Gestural enhancement of degraded speech comprehension in Autism Spectrum Disorder

The Communicative Brain Group:
Sara Mazzini[1], *Noor Seijdel*[1], *Linda Drijvers*[1,2]

[1]Max Planck Institute for Psycholinguistics, Nijmegen, the Netherlands

[2] Donders Institute for Brain, Cognition and Behaviour, Radboud University, Nijmegen, the Netherlands

sara.mazzini@mpi.nl, noor.seijdel@mpi.nl, linda.drijvers@mpi.nl

The presence of iconic co-speech gestures enhances degraded speech comprehension in neurotypical adults (Drijvers & Özyürek, 2017). Nonetheless, the benefit of gestures in comprehending degraded speech has not been investigated in neurodivergent populations, such as autistic individuals. Previous research demonstrated atypical audio-visual integration (Ronconi et al., 2023) and difficulty in interpreting iconic gestures in autistic individuals (Trujillo et al., 2021), suggesting that integrating speech and gestures may be more challenging (Silverman et al., 2010) and less beneficial for speech comprehension in adverse listening conditions in comparison with neurotypicals. Conversely, autistic individuals encounter difficulties in filtering relevant information from noise (Van de Cruys et al., 2017), suggesting that they could benefit from additional cues to comprehend speech in noise.

In the present study, we investigated gestural enhancement of degraded speech in neurotypical and autistic adults. We recruited 80 participants (40 neurotypicals and 40 autistic individuals) to take part in an online experiment: they were presented with videos of an actress uttering a Dutch action verb and had to complete a 4-alternative forced choice task. The action verb was produced in either clear or degraded speech and accompanied by a matching gesture or without a gesture. Both accuracy scores and reaction times were recorded.

We observed no significant differences in gestural enhancement between groups: the presence of gestures enhanced degraded speech comprehension in both neurotypicals and autistic individuals. Additionally, reduced reaction times were observed in the gesture conditions in neurotypicals, but not in autistic individuals, who had overall longer reaction times in both clear and degraded speech conditions.

Our findings suggest that despite the previously reported differences in audio-visual integration and gesture interpretation, autistic individuals do benefit from gestures in degraded speech comprehension, similarly to neurotypicals. Nonetheless, the observed longer reaction times suggest that the process may require higher cognitive effort.

Index Terms: speech-gesture integration, degraded speech comprehension, autism spectrum disorder

References

Drijvers, L., & Özyürek, A. (2017). Visual Context Enhanced: The Joint Contribution of Iconic Gestures and Visible Speech to Degraded Speech Comprehension. *Journal of Speech, Language, and Hearing Research*, *60*(1), 212–222. https://doi.org/10.1044/2016_JSLHR-H-16-0101

Ronconi, L., Vitale, A., Federici, A., Mazzoni, N., Battaglini, L., Molteni, M., & Casartelli, L. (2023). Neural dynamics driving audio-visual integration in autism. *Cerebral Cortex*, *33*(3), 543–556. https://doi.org/10.1093/cercor/bhac083

Silverman, L. B., Bennetto, L., Campana, E., & Tanenhaus, M. K. (2010). Speech-and-gesture integration in high functioning autism. *Cognition*, *115*(3), 380–393. https://doi.org/10.1016/j.cognition.2010.01.002

Trujillo, J. P., Özyürek, A., Kan, C. C., Sheftel-Simanova, I., & Bekkering, H. (2021). Differences in the production and perception of communicative kinematics in autism. *Autism Research*, *14*(12), 2640–2653. https://doi.org/10.1002/aur.2611

Van de Cruys, S., Van der Hallen, R., & Wagemans, J. (2017). Disentangling signal and noise in autism spectrum disorder. *Brain and Cognition*, *112*, 78–83. https://doi.org/10.1016/j.bandc.2016.08.004