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Let's Zoom in on the Teleassessment of Speech Intelligibility

Grégoire Python, Cyrielle Demierre, Angélina Bourbon, Roland Trouville, Marina Laganaro and Cécile Fougeron

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Python, Grégoire[1,2,3*], Demierre, Cyrielle[1], Bourbon, Angelina[3], Trouville, Roland[3], Laganaro, Marina[1], Fougeron, Cécile[3]

[1]Faculty of Psychology, University of Geneva, Switzerland
[2]Neurorehabilitation Unit, Department of Clinical Neurosciences, CHUV, Lausanne, Switzerland
[3]Laboratoire de Phonétique et Phonologie, CNRS-U. Sorbonne Nouvelle, Paris, France

***corresponding author, gregoire.python@unige.ch**

Introduction

In speech and language rehabilitation, it is crucial for patients to recover intelligible speech. Intelligibility can be successfully assessed in-person by computer (Haley et al., 2011), but it is also interesting to assess intelligibility online, as phone-/videocalls or voice messages are daily used. The aim here is to investigate 1) whether it is feasible to teleassess speech intelligibility and 2) to what extent remote recordings via Zoom are comparable to in-person recordings to score intelligibility.

Methods

Fifteen healthy speakers (25-83 y.o.) without neurological or psychiatric disorders and one aphasic individual (45 y.o.) with post-acute transcortical motor aphasia and mild apraxia of speech took part in this experiment. Speech intelligibility was evaluated by a recent computer-based assessment tool, the MonPaGe screening protocol (Laganaro et al., 2021). In the intelligibility game-like task, participants had to produce pre-defined sentences containing random target-words appearing on a colored grid, in order to give instructions to the experimenter about the target-words and their location. The intelligibility score (max. 15) represented the number of target-words correctly understood by the listener.

All participants underwent teleassessment with three simultaneous sources of recordings:
1) "local high-quality (HQ)": speech is recorded in-person on PC laptop with professional microphone and an external USB soundcard;
2) "local standard-quality (SQ)": speech is recorded in-person on Apple laptop with internal microphone and the WAVE sound files are automatically transferred to an online server;
3) "remote": speech is recorded by the remotely located experimenter on its Apple laptop running MonPaGe with internal speakers and microphone via an education account of Zoom.

Offline intelligibility scoring was performed by three speech and language therapists on the recorded material, in order to evaluate the interrater agreement on top of the intrajudge variability between the three recording sources.

Results

For healthy speakers, maximal intelligibility scores (15/15 words correctly understood) were given to 58% of participants in remote recordings (min. 12/15, mean 14.4), 76% in local SQ

recordings (min. 13/15, mean 14.7) and 82% in local HQ recordings (min. 14/15, mean 14.8). There was a significant main effect of the recording source (χ^2=15.59, p<.001). More precisely, remote recordings led to significantly lower intelligibility scores as compared to local SQ recordings (χ^2=22.5, p=.007) and local HQ recordings (χ^2=129, p<.001), but both local recordings led to similar scoring (χ^2=16.5, p=.22). Overall interrater agreement on intelligibility scoring was substantial (65.9% agreement; k=.63).

Similarly, lower mean intelligibility scores were given to the aphasic participant in remote recordings (14.3) than in local SQ (14.7) and local HQ (14.7) recordings. Overall interrater agreement was again substantial (77.8% agreement; k=.76).

Conclusions

Even if teleassessment of speech intelligibility seems feasible, intelligibility scores significantly decreased in remote recordings as compared to local recordings. Intelligibility scoring seems more influenced by online speech compression than by subjective perception, considering the substantial interrater agreement. It is necessary to assess speech intelligibility not only in the office, but also online, as speech-impaired individuals might suffer from intelligibility decrease in virtual communication to the same extent or even more than healthy speakers.

References

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