

LEFT TO THEIR OWN DEVICES?

*What the evidence tells us
about self-fitting hearing aids*

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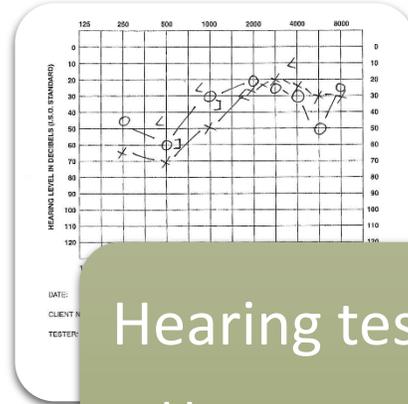
THE UNIVERSITY
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AUSTRALIA

WHAT ARE SELF-FITTING HEARING AIDS?



Physical fit

- Ear tip size
- Tube length



Hearing test

- User-directed
- *In situ*



Fitting formula

- Automatic
- First fit



Fine-tuning

- User-directed
- Real world

Hearing aids that are set up for the user, by the user

COMMERCIAL AVAILABILITY

SoundWorld Solutions

- 16-channel WDRC, noise suppression, feedback cancellation
- Directional microphones
- Bluetooth connection to self-fitting app
- Rechargeable batteries, retractable tubing, 3 ear tip sizes



iHear Medical

- 4-channel WDRC, noise suppression, feedback cancellation
- USB programmer with cables
- Variety of ear tip sizes
- Hearing test with ambient noise sensing, calibrated earphones

POTENTIAL BENEFITS OF SELF-FITTING



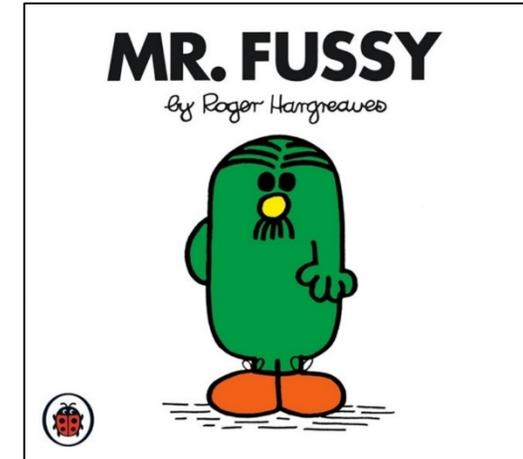
Accessibility

For rural and remotely located people in developed countries; for parts of the developed world that lack an audiological infrastructure



Affordability

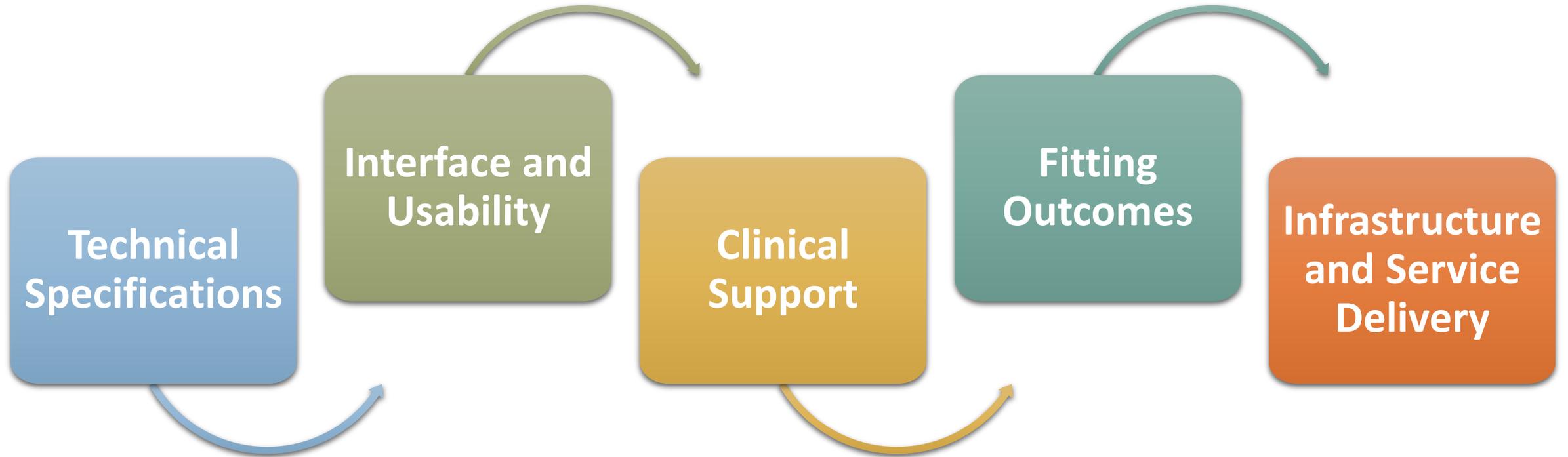
Less expensive than conventional hearing aids, since there are no professional service fees



User control

Ability to make permanent adjustments to the hearing aid settings in real time and in real-world listening environments

PRESENTATION ROADMAP



PHYSICAL DESIGN CONSIDERATIONS

Physical fit modifications
under user control

Automatic diagnostic
test of LF leakage to
ensure correct ear tip
size and placement

Reliable and valid *in situ*
audiometry algorithm

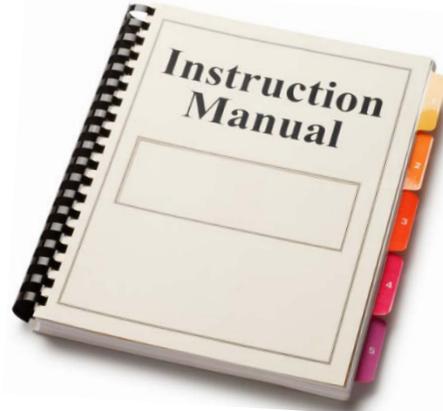


Correction factors for
transducer, coupling, ambient
noise, residual LF leakage

Integration of quality
checks to ensure valid
audiometric thresholds

Automatic application
of fitting rationale

Task: Assemble and insert a pair of RIC-style hearing aids



Success Rate
25%

Participants with lower health literacy levels were significantly less likely to succeed



Success Rate
63%

Health literacy was **not** a significant predictor of the outcome...

...despite significantly lower levels of health literacy in this sample

Task: Insert a pair of RIC-style hearing aids

| Overall Task | Insertion % Correct |
|--|---------------------|
| Assemble and insert a pair of RIC-style HAs | 46 |
| Insert pair of RIC-style HAs and perform <i>in situ</i> audiometry | 64 |
| Full self-fitting setup with prototype self-fitting HAs | 58 |
| Full self-fitting setup with commercial self-fitting HAs | 80 |



Step 3 – Insert the hearing aids

1. Place the hearing aid behind your ear, hanging the tube and earpiece over the front of your ear.
2. Insert the ear tip all the way into your ear canal.
3. The ear tip should fit snugly and comfortably in your ear.
4. Do these steps for both ears.

Note: The insertion video (and all other self-fitting instructional videos) can be found at <http://diy.nal.gov.au>



“Click the black rectangle to watch a video about inserting your hearing aids.”

USER INTERFACE



More processing power

Visual interface

Multifunctional
(not just for HAs)

Existing ownership

Conversant with only one or two functions

“Hand-me-downs” from younger family members

Low penetration among prime HA demographic

Task: Set up a pair of self-fitting hearing aids



N = 60



| | Step | % Correct |
|-------------------|----------------------|-----------|
| PHYSICAL HANDLING | Identify L & R HAs | 97 |
| | Choose ear tips | 97 |
| | Adjust tubes | 87 |
| | Insert HAs | 80 |
| USING THE APP | Pair HAs to phone | 58 |
| | Assign ears in app | 42 |
| | Test hearing | 63 |
| | Practice fine-tuning | 80 |

CLINICAL SUPPORT



Layperson

Lacks necessary expertise



***Trained clinical
assistant***



Audiologist

Perhaps *overqualified?*



| Step | With clinical assistant help (% correct) |
|----------------------|---|
| Pair HAs to phone | 91 |
| Assign ears in app | 93 |
| Test hearing | 90 |
| Practice fine-tuning | 88 |



| Step | With clinical assistant help (% correct) | With lay partner help (% correct) |
|----------------------|---|--------------------------------------|
| Pair HAs to phone | 91 | 53 |
| Assign ears in app | 93 | 55 |
| Test hearing | 90 | 72 |
| Practice fine-tuning | 88 | 72 |

CONVERY ET AL. (2016)

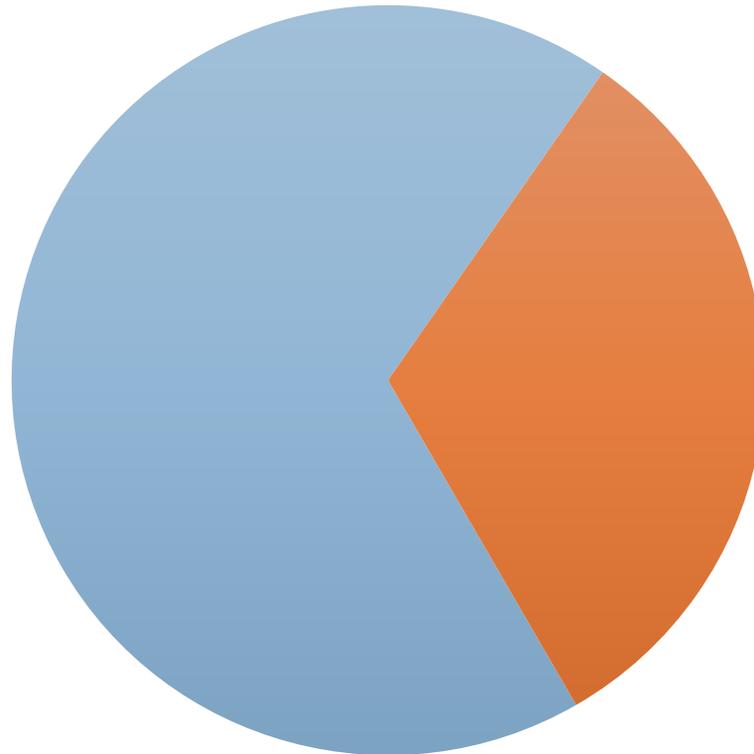
OVERALL PERFORMANCE

68% Successful

Completed the self-fitting task independently, using the instructions only

OR

Correctly identified specific difficulties and sought help with them from the clinical assistant



N = 60

32% Unsuccessful

Did not complete the self-fitting task

OR

Source(s) of error were identified opportunistically by the clinical assistant, not by the participant

PREDICTORS OF SUCCESS

A person who is successful at setting up a self-fitting hearing aid is...

32 times more likely to own a smartphone or tablet

20 times more likely to have previous experience with conventional hearing aids

These two variables correctly classify 75% of cases



A successful self-fitter also has...

A less external health LoC

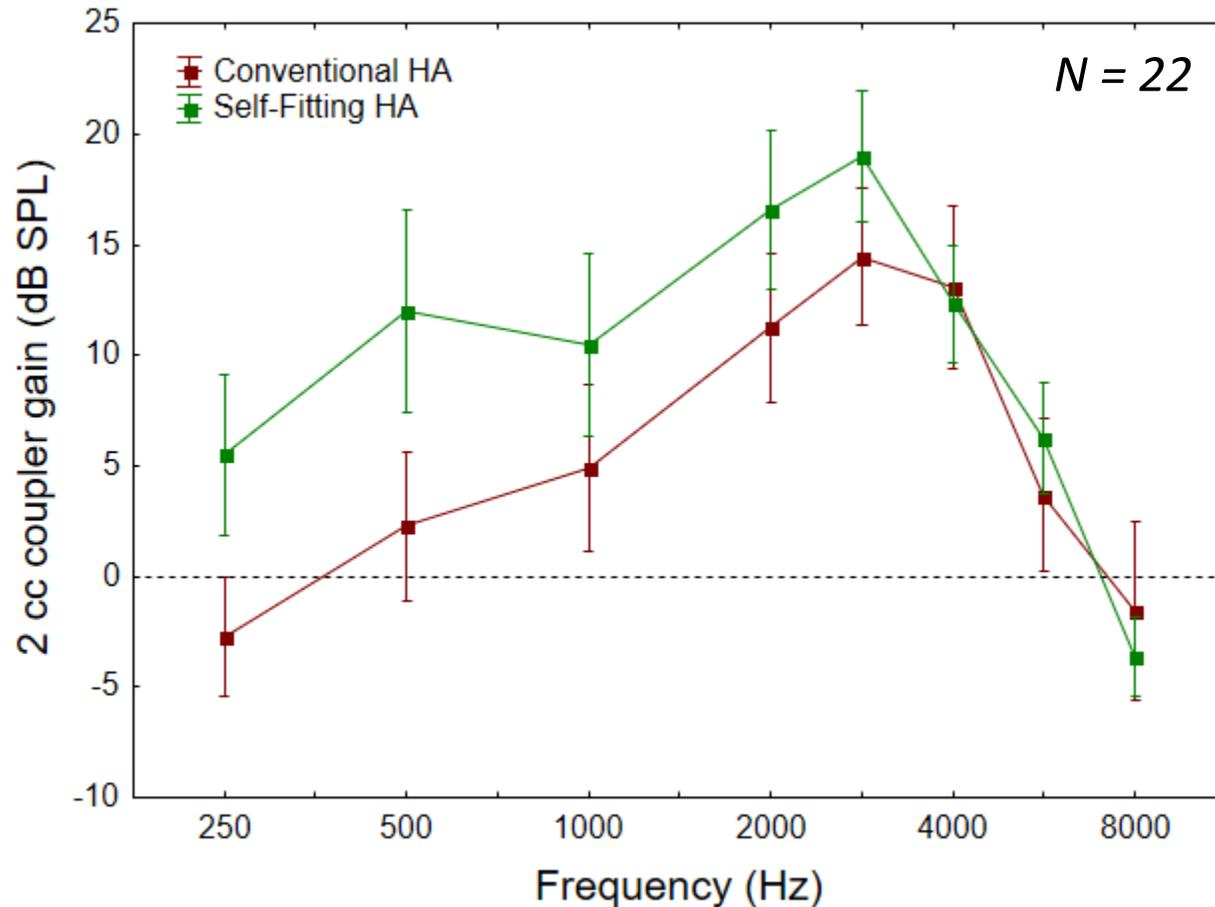
Better self-management skills

Higher HA self-efficacy

Better problem-solving skills

All six variables correctly classify 80% of cases

GAIN / FREQUENCY RESPONSE



Self-fitting HAs provided significantly more gain at and below 3000 Hz

- Fitting rationale differences
- Fine tuning differences: only the self-fitting HAs allowed adjustment of the frequency response shape
- *Partial contributor: overestimation of 500 Hz threshold by in situ audiometry algorithm (10 dB)*

SPEECH DISCRIMINATION

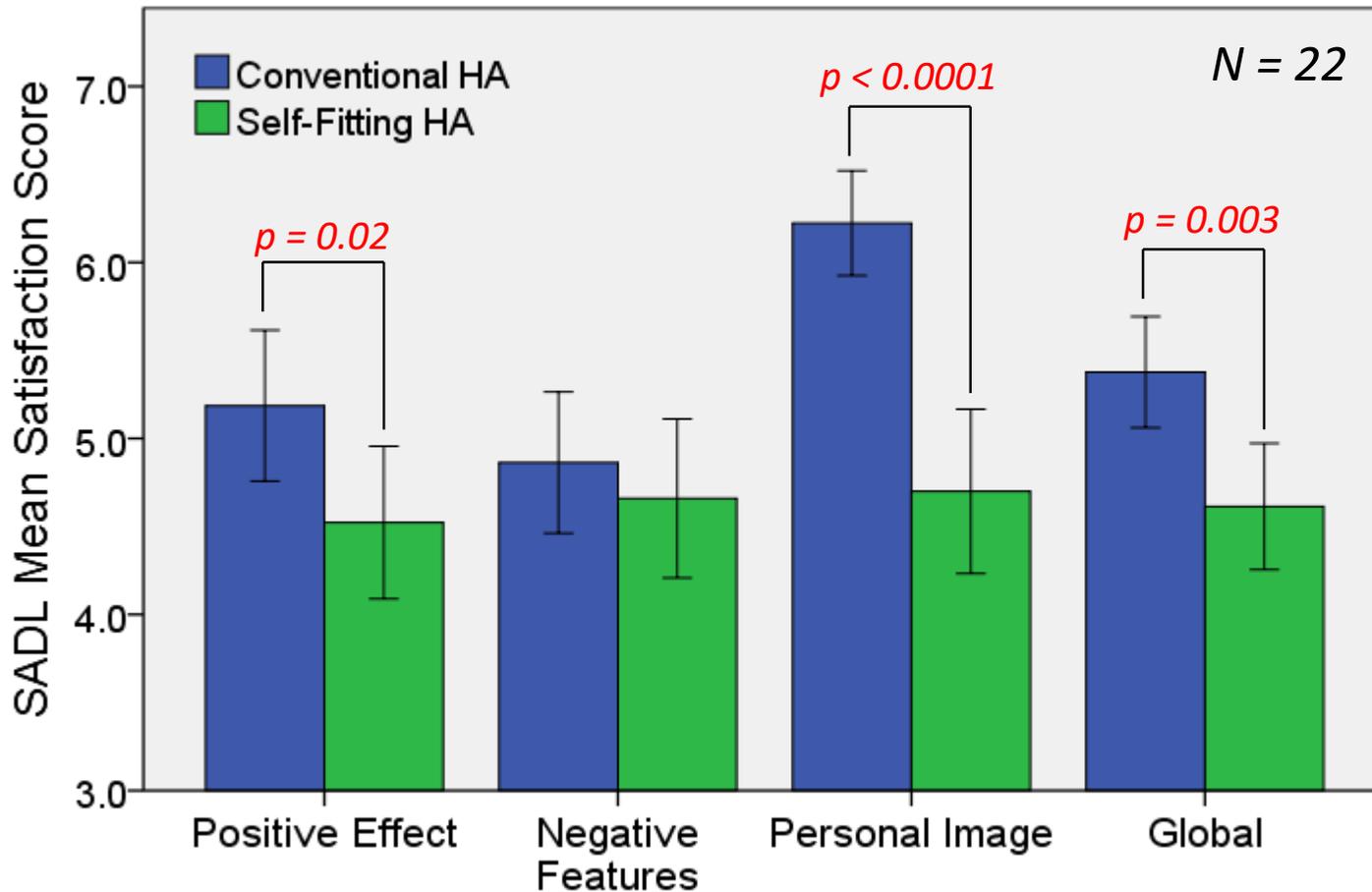
**No significant difference in
speech reception threshold**

| Condition | SRT ₅₀ (dB SNR) |
|-----------------|----------------------------|
| Self-fitting HA | -0.14 |
| Conventional HA | -0.55 |

N = 22



SATISFACTION

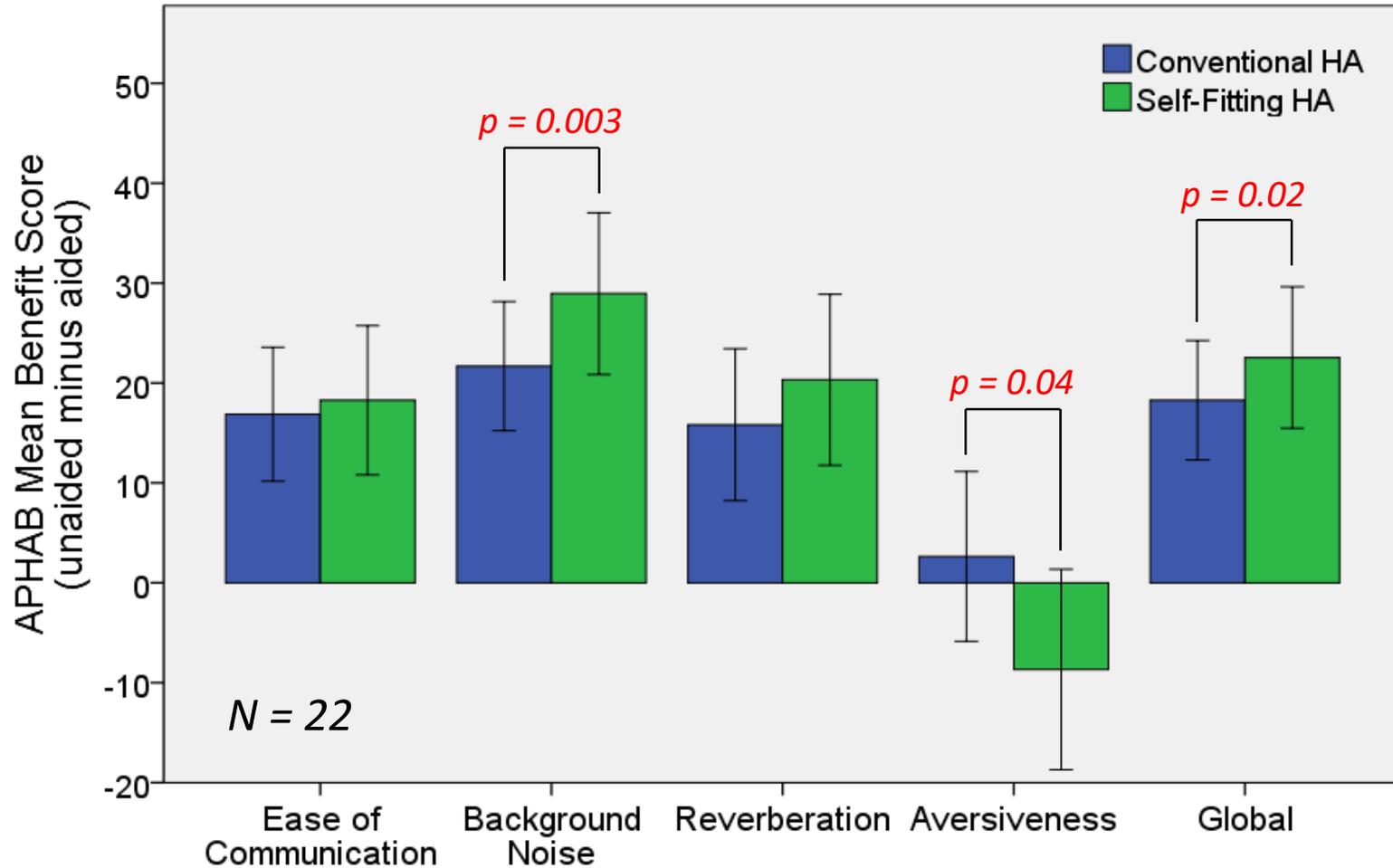


Conventional HAs were rated as significantly better at improving communicative confidence and reducing requests for repetition

Conventional HAs were rated as significantly more physically appealing

Conventional HAs were rated as significantly more satisfactory overall

BENEFIT



Self-fitting HAs were rated as significantly more beneficial in background noise

Conventional HAs were rated as significantly more beneficial in the presence of aversive or uncomfortably loud sounds

Self-fitting HAs were rated as significantly more beneficial overall

SELF-FITTING IN CLINICAL PRACTICE?



Why offer?

Additional option to appeal to a wider/more diverse array of clients

Increase geographic reach

Free up time to carry a larger caseload, see more complex clients, meet psychosocial needs



Why choose?

Receive a proper assessment of candidacy – and alternative options

Option of receiving rehabilitative support from an audiologist

Less costly than conventional hearing aids

“How do I get my husband to look at me when he’s speaking?”

“What do I say when my friends see my hearing aids?”



ACKNOWLEDGEMENTS

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