The role of prosody and gesture in on-line pragmatic processing in children with Developmental Language Disorder

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Numerous studies have demonstrated that the combination of linguistic prosody and body gestures can aid both children and adults in accessing pragmatic and discursive meanings (Armstrong et al., 2018; Crespo-Sendra et al., 2013; Llanes-Coromina et al., 2018; Morett et al., 2021; Trott et al., 2019; Wiedmann & Winkler, 2015). Because the ability to comprehend pragmatics can be impacted by one's structural language abilities (Katsos et al., 2011), when structural components of language are compromised, as in the case of children with Developmental Language Disorder or DLD (Norbury et al., 2008), the presence of prosodic and multimodal cues can be particularly beneficial to help access pragmatic and sentence information. In this study, we aim to compare the benefits of multimodal cues for processing pragmatic meaning in children with and without DLD. Specifically, we will investigate whether children with DLD are more likely to benefit from prosodic and gestural cues than children without DLD when processing interrogative, indirectness in requests, and complex phrasing.

A total of 39 children with DLD and 39 TD children aged 5 to 10 participated in a visual-world eye-tracking task. All participants first underwent an assessment of their cognitive abilities using the Kaufman Brief Intelligence Test (K-BIT), as well as of their linguistic abilities using the Clinical Evaluation of Language Fundamentals-5 (CELF-5). Next, in the eye-tracking task, participants listened to a target sentence and were asked to point at the image representing the meaning they just heard (see Figure 1). We manipulated two factors in a within-subjects design: (1) the type of meaning to be processed: literal speech acts (interrogative sentences), nonliteral speech acts (indirect requests), and discourse structure (syntactically ambiguous sentences) and (2) the presence of multimodal cues highlighting the meaning of the sentence (prosodically-enhanced, multimodally-enhanced, and no-enhancement). These meanings were chosen because they are from less to more complex and therefore are expected to develop progressively during the age range analysed. Each meaning was evaluated in a separate experimental block and through 12 trials (3 trials per each multimodal condition), preceded by three familiarization trials. Our predictions were that multimodal markers would help children with DLD to choose the target image faster and with more accuracy, compared to children with no language impairment, and that this trend will emerge gradually in development as they need to process more complex meanings.

Results from the offline selection of the target image revealed a main effect of condition by which all children benefit from the presence of prosodic -and multimodal- enhancement when processing interrogative and discourse meanings *(χ^2= 36.96, p > 0.001; χ^2= 37.66, p > 0.001,* respectively), with no interaction with age nor participants' group (see Figure 2). Interestingly, in the comprehension of indirect requests (the most complex pragmatic meaning of the three), we found a 3-way interaction by which the multimodal-enhancement condition was especially helpful for older children with DLD *(χ^2= 16.99, p > 0.001*) We are currently analysing the eye-tracking data (proportion and timing of fixations to the target image) and expect to have results by the end of April 2023. This study will show whether prosody and gesture gesture can contribute to the comprehension of complex pragmatic meanings in children with language impairments and can shed light on the types of cues that help children with language impairment have successful communicative interactions.

Index Terms: gestures, prosody, DLD, Pragmatics

Figure 1: *Visual display for an **indirect request** in the 'multimodally-enhanced' condition. Upon seeing the main character in the centre of the screen saying '**It is too dark in here…**' with the specific prosodic and gesture cues of indirect request, children are expected to select the image representing the speaker's intention behind that indirect request (bottom right) but not the image representing a literal statement (top left) nor any of the two distractors (top right and bottom left).*

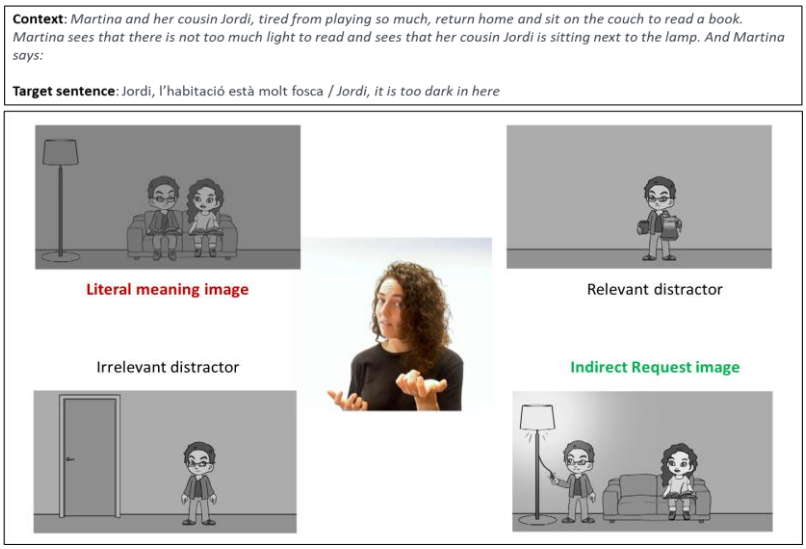
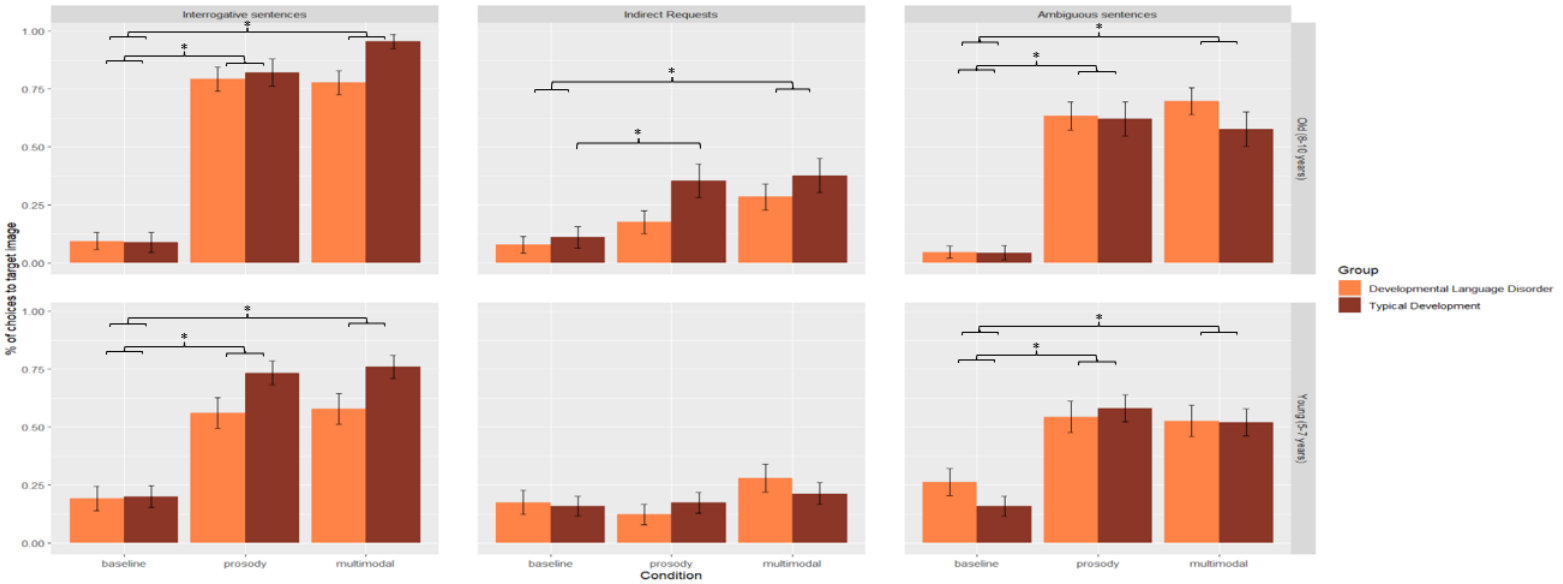


Figure 2: *Offline results for the three experimental blocks and two age groups. Y axis shows the proportion of selections to the target image for the three pragmatic meanings: interrogative sentences, indirect requests and syntactically ambiguous sentences. X axis shows the three experimental conditions: no-enhancement (baseline), prosodically-enhanced and multimodally-enhanced. * **represents a significance of p < 0.05.***



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