Multimodal speech processing in consecutive dialogue interpreting: Evidence from EEG and HRV experiments

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In a bidirectional process of consecutive dialogue interpreting, communication is mediated by a professionally trained individual who retransmits messages back and forward between two languages. Despite a seemingly language-centered character of interpreter-mediated encounters, the act of interpreting is described as multimodal, embodied cognitive activity (Martín de León & Fernández Santana, 2021:277). Previous research showed that gestures not only facilitate verbal renditions in L2 (Galhano-Rodrigues, 2007), but also prove to be an important asset in bidirectional settings, where they are used to coordinate turn-taking (Vranjes & Brône, 2021). Moreover, existing studies showed that interpreters tend to reproduce speakers' referential gestures both in simultaneous conference interpreting (Zagar-Galvao, 2019) and in dialogue interpreting (Chwalczuk, 2022). Thus, a claim is formulated that gesture production during interpreting is motivated by the attempt of decreasing the cognitive load generated by this intense language-processing task (Cienki & Iriskhanova, 2020). The goal of this project is to examine the impact of gestures' visibility and gesture production on the cognitive load of the interpreters working in consecutive dialogue mode.

Does seeing speakers' gestures facilitate interpreting? When interpreters are forbidden to gesture, does it increase their working memory load? With a view to answering these questions, we set 2 experimental tasks, focusing respectively on the comprehension of the source message and the production of the target message. The participants are recruited among graduate interpreting students (English-Polish, N=30). Task 1 consists in interpreting from bilingual video recordings presented in PsychoPy and illustrating a mock police interrogation with an allophone user. In one of the videos, visibility of speakers' gestures is manipulated: a still image of the actors' bodies – from the neck down – is superposed on the original video to create an illusion that they never move their hands. Stimuli in task 2 are video recordings of a mock doctor-patient interaction with visible gestures of the speakers, however gesture production of the interpreter is inhibited by the instruction to keep one's hands on the table during half of the interpreting task.

Speech and gesture production are filmed and continuous electroencephalographic (EEG) and heart rate variability (HRV) measurements are taken throughout the procedure. Additionally, after each condition, the participants are asked to self-evaluate their performance and answer questions adapted from the NASA Task Load Index to assess their cognitive load. EEG preprocessing and analysis are performed using the EEGlab toolbox for MATLAB. To address the issue of oculomotor and muscle artifacts, the independent component analysis (ICA) and artifact subspace reconstruction (ASR) algorithm are applied to raw data (Koshkin et al., 2018). Drawing on the latest EEG findings in cognitive interpreting studies (Boos et al., 2022), we analyze the mean of online values of theta power at a frontal (F3, Fz, and F4) and alpha power at a parietal (P3, Pz, and P4) electrode pool to assess the impact of gesture / no gesture conditions on the mental effort (Antonenko et al., 2010) recruited in consecutive dialogue interpreting.

References

Antonenko, Pavlo, Fred Paas, Roland Grabner & Tamara van Gog. 2010. Using Electroencephalography to Measure Cognitive Load. *Educational Psychology Review* 22(4). 425–438. https://doi.org/10.1007/s10648-010-9130-y

Boos, Michael, Matthias Kobi, Stefan Elmer & Jäncke Lutz. 2022. The influence of experience on cognitive load during simultaneous interpretation. *Brain and Language*. 234. 105185. https://doi.org/10.1016/j.bandl.2022.105185

Chwalczuk, Monika. 2022. Construction of Shared Semantic Spaces through Gestures in Interpreter-Mediated Psychotherapy Sessions. *VISUAL REVIEW. International Visual Culture Review / Revista Internacional De Cultura Visual*. *9*(2). 207–221. https://doi.org/10.37467/gkarevvisual.v9.2933

Cienki, Alan, & Olga Iriskhanova. 2020. Patterns of multimodal behavior under cognitive load: an analysis of simultaneous interpretation from L2 to L1. *Voprosy Kognitivnoy Lingvistiki,* 1. 5-11.

Galhano-Rodrigues, Isabel. 2007. Body in interpretation – Nonverbal communication of speaker and interpreter and its relation to words and prosody. In P. A. Schmitt & H. Jüngst (Eds.), *Translationsqualität*, 739–753. Frankfurt: Peter Lang.

Koshkin Roman, Yury Shtyrov, Andriy Myachykov & Alex Ossadtchi. 2018. Testing the efforts model of simultaneous interpreting: An ERP study. *PLoS ONE.* 13(10). https://doi.org/10.1371/journal.pone.0206129

Martín de León, Celia & Alba Fernández Santana. 2021. Embodied cognition in the booth: Referential and pragmatic gestures in simultaneous interpreting. *Cognitive Linguistic Studies*, *8*(2). 277-306.

Vranjes, Jelena & Geert Brône. 2021. Interpreters as laminated speakers: Gaze and gesture as interpersonal deixis in consecutive dialogue interpreting. *Journal of Pragmatics.* 181, 83-99, https://doi.org/10.1016/j.pragma.2021.05.008.

Zagar Galvão, Elena. 2019. Gesture functions and gestural style in simultaneous interpreting. In H. Salaets & G. Brône (Eds.), *Linking up with video: Perspectives on interpreting practice and research*, 151–179. Amsterdam: John Benjamins.