Trainable hearing aids: clinical impact and reliability of training

Els Walravens 1,2,3, Louise Hickson 1,2, Gitte Keidser 1,3

1 HEARing CRC, 2 University of Queensland, 3 National Acoustic Laboratories

BACKGROUND
Trainable hearing aids (HAs) let users fine-tune their own devices. Based on the user’s consistent changes to the HA settings, the training algorithm will adjust the HA settings across listening environments, resulting in personalized settings over time.

Trainable or learning HAs have been commercially available for 10 years, but their impact in the clinic is unknown. Furthermore, it is unknown to what extent listeners can reliably select different HA settings in real-life listening environments, a requirement for successful training outcomes.

CLINICAL IMPACT*
An online survey was completed by 259 clinicians, 81 HA users and 23 HA candidates across Australia.

Provision and uptake
Of the surveyed clinicians, just over half activated training; a third did not have access to trainable HAs (or were unsure if the HAs they provided were trainable); and the remaining never activated training. Most of the clinicians who activated training did so for selected clients.

Experiences and expectations
- Using multiple questions, both clinicians and users reported mainly positive outcomes, for example:
  - 91% of clinicians accepted the trained settings the client had obtained most of the time.
  - All but 1 of the trainable HA users indicated they would consider training again.
- Over 85% of HA users and candidates without experience expressed interest in training their (future) HAs.

RELIABILITY
Participants
To date: 12 volunteers with symmetrical hearing ranging from within normal limits to moderate sensorineural hearing loss.

Hearing aids and settings
A pair of in-house omnidirectional HAs was set-up to NAL-NL2 with a minimum of 5 dB insertion gain from 250 to 4000 Hz.

Environments
Two background noises (real-life recordings) and two speech signals were combined to create four listening environments presented in a 16-speaker array:

<table>
<thead>
<tr>
<th>Target</th>
<th>Masker</th>
<th>SNR</th>
</tr>
</thead>
<tbody>
<tr>
<td>NA</td>
<td>Traffic</td>
<td>67.3 dB</td>
</tr>
<tr>
<td>Monologue</td>
<td>Traffic</td>
<td>67.3 dB</td>
</tr>
<tr>
<td>Dialogue</td>
<td>Café</td>
<td>67.6 dB</td>
</tr>
<tr>
<td>Dialogue</td>
<td>Café</td>
<td>67.6 dB</td>
</tr>
</tbody>
</table>

Values listed are dB A LTA.

Task
Participants were asked to select their preferred settings, A or B, with settings differing in directionality, intensity or gain-frequency response. Each A-B pair was repeated 10 times in each environment and participants could listen to the settings for as long and as often as they liked.

Preference was considered reliable when a setting was preferred 9 or 10 times out of 10 presentations.

Preliminary results
The number and percentage of reliable participants is displayed below for each setting and environment.

Traffic noise
N = 11

- Dialogue in café noise
  - Monologue in traffic noise + 5 dB SNR
    - N = 12

Dialogue in café noise + 5 dB SNR
N = 12

Dialogue in café noise 0 dB SNR
N = 12

Conclusion
Based on survey data, there seems to be a place for trainable HAs in clinical practice. Reliability of preference decreases with decreasing difference between intensity and gain-frequency responses and with increasing complexity of environments. Reliable preferences for directionality seem to depend on the masking of speech.