This abstract has been accepted for presentation at the Interdisciplinary Workshop “Sign Language Grammars, Parsing Models, & the Brain”, 6-7 November 2025, Max Planck Institute for Human Cognitive & Brain Sciences, Leipzig, Germany. For further information about the event visit: https://sign-language-grammars-parsers-brain.github.io

Analysis of the linguistic structure of Italian Sign Language (LIS): sequentiality, simultaneity, and segmentation methodologies

Alessio Di Renzo[1], Gabriele Gianfreda[1], Isabella Chiari[2], Olga Capirci[1]
[1]Institute for Cognitive Sciences and Technologies (ISTC), CNR
[2]Sapienza University of Rome

This study analyzes the phenomena of sequentiality and simultaneity in Italian Sign Language (LIS), with the aim of highlighting the structural peculiarities of the signed linguistic system. The data were collected through the analysis of four videos of spontaneous LIS signing, differing in textual typology (monologues vs. dialogues) and context (in-person vs. remote). An annotation methodology was developed to detect the activity of manual and bodily articulators, applied according to three segmentation criteria: *Hands* LIN-H, *Any* LIN-A, and *Time* LIN-T.

In *Hands* LIN-H (manual linearity), videos are segmented based on the activation or modification of manual articulators, with reference to the production of a signifier. In *Any* LIN-A (linearity of any articulator), segmentation is based on the activation or modification of any articulator, whether bodily or manual, again with reference to the production of a signifier. In *Time* LIN-T (temporal linearity), videos are divided into equal segments based on a fixed temporal unit of 500 milliseconds.

The comparison among the three segmentation methods showed that the *Any* LIN-A provides a more accurate linguistic representation, both qualitatively and quantitatively, as it identified a greater number of segments and signifiers and was able to capture phenomena not visible through the other segmentation methods.

Simultaneity emerged as predominant across all texts, and within the segment sequences, variations in the number of signifiers and the redistribution of active articulators were observed. The results offered a rich and detailed picture of the structure of the analyzed texts and of the linguistic system of Italian Sign Language.

In particular, the analysis highlighted that LIS cannot be interpreted through the traditional parameters of spoken language linguistics, as its visual-gestural nature implies a three-dimensional grammar in which space, time, and simultaneity play a fundamental role. The *Any* LIN-A segmentation made it possible to grasp the complexity of articulators, showing how LIS develops through processes of construction and deconstruction involving various manual and bodily articulators.

Furthermore, the analysis of four videos of spontaneous LIS signing, differing in textual typology (monologues vs. dialogues) and context (in-person vs. remote), allowed for the observation of the different forms that communication and interaction take within these texts.

In conclusion, this work contributes to emphasizing the importance of considering the specific features of signed languages within linguistic research, including for educational applications and for the recognition and promotion of LIS as a fully acknowledged and studied language.

References

Albano Leoni, F. (2022). Some Remarks on Orality and the Antinomy between Writing and Speaking in Western Linguistic Thought. In A. Ercolani & L. Lulli (Eds.), Rethinking

Orality I: Codification, Transcodification and Transmission of'Cultural Messages' (Vol. 1, pp. 53-72). de Gruyter.

Antinoro Pizzuto, E., Chiari, I., & Rossini, P. (2010). Representing Signed Languages: Theoretical, Methodological and Pratical Issues. In M. Pettorino, A. Giannini, I. Chiari, & F. Dovetto (Eds.), Spoken Communication (pp. 205-241). Cambridge Scholars Publishing.

Pietrandrea, P. (2023). What is a language? A socio-semiotic approach to signed and spoken languages. In T. Janzen & B. Shaffer (Eds.), Signed Language and Gesture Research in Cognitive Linguistics (Vol. 67, pp. 75-101). De Gruyter Mouton. https://doi.org/10.1515/9783110703788-004

Slonimska, A., Özyürek, A., & Capirci, O. (2020). The role of iconicity and simultaneity for efficient communication: The case of Italian Sign Language (LIS). Cognition, 200(104246), 1-20.

Vermeerbergen, M., Leeson, L., & Crasborn, O. (Eds.). (2007). Simultaneity in Signed Languages: Form and function. John Benjamins. https://doi.org/10.1075/cilt.281.

Volterra, V., Roccaforte, M., Di Renzo, A., & Fontana, S. (2022). Italian Sign Language from a Cognitive and Socio-semiotic Perspective: Implications for a general language theory (Vol. Gesture Studies (GS)). John Benjamins Publishing Company. https://doi.org/10.1075/gs.9