Trainable hearing aids: clinical impact and reliability of training

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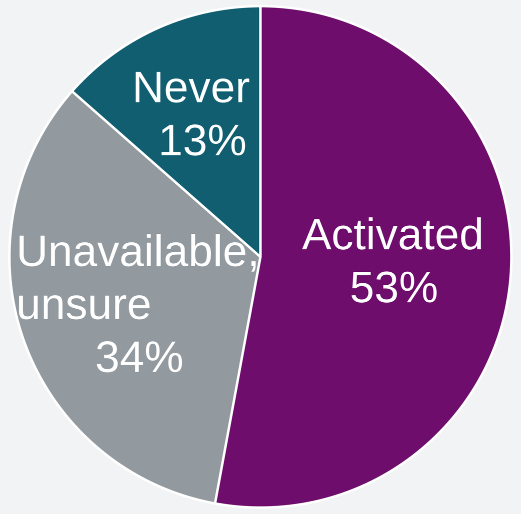
BACKGROUND

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.

Of the surveyed HA users, 15 had experience training their HAs.

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.

* *Walravens E, Keidser G and Hickson L (in press). Provision, perception and use of trainable hearing aids in Australia: a survey of clinicians and hearing impaired adults. Int J Audiol.*

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.

Setting		Difference	Difference from baseline
Directionality	*Dir*	Omnidirectional and directional	
Intensity, large	I_L	6 dB	+2 and -4 dB
Intensity, small	I_S	3 dB	+1 and -2 dB
Gain-frequency, large	Gf_L	2.7 dB/oct	+ and -4 dB at 0.5 & 4kHz
Gain-frequency, small	Gf_S	1.3 dB/oct	+ and -2 dB at 0.5 & 4kHz

Environments

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

Target		Masker		SNR
NA		Traffic	*67.3 dB*	
Monologue	*72.3 dB*	Traffic	*67.3 dB*	+5
Dialogue	*67.3 dB*	Café	*67.6 dB*	0
Dialogue	*72.3 dB*	Café	*67.6 dB*	+5

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.

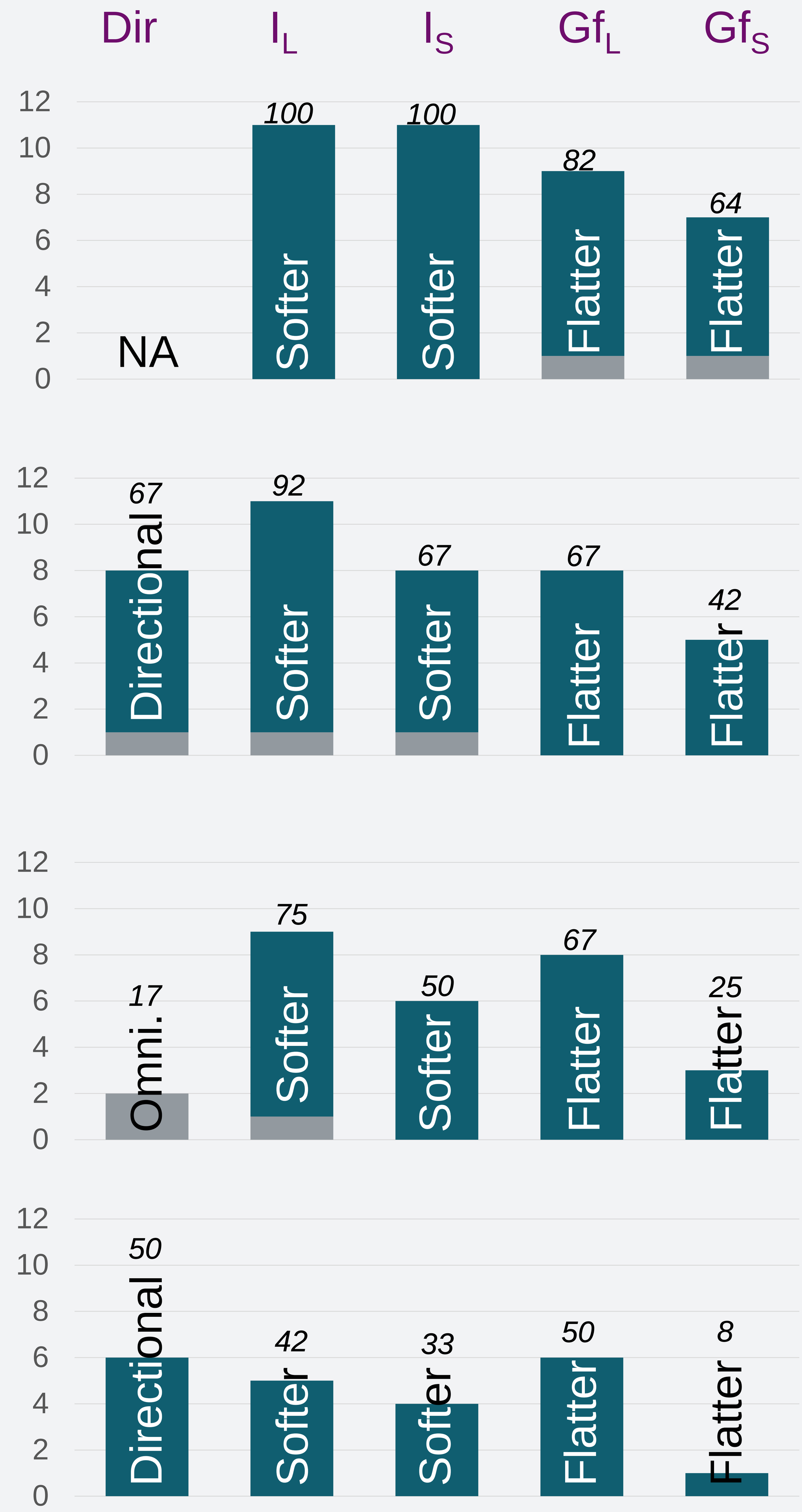
Settings:

Traffic noise
N = 11

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.