Ecological momentary assessment and its potential as future clinical tool

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- Rehabilitation outcomes for adults with hearing impairment
- Intervention options for adults with hearing and balance issues
- Implementation of family-centred care in audiology
- New approaches in mHealth and teleaudiology.

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What is Ecological Momentary Assessment (EMA)?

Using EMA in research

EMA as a clinical tool

Measuring hearing impairment

- Audiometry shows hearing acuity
- Low correlation with self-reported hearing difficulties, esp for mild hearing impairment

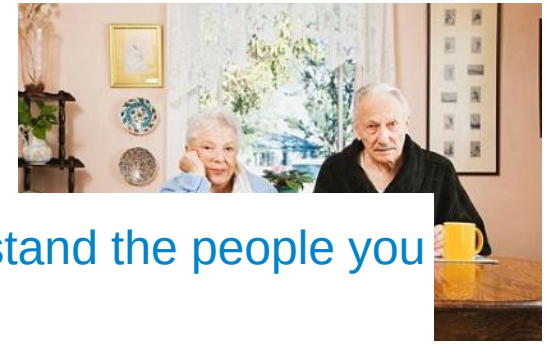
- Self-report gives better insight into activity limitations and participation restrictions

Timmer, B. H. B., Hickson, L., & Launer, S. (2015). Adults with mild hearing impairment: Are we meeting the challenge? *International Journal of Audiology, 54*(11), 786-795

Self-report measures

- Traditional self-report measures require input from the participant based on his/her memory and experience of select listening situations, often generalized across listening situations.





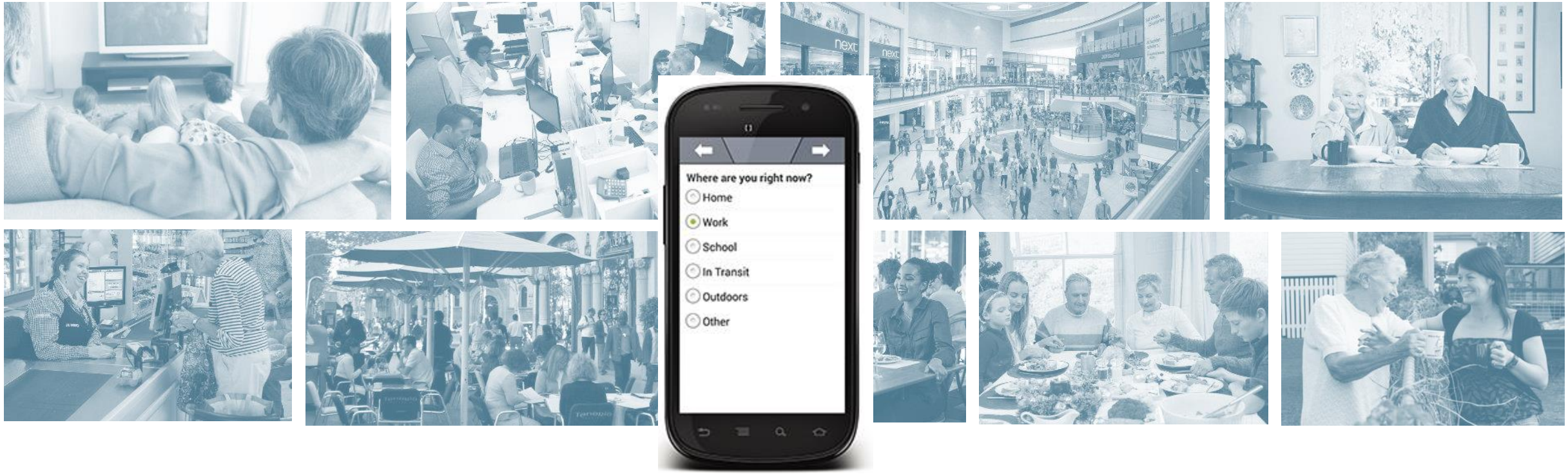
Compared to using no hearing aid at all, do your hearing aids help you understand the people you speak with most frequently?





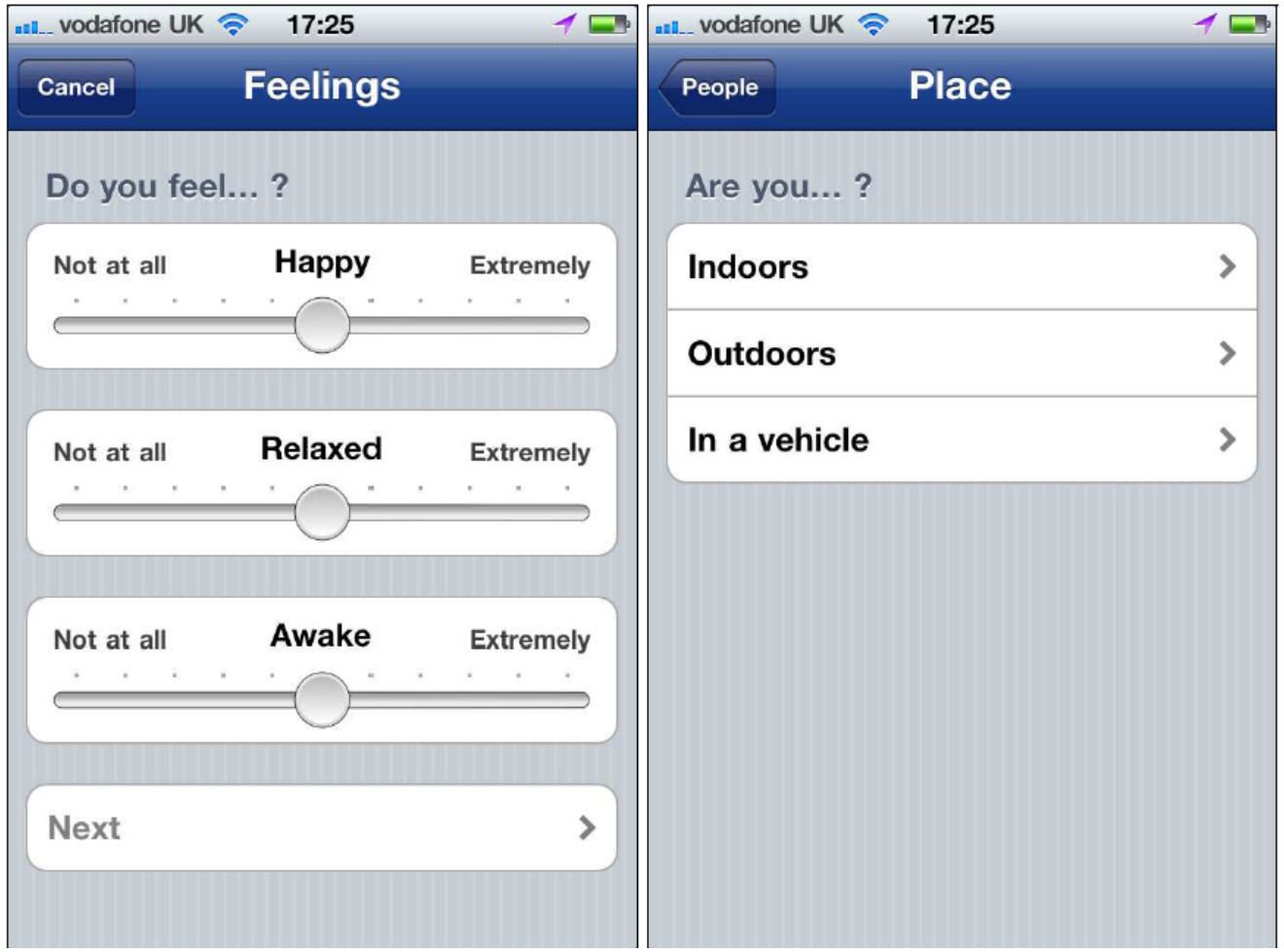
Self-report measures

- Ecological Momentary Assessment (EMA) captures data about experiences in real time, in participants' natural environments.



Timmer, B. H. B., Hickson, L., & Launer, S. (2018). The use of ecological momentary assessment in hearing research and future clinical applications. Hearing Research, Early online. doi: 10.1016/j.heares.2018.06.012.

Happiness study



MacKerron G. & Mourato S. 2013. Happiness is greater in natural environments. *Global Environmental Change*, 23, 992-1000.

Happiness study

Over one million responses from more than 20,000 participants.

outdoors

birdwatching

with friends

in heathland

on a hot

sunny

Sunday early afternoon

commuting

on his or her own

in a city

in a vehicle

on a cold

grey

early weekday morning.

MacKerron G. & Mourato S. 2013. Happiness is greater in natural environments. *Global Environmental Change*, 23, 992-1000.

What is EMA?

Surveys of current experiences in real time and at multiple times per day.

- Used across many health disciplines to investigate chronic conditions e.g., pain, substance addiction, eating disorders, and mental health disability.
- Also called experiential sampling.
- Can yield a large number of reports per participant and allow for investigation of variability between and within individuals.
- Use of smartphones increases reliability.
- Valid and relevant for audiology research.

Timmer, B. H. B., Hickson, L., & Launer, S. (2017). Ecological momentary assessment: Feasibility, construct validity and future applications. *American Journal of Audiology, 26*(3S), 436-442.

EMA findings from mild hearing loss study

In 91% of listening events participants rated their percentage of speech understanding as either 75% or 100%.

In 67% of listening situations, participants reported that listening effectively required effort.

Using EMA to measure hearing aid benefit

The most common intervention for adults with mild hearing impairment is the provision of hearing aids.

Some audiologists adopt a ‘wait and retest’ approach rather than provide hearing aids.

Research question:

Can hearing aids provide benefit for adults with a mild hearing impairment in daily life, as measured by EMA?

Participant characteristics

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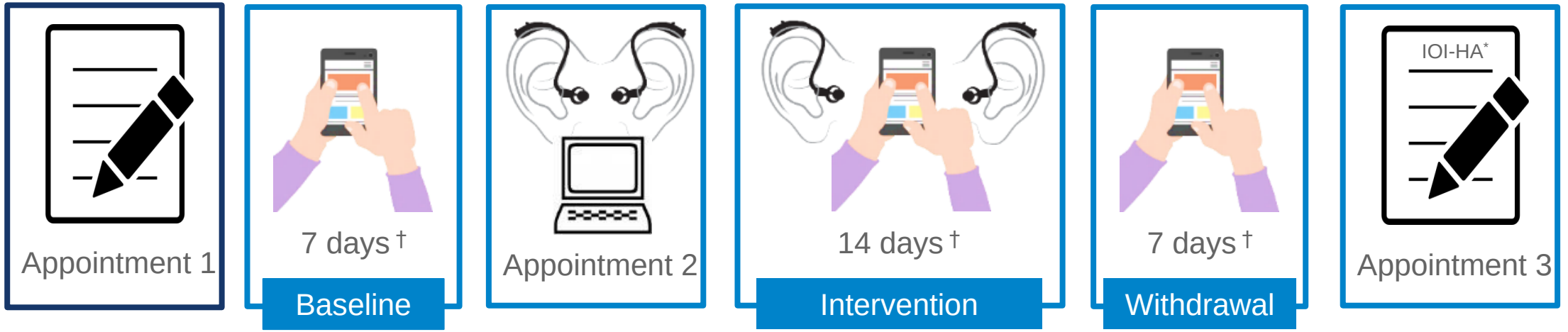
	Age (years)	Sex	Length of hearing difficulties (years)	Confidence in managing HAs	Attitude to HAs
1	71	Female	2	Quite a bit	0
2	73	Male	10	Quite a bit	2
3	75	Female	9	Quite a bit	-3
4	65	Male	17	Quite a bit	-1
5	65	Male	8	Extremely	1
6	81	Female	15	Somewhat	1
7	71	Female	7	Quite a bit	0
8	57	Male	20	Extremely	2
9	72	Male	6	Quite a bit	0
10	67	Male	4	Extremely	-2

Timmer, B. H. B., Hickson, L., & Launer, S. (2018). Do Hearing Aids Address Real-World Hearing Difficulties for Adults With Mild Hearing Impairment? Results From a Pilot Study Using Ecological Momentary Assessment. *Trends in Hearing, 22*, doi: 10.1177/2331216518783608.

Study design



† Target: 3 EMA surveys/day, 16 questions about listening activity, characteristics of the listening event and hearing performance.

EMA survey - listening event

Listening activity, and characteristics of the listening situation and acoustic environment, e.g.,

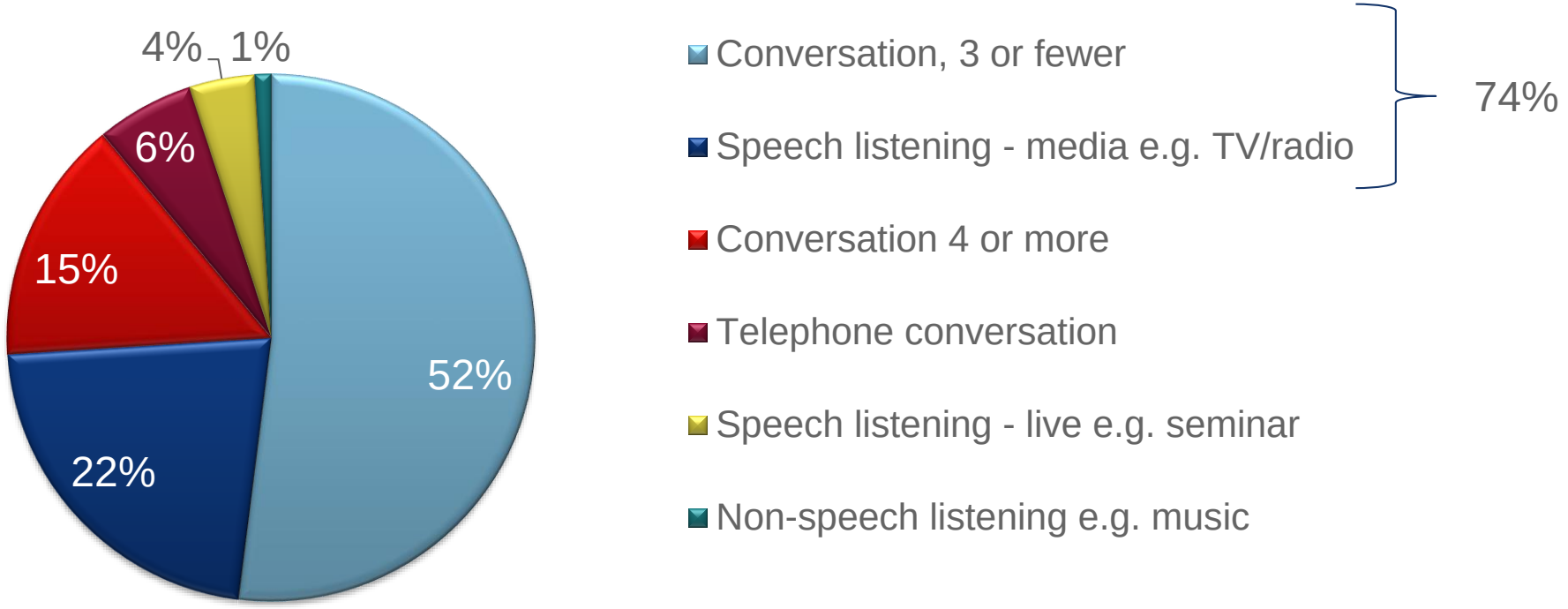
What were you listening to?	☐ Conversation, 3 people or fewer ☐ Conversation, 4 people or more ☐ Speech listening, live ☐ Speech listening, media ☐ Conversation on phone
Compared to an average living room, how large was the room?	☐ Smaller ☐ About average ☐ Larger
Were you familiar with the speaker(s)?	☐ Unfamiliar ☐ Somewhat unfamiliar ☐ Somewhat familiar ☐ Familiar
On average, how noisy was it during the listening event?	☐ Quiet ☐ Somewhat noisy ☐ Noisy ☐ Very noisy

EMA Survey – hearing performance

On average, how much **speech** did you understand during the listening event?	☐ 0% ☐ 10% ……. ☐ 90% ☐ 100%
On average, how much **effort** did you have to put in to listen effectively?	☐ No effort ☐ Some effort ☐ Moderate effort ☐ Quite a bit of effort ☐ A lot of effort
Do you feel that any difficulty with your hearing negatively affected or **hampered communication** during this listening event?	☐ Not at all ☐ A little ☐ Moderately ☐ Quite a bit ☐ Very much
Do you feel your hearing negatively affected your **enjoyment** of this listening event?	☐ Not at all ☐ A little ☐ Moderately ☐ Quite a bit ☐ Very much

Results

A total of 860 listening event surveys collected from the 10 participants (mean= 67.4, range = 43 – 112 per participant)



► Participants were predominantly in non-complex listening situations.

Effect size calculation of benefit

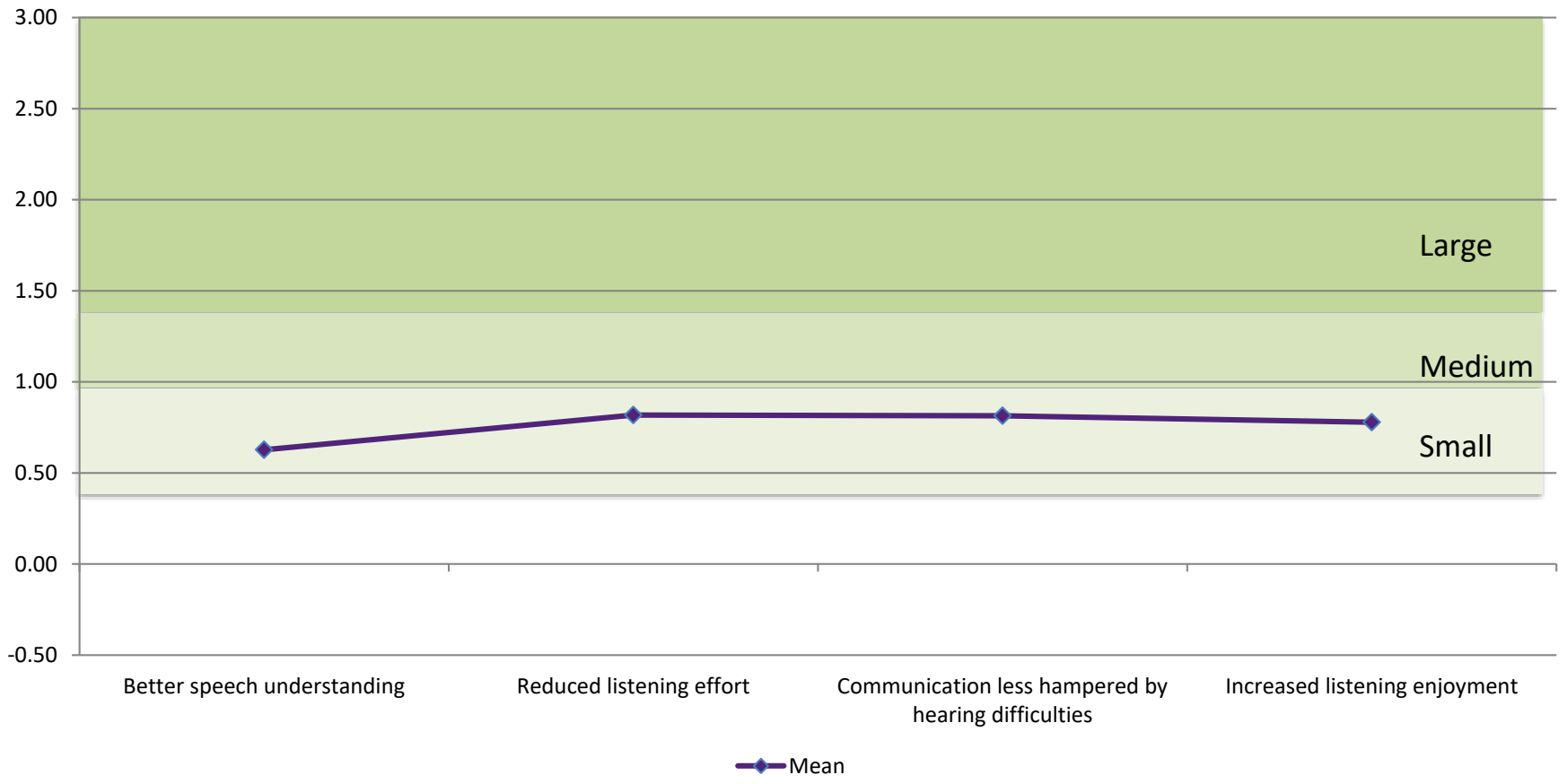
Benefit effect size = scores baseline (no HA) vs intervention (HA)

Four hearing performance dimensions: speech understanding, listening effort, communication impact and listening enjoyment.

Benchmarks for effect sizes from:

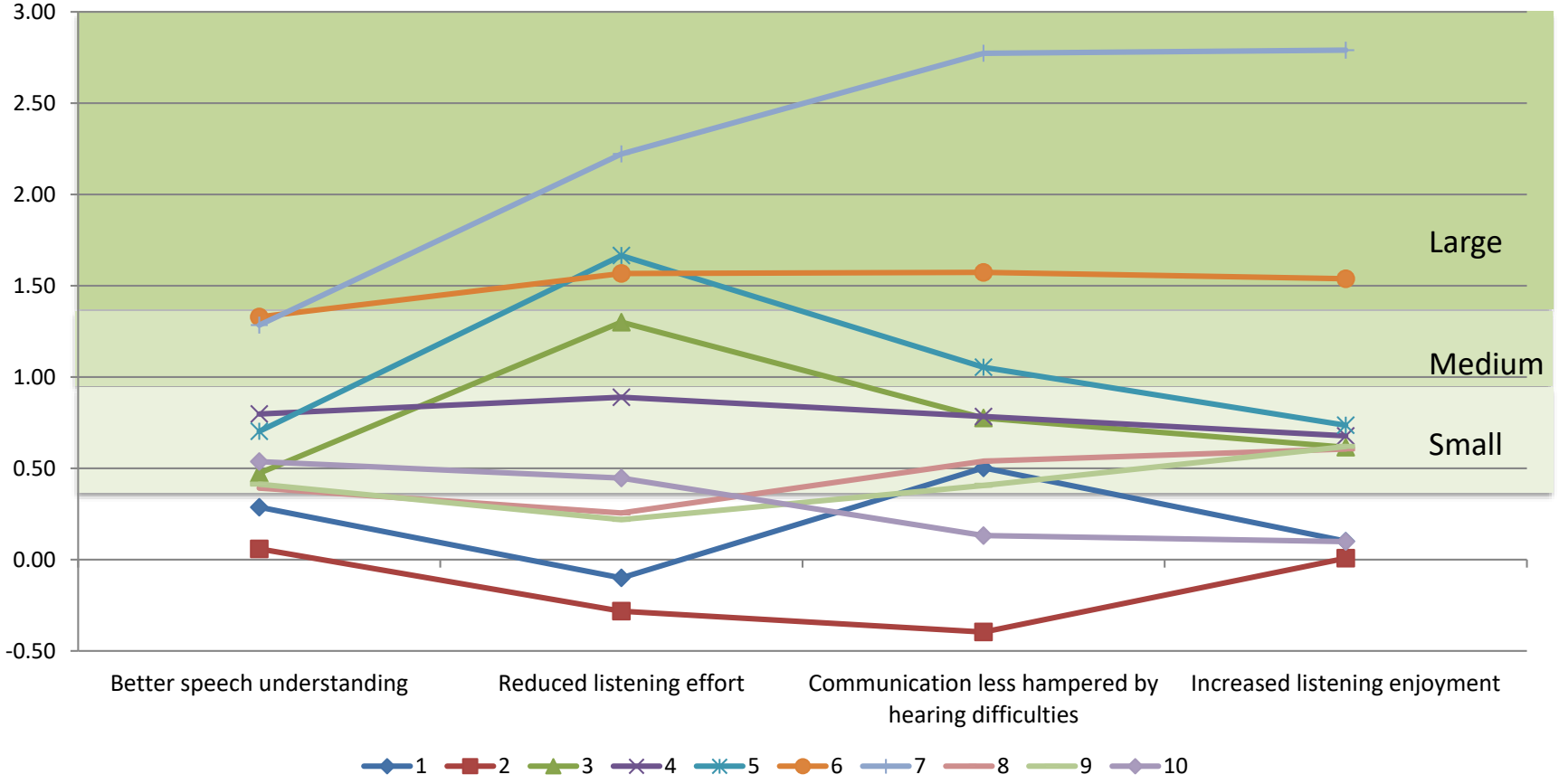
Johnson, C. E., Danhauer, J. L., Ellis, B. B., & Jilla, A. M. (2016). Hearing aid benefit in patients with mild sensorineural hearing loss: A systematic review. *Journal of the American Academy of Audiology, 27*(4), 293-310. doi: 10.3766/jaaa.14076.

Group hearing aid effect size



► As a group, participants reported small benefit from hearing aid for all four dimensions

Individual hearing aid effect size

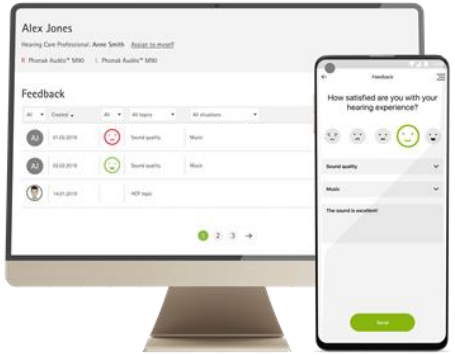


Conclusions

- Mild hearing impairment may have little bearing on speech understanding in common (non-complex) real-world listening events, but greater impact on other aspects that affect daily communication.
- Real-world data can be used to highlight **individualised** hearing aid benefit, a need for further counselling, or hearing aid modifications.

Smartphone-based EMA as clinical tool

- Smartphone-based EMA is a prime example of a potential mHealth tool with relevant clinical benefits.
- Smartphone and tablet ownership is increasing in all age groups.



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EMA can support the entire patient journey

EMA can be used when goals or outcomes change

EMA can alert audiologists to provide assistance

EMA can inform audiologists which adjustments are required

EMA can give insight into candidacy and specific hearing difficulties

EMA can guide individualized goal setting

EMA can:

- Collect real-world information, about situations relevant to the individual.
- Gain information about dimensions beyond speech understanding which can affect communication and well-being.
- Provide insights other measures can’t.
- Be easily individualized.
- Support the individual in self-management.
- Be a valuable mHealth clinical tool in future.

Thank you

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