level and the intended communication distance can aid in alleviating the communication problem for personal radio systems.

Funding

Hypothesis
Vocal power level as a function of communication distance as presented in Garcia et al. (2011)

\[
L_w = 59.54 + 2.96 \times \log_2 \left( \frac{d}{1.5} \right)
\]

Including the effect of noise:

\[
L_w = 59.54 + 2.96 \times \log_2 \left( \frac{d}{1.5} \right) + n \times [10 + 0.3 \times (N - 60)]
\]

Including the effect of noise and occluding the ear:

\[
L_w = 59.54 + 2.96 \times \log_2 \left( \frac{d}{1.5} \right) + n \times 0.125 \times (N - 60)
\]

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