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INNOVATIVE TECHNOLOGIES AND TRANSLATIONAL THERAPIES

Body movement behaviours during online speech tasks via videoconferencing platform

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Background

Need of study

- Body movements, such as head movements and eyebrow-raising, often occur when people have difficulty understanding speech in face-to-face conversations.
- These body movements may convey information about how effortful it is to communicate.
- Little is known about whether body movements can provide insights into the ease of communication for people with hearing loss (HL) during video calls (VC).

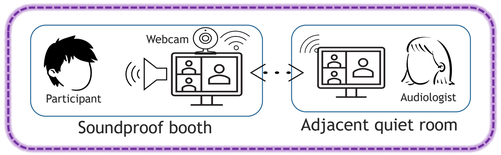
Objectives

- To explore whether body movement behaviours during video calls indicate ease of communication in people with normal hearing (NH) and with HL.
- To evaluate whether the use of hearing aids (HAs) may change these body movement behaviours.

Methods

Experimental setup

- Audio-video recordings during the speech tasks in each condition were captured using an integrated webcam on the researcher's laptop and an external USB webcam on the participant's side.



Participants and testing conditions

	VC1	VC2
NH adults (n=13)	Test	Re-test
HAs users (n=16)	Test with HAs	Test without HAs

Measurement of body movements

- Horizontal head movement
- Head shaking
- Leaning forward, such as head down or forward, or moved their body forward
- Facial movements such as furrowing or raising eyebrows

Outcome measures

- Speech perception in quiet (BKB_Q)
- Speech perception in noise (BKB_N)
- Speech comprehension in noise (NAL DCT_N)

Analysis

- Participants' video recordings were captured using OBS software.
- The total number of each movement while participants listened to the speech materials was labeled and quantified offline for each outcome measure across both VC sessions.

Reseults

- Significant differences in body movements across outcome measures (BKB_Q, BKB_N, DCT_N) (p<.05), with movements significantly lower for BKB_Q compared to BKB_N and DCT_N (p<.05), but no significant difference between BKB_N and DCT_N.
- No group (NH vs. HL adults with HAs) effect on body movements and no significant interaction between group and outcome measure (p>.05).

Table 1. Total movements (Mean±SD) across three outcome measures and between groups.

	BKB_Q	BKB_N	DCT_N
NH	0.7±1.4	16.4±6.0	14.8±6.3
HL	0.3±0.7	14.6±9.5	15.2±9.5

- People with NH showed a strong consistency in body movements between test (VC1) and retest (VC2) sessions (Fig. 1).
- People with HL showed significantly more (p<.05) movements when unaided, compared to when wearing their HAs (Fig. 2)
- **Head Shaking** is more common in BKB_N, **Head Movement** in DCT.
- **Lean Forward** is more frequent in HL than NH during DCT. (Fig. 3).

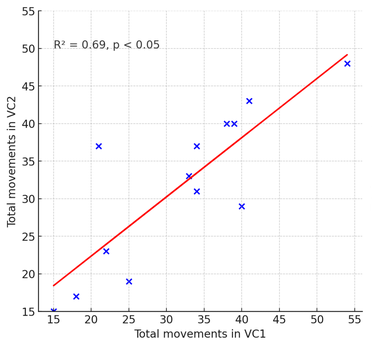


Fig 1. Test-retest reliability for NH group

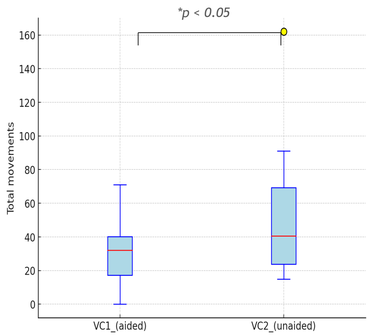


Fig 2. Comparison of total movements in aided and unaided conditions for people with HL

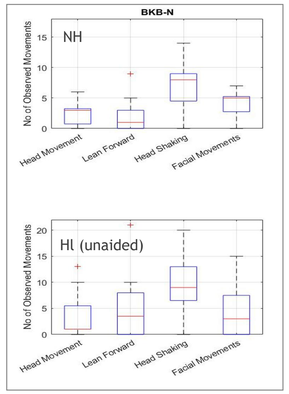


Fig 3. Comparison of movements across BKB-N and BKB-DCT tasks for NH and HL groups

Discussion

- The findings suggest that body movement behaviours may be used as indicators for evaluating people's speech understanding performance in noise during video calls.
- Future research might consider integrating motion tracking technologies in VC system and/or HAs algorithms to improve people's real-time speech perception to reduce mental workload during video calls.

References

Hendrikse, M. M., Grimm, G., & Hohmann, V. (2020). Evaluation of the influence of head movement on hearing aid algorithm performance using acoustic simulations. Trends in hearing, 24, 2331216520916682.

Hendrikse, M. M., Llorach, G., Grimm, G., & Hohmann, V. (2018). Influence of visual cues on head and eye movements during listening tasks in multi-talker audiovisual environments with animated characters. Speech Communication, 101, 70-84.

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