A. Stinwill

• Speech recordings were taken from the TIMIT database.
• For consistency and sound pressure level control, the speech signals were digitised at 16-bit and sampled at 16 kHz.
• For the investigations of the independent effect of OHC and IHC impairments, the synthesized vowel with the spectrum shown in Fig. 3 was used.

B. Gain Optimization Strategy

• Optimal single-band gain adjustments around the hearing aid prescription gain were evaluated through the gain adjustment strategy shown in Fig. 2a. The gain adjustment strategy employed is the one that minimizes the errors in the syllable contrasts. Three equations were solved simultaneously on a pixel-by-pixel basis for the mixed impaired models:

\[
\begin{align*}
\text{Gain}_{\text{OHC}} & = \frac{E_{\text{NAL}} - E_{\text{OHC}}}{E_{\text{OHC}}} \\
\text{Gain}_{\text{IHC}} & = \frac{E_{\text{NAL}} - E_{\text{IHC}}}{E_{\text{IHC}}} \\
\text{Gain}_{\text{COHC}} & = \frac{E_{\text{NAL}} - E_{\text{COHC}}}{E_{\text{COHC}}}
\end{align*}
\]

where \(E\) is the spike-timing error as defined in Eq. 2. Errors in response phase are more dominant for mild loss, while errors in synchrony phase are more dominant for moderate-severe loss.

C. Influence of OHC Impairment

• For mixed OHC-IHC impairment alone, optimal gain adjustments were illustrated for these two cases in the right panels of Figs. 7 and 8. For moderate-severe IHC impairment alone, substantial spread of synchrony is produced if the gain is optimized to restore the mean-rate response.

REFERENCES


