Optimising virtual meetings for people with hearing loss

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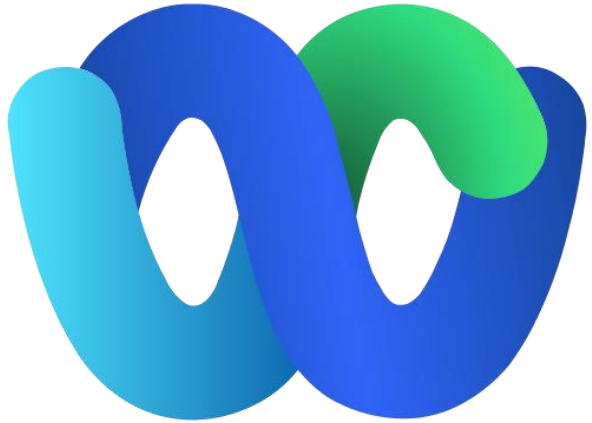
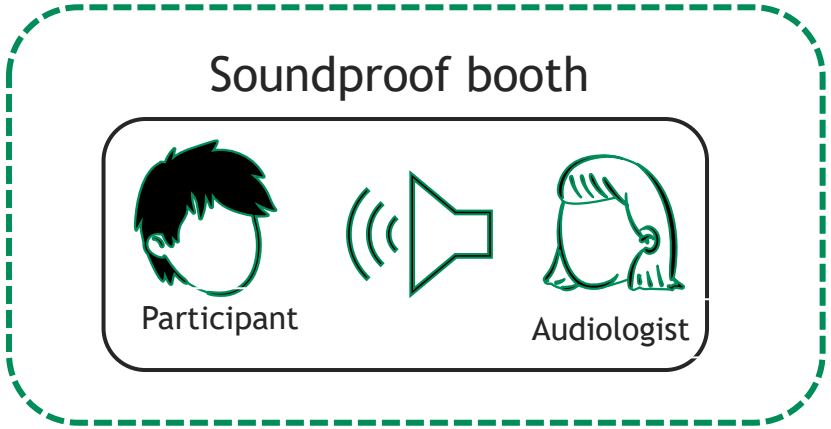
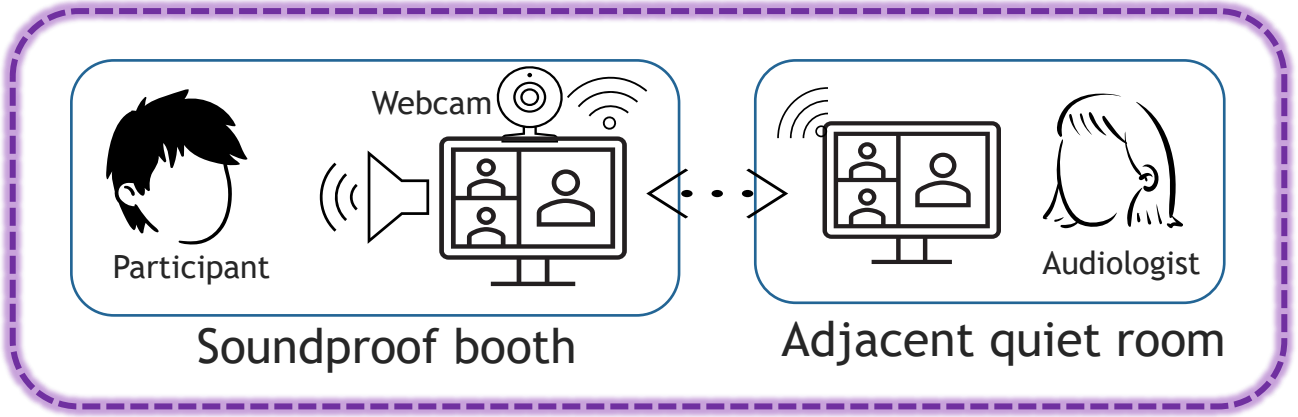


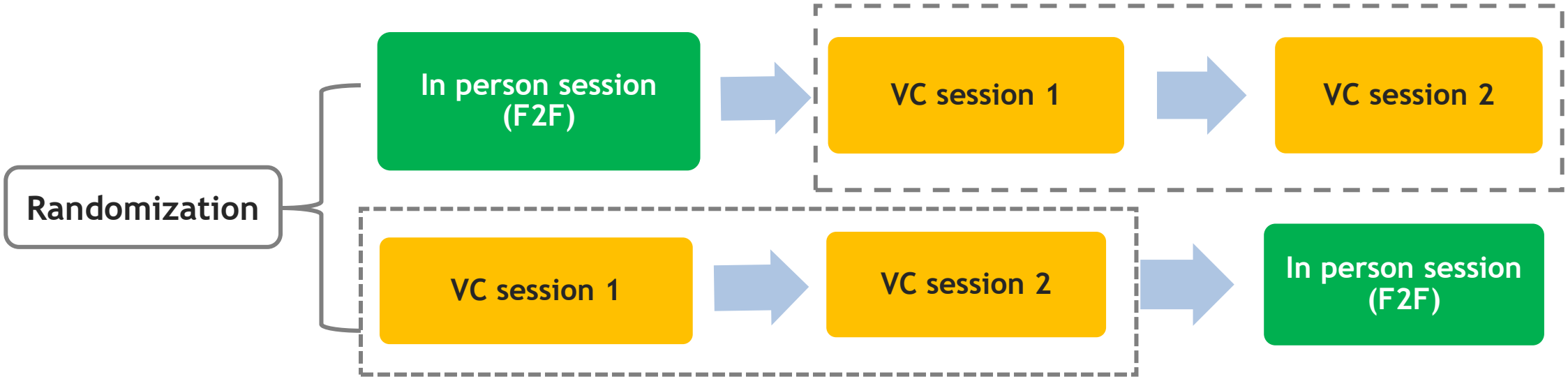

zoom



In person session



Videoconference session

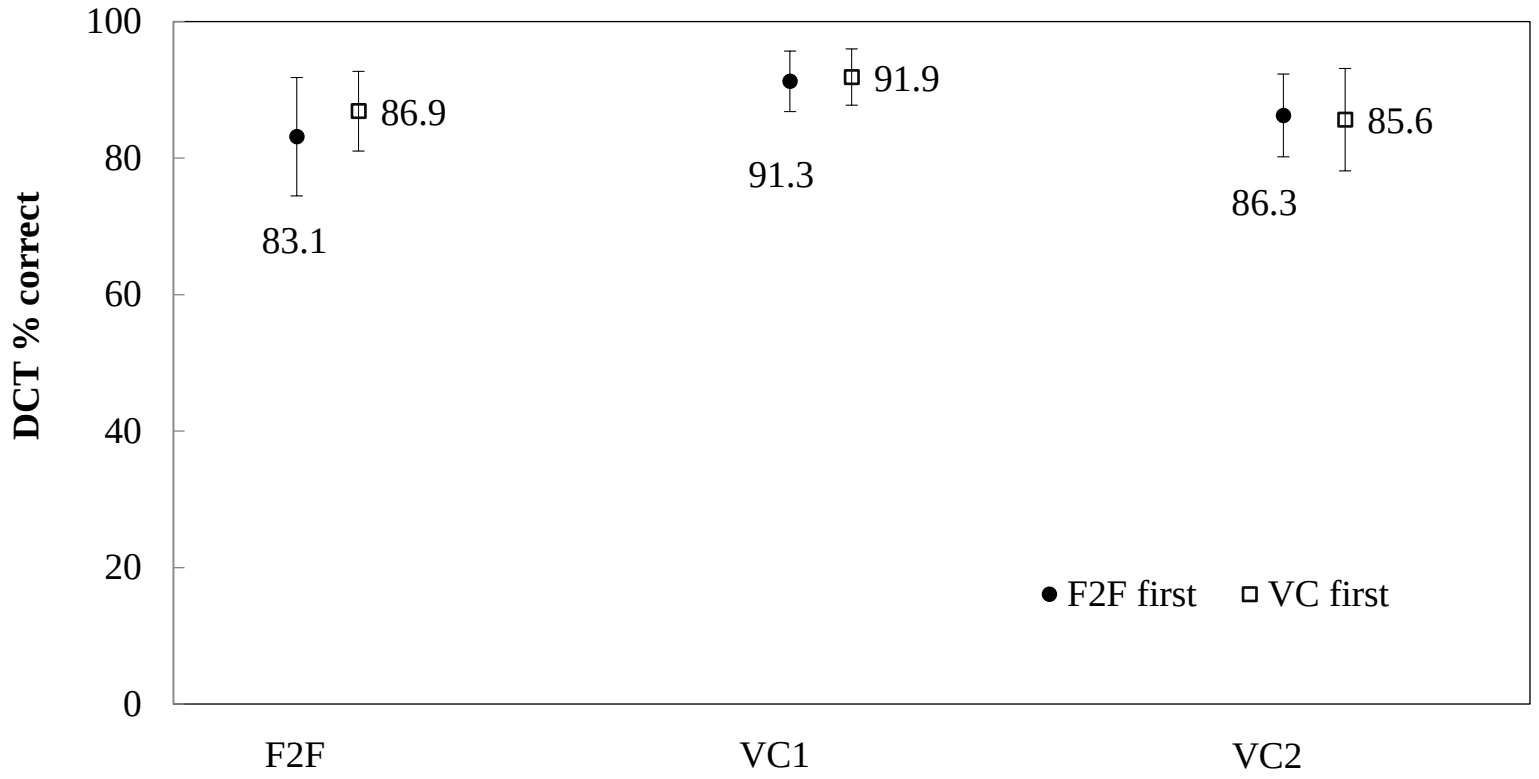


Testing Condition 1
-Hearing tests
-Speech perception
-Speech comprehension
-Self-reported questionnaire

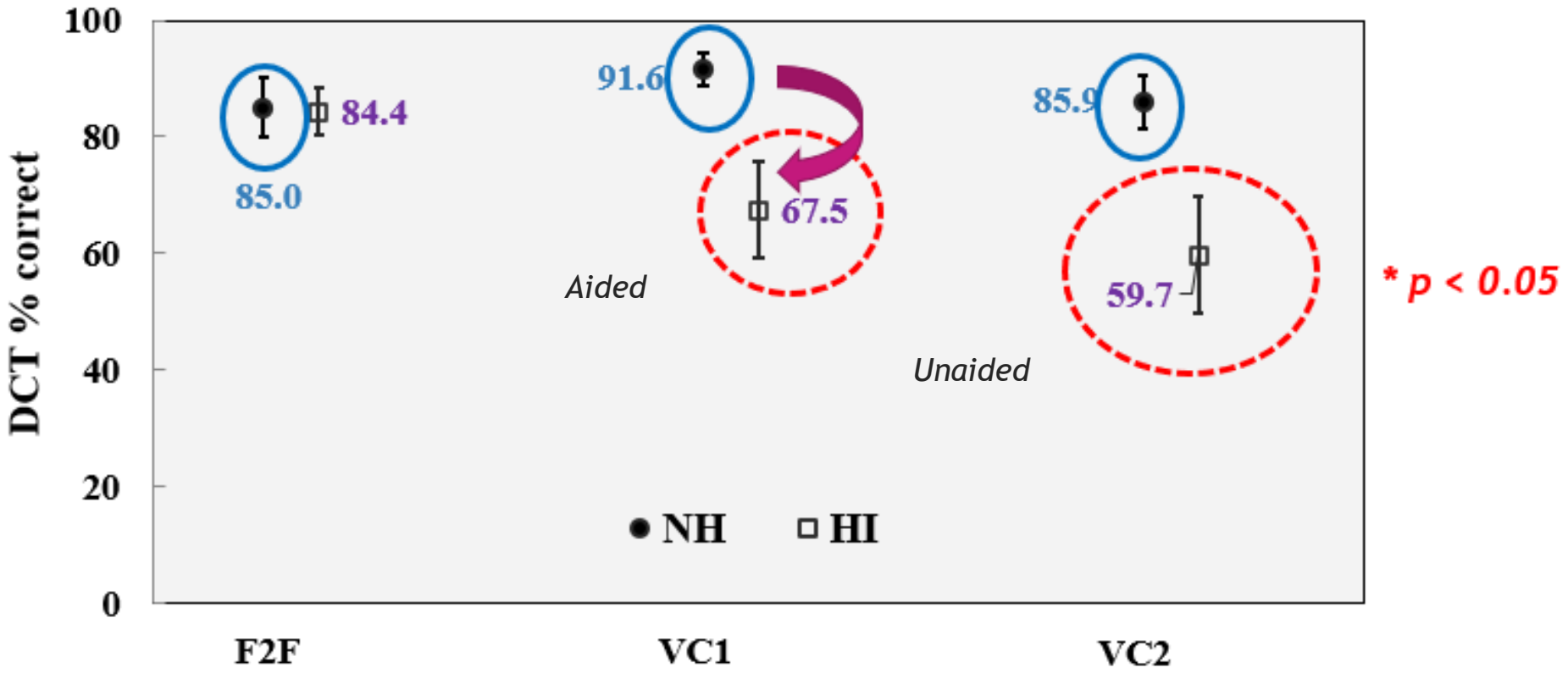
-Testing Condition 2
-Speech perception
-Speech comprehension
-Self-reported questionnaire

-Testing Condition 3
-Speech perception
-Speech comprehension
-Self-reported questionnaire

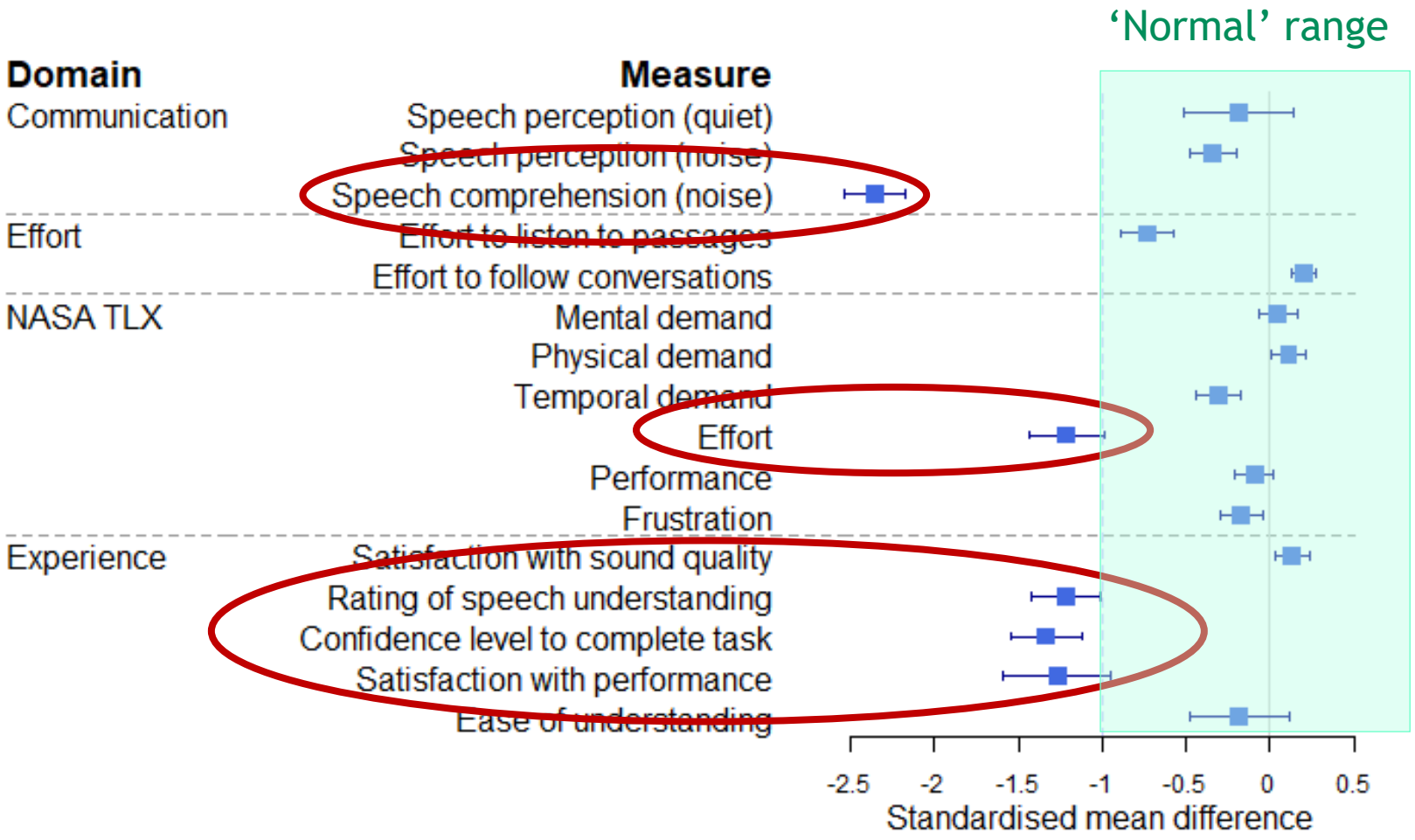
Performance of listeners without hearing loss



Groups with and without hearing loss



Groups with and without hearing loss



Interim conclusions

- **People with hearing loss (HL) have significantly greater difficulties** when communicating via videoconferencing (VC) platforms, compared to people without hearing loss.

- Hearing aids can help people with hearing loss understand speech and follow conversations on videoconference calls, but **do not fully overcome their difficulties** when used to listen via laptop speakers.

- There is a need for **evidence and guidance for hearing aid users** as to the optimal ways of using videoconferencing platforms (e.g. using headphones, streaming, or other enhancements)

RESEARCH QUESTION

How do different methods of using video conferencing, including SonicCloud software and Bluetooth streaming, affect the speech understanding and perceived difficulty of communication for people with hearing loss during videoconferencing calls?

STUDY AIMS

To evaluate the effectiveness of using:

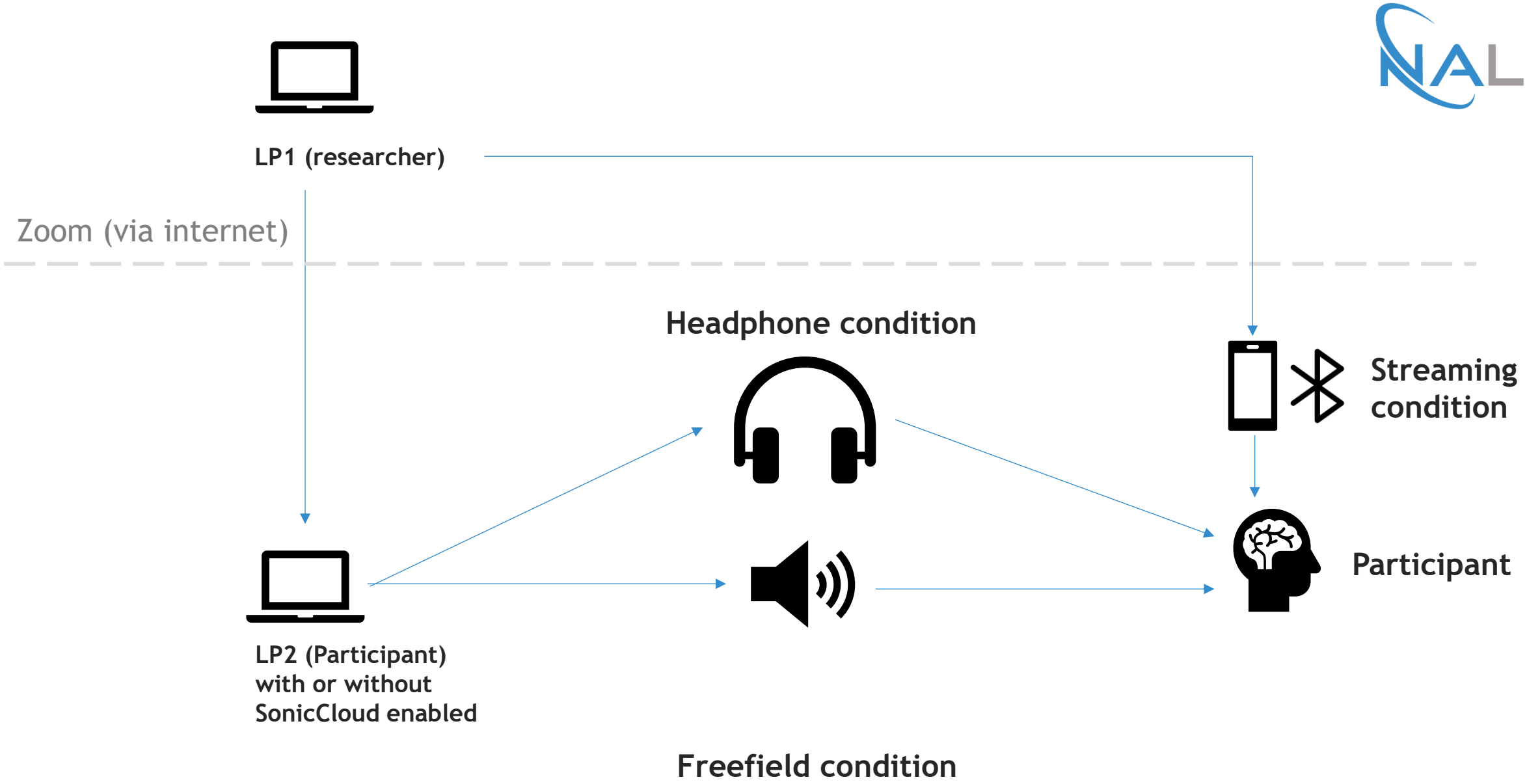
- Headphones without hearing aids
- SonicCloud software with hearing aids
- Bluetooth streaming through hearing aids

To enhance speech communication, reducing the mental workload/listening effort, and improve user satisfaction of people with HL who use videoconferencing for communication.

METHOD

PARTICIPANTS

• 25 bilateral hearing aid users	20 Female, 5 Male (16 took part in previous VC study)
• Mean age:	40 years (20 – 63 years)
• Mean age at onset of hearing difficulties:	17 years (Birth – 50 years)
• Mean 4-frequency pure-tone average:	48 dB HL (24 – 81 dB HL)
• Mean years of experience with their current HAs:	2 years (<1 – 9 years)

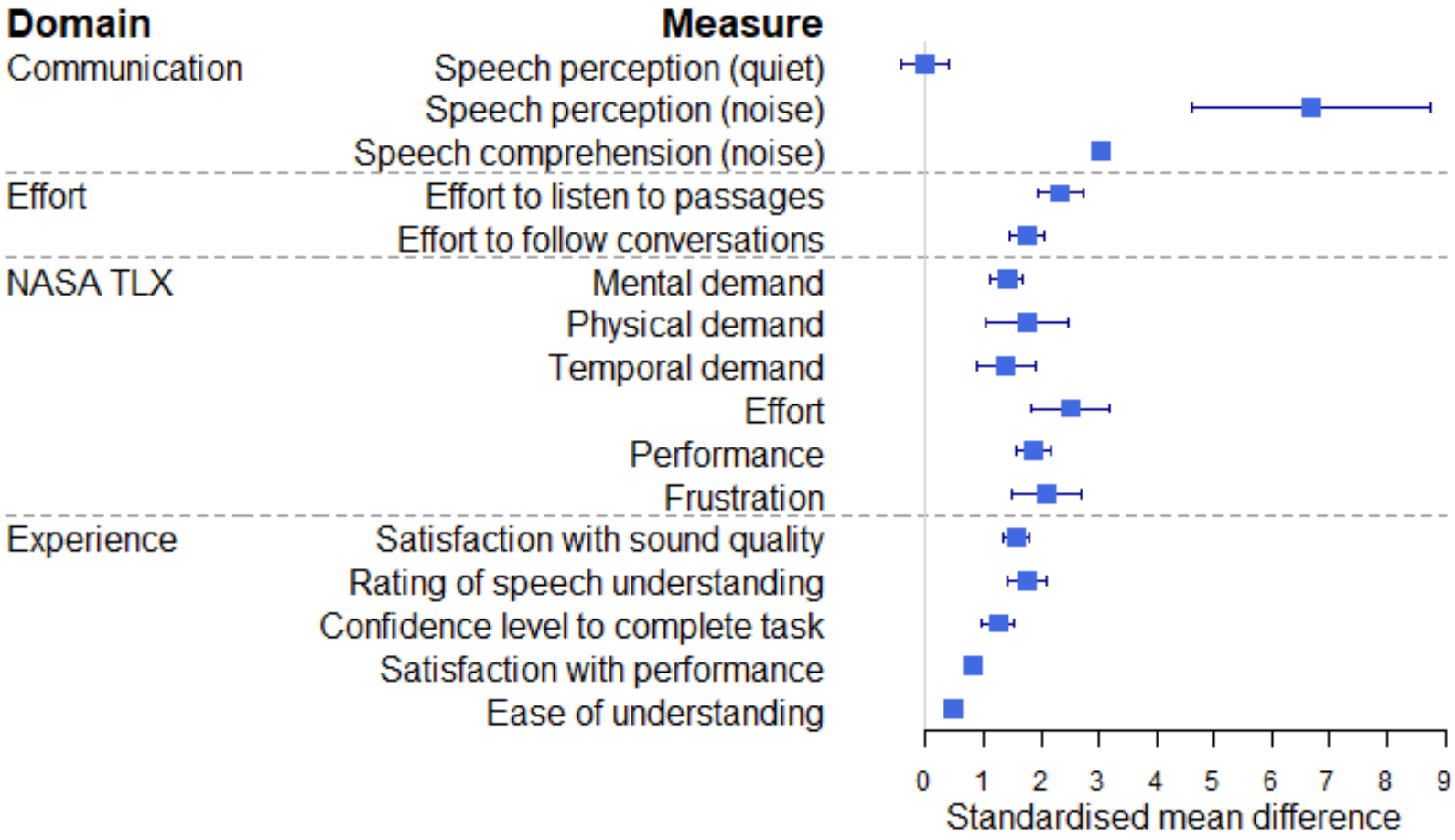

LP1 (researcher)
Zoom (via internet)
Headphone condition
Streaming condition
Participant
LP2 (Participant) with or without SonicCloud enabled
Freefield condition

METHOD

TESTS AND ASSESSMENTS

- Speech perception test:
  - BKB-like sentences in quiet (1 list): % accuracy at reporting key words
  - BKB-like sentences in noise (2 lists): 50% speech reception threshold in dB SNR
- Speech comprehension test:
  - NAL Dynamic Conversations Test (DCT) with +9dB fixed SNR (2 passages): % accuracy at reporting key facts from the 2-talker conversation
- Self-report ratings:
  - NASA TLX to assess task workload
  - Rating scales assessing listening effort, satisfaction with sound quality, satisfaction with speech understanding, and acceptability of each listening condition
- Final evaluation questionnaire assessing preferences for the listening conditions and intention to use SonicCloud and/or Bluetooth streaming in the future

Groups with and without hearing loss



RESULTS

ANALYSES COMPARING BEST VS WORST CONDITIONS FOR PERFORMANCE AND RATINGS

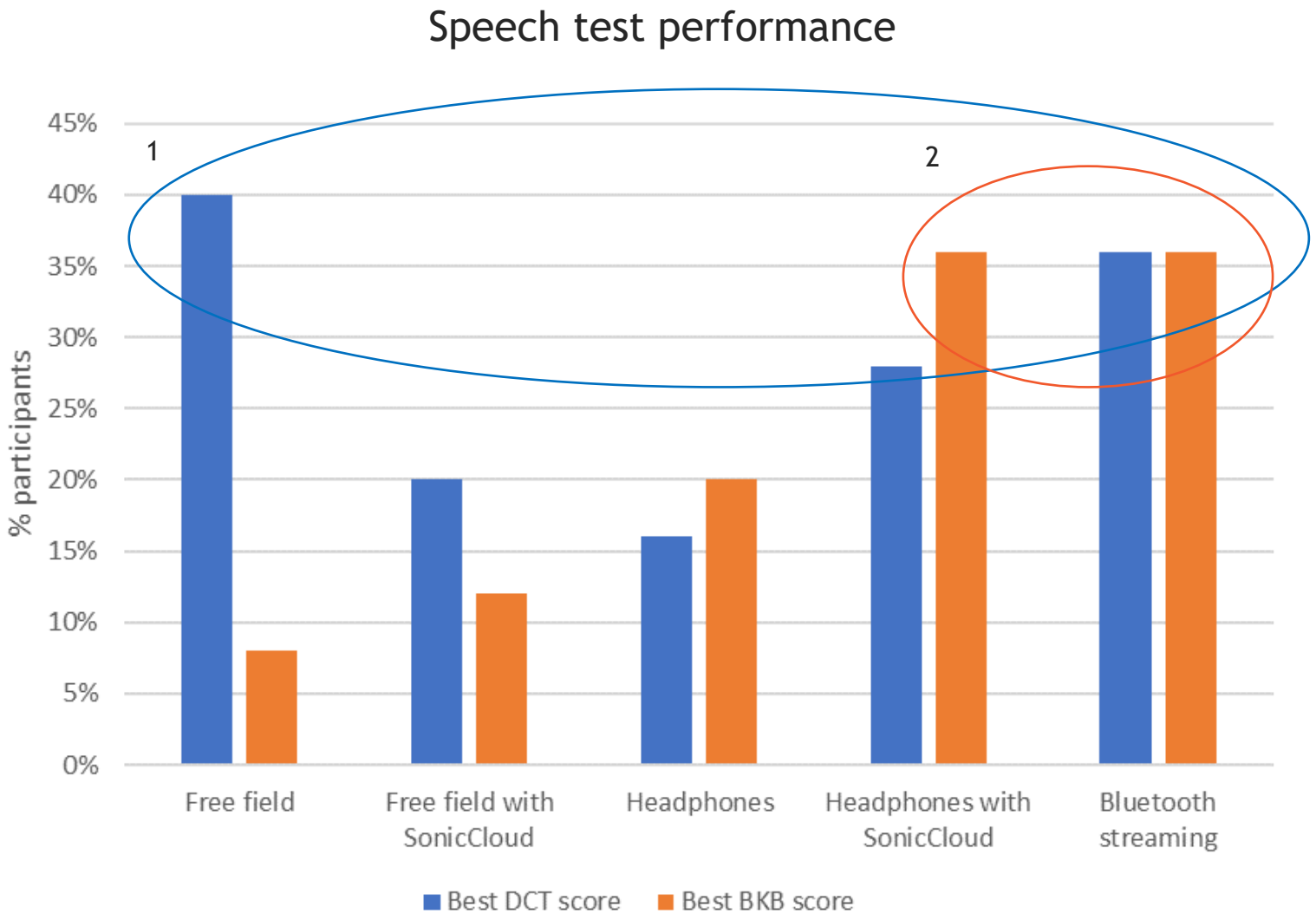
Measure	Average score in each participant's best condition	Average score in each participant's worst condition	Average difference between best and worst	Significant? (paired t-test)
BKB in noise *(dB SNR, lower is better)*	-1.9 dB	2.3 dB	4.2 dB	✓*
DCT *(% correct, higher is better)*	91.2%	62.6%	28.6%	✓*
Listening effort *(0-10 rating, lower is better)*	4.0	7.9	3.9	✓*
Speech understanding *(5-point Likert scale, higher is better)*	4.3	2.4	1.8	✓*
Overall quality *(5-point Likert scale, higher is better)*	4.5	2.7	1.8	✓*
Acceptability *(5-point Likert scale, higher is better)*	4.8	3.8	1.0	✓*

* $p < .008$ ($p<0.05$ Bonferroni corrected)

Significant differences were found between each participants' best and worst performance scores and best and worst self-reported experiences with effort, speech understanding, sound quality and acceptability

RESULTS

IDENTIFYING EACH PARTICIPANT'S 'BEST' CONDITION(S)



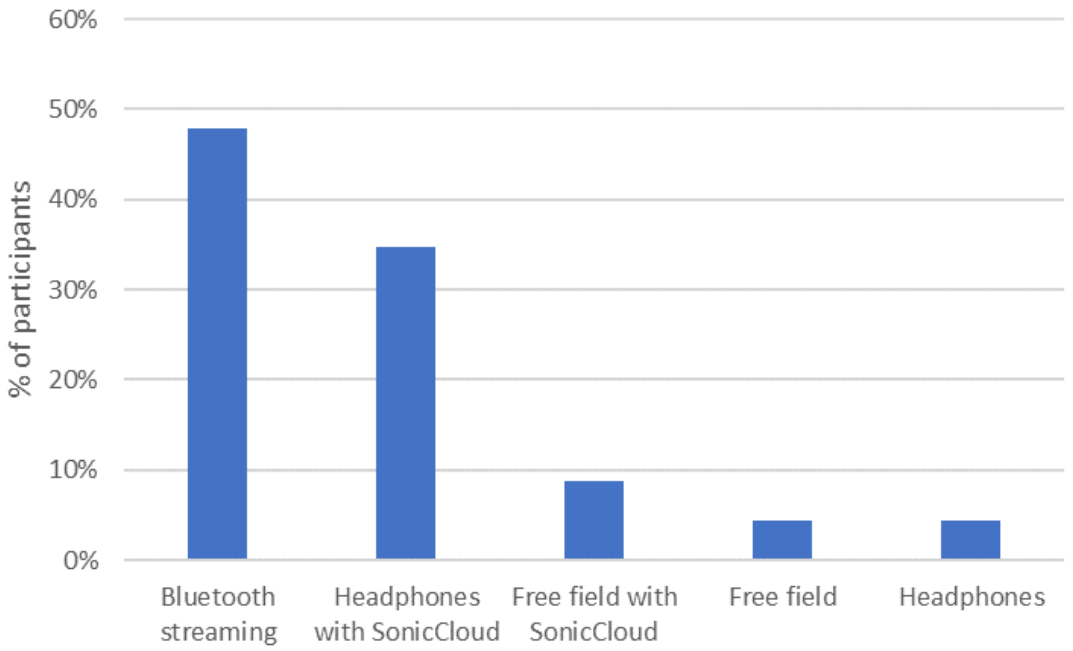
RESULTS

IDENTIFYING EACH PARTICIPANT'S 'BEST' CONDITION(S)

RESULTS

PREFERENCES FOR THE DIFFERENT LISTENING CONDITIONS

"Which testing session did you like the best?"

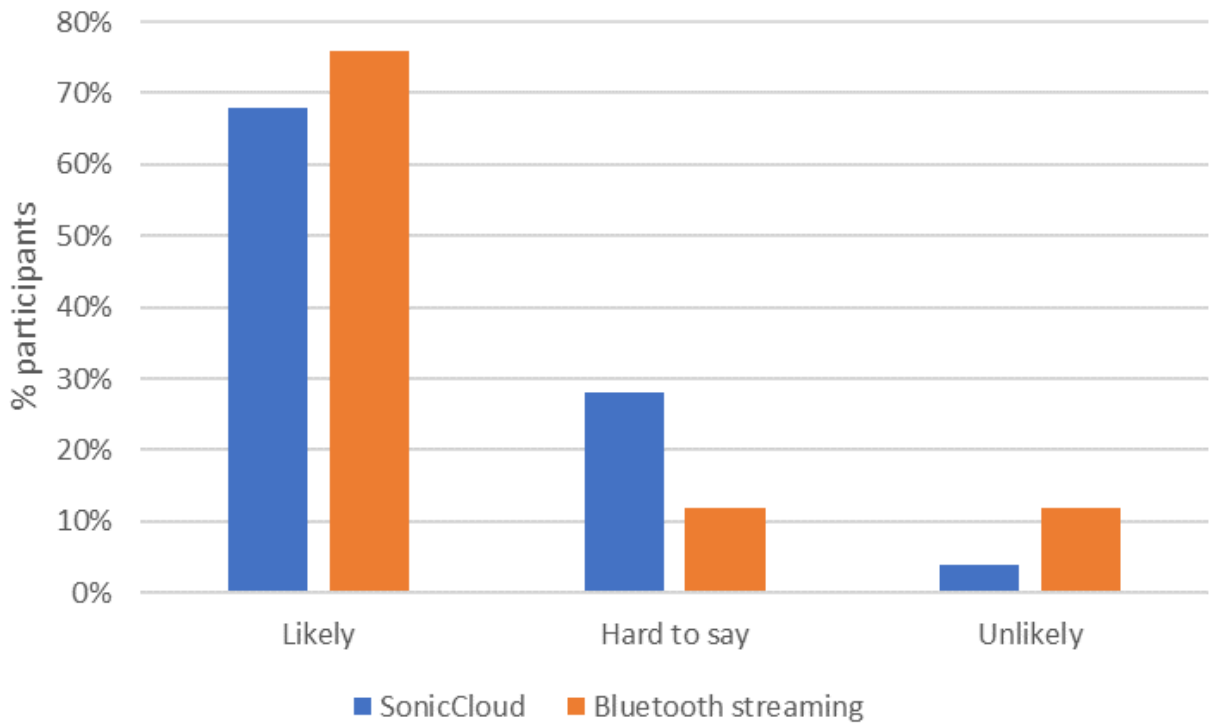


Most people preferred the **Bluetooth streaming and Headphones with SonicCloud**

RESULTS

PREFERENCES FOR THE DIFFERENT LISTENING CONDITIONS

"How likely are you to use […] for video calls in the future?"



A majority of participants (~70-75%) reported that they were likely to consider using both SonicCloud and Bluetooth streaming for future video calls

Conclusions

CONCLUSIONS

- Different listening configurations (e.g. free field vs headphones vs streaming) and listening aids (SonicCloud) *do influence* speech understanding and conversation comprehension
- There was *no single 'best' listening condition/configuration* that consistently resulted in the highest performance and best experience
- *Different individuals preferred and performed best in different conditions*, but a majority of the best results came from aided Bluetooth streaming and using headphones with SonicCloud.
- For the most part, participant's preferred condition matched the condition that yielded their best individual performance or lowest/best task workload.

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Angela Wong

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Thank you