EARLY LEXICAL COMPREHENSION AND GENDER AGREEMENT IN ITALIAN TODDLERS.

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Experimental evidence of lexical comprehension in children younger than one year of age is limited[1,2]. To date, studies applying online techniques on Italian toddlers have shown successful lexical comprehension after age 15 months[3]. Italian is a gender marked language in which determiners agree in gender and number with the following noun: being aware of such agreement relationship is crucial because it could facilitate the processing of words, allowing children to predict what they are going to listen to next. The processing of gender features - specifically related to the characteristics of each language[4,5] - has been sporadically investigated in children under 2 years of age[5].Therefore, the aim of this study is to investigate early lexical comprehension and the role of determiners in the processing of Italian, in children aged 12 and 20 months.

The Looking While Listening (LWL) procedure[6] is an online paradigm allowing to analyze comprehension in real time, by recording children's eye-movements in relation to an auditory stimulus. In each trial, two pictures (a target and a distractor) appeared on a monitor while sentences, including determiner and noun, were auditory presented (*Where is the*$_{FEM}$ *ball*$_{FEM}$?). Two conditions were created: a same-gender condition, in which a target and a distractor share the same grammatical gender (e.g., *dog*$_{MASC}$ vs. *boy*$_{MASC}$) and determiner was uninformative; and a different-gender condition in which nouns have different grammatical gender (*dog*$_{MASC}$ vs*. girl*$_{FEM}$) and determiner was informative. Children's looking patterns were recorded by an eyetracker (Tobii X50) for the whole duration of the trials (5s). Children were divided into two groups based on age: 12-months (N=17) and 20-months (N=15). Separately for each age-group, we conducted three cluster-based permutation analyses: one for each experimental condition comparing the average looking proportion toward the target to chance level (0,5), and one comparing the looking proportions between conditions.

In the 20-month group, looking proportions to the target for the same-gender condition were significantly different from chance level from the middle to the end of the trial (1120-2220ms, $p<.001$, blue line Fig.1). For the different-gender condition, looking proportions to the target were significantly different from chance level (i) already just after hearing the informative determiner (560-1160ms, $p=.012$, first red line in Fig.1) and (ii) when they heard the full name of the target (1260-1920ms,$p=.005$, second red line in Fig.1). The direct comparison between conditions confirmed this pattern, as shown by the significant clusters represented with dashed lines in Fig.1 (260-980ms, $p=.018$, 1400m-1740ms, $p=.047$, and 1760-2220ms, $p=.041$). Moreover, in the 12-month group looking proportions to the target were significantly different from the chance level for the different-gender condition just after hearing the informative determiner (380-700ms,$p=.042$–red line in Figure 2). Results in this age-group were however less robust, as confirmed by the absence of significant cluster in the direct comparison between conditions.

In conclusion, this study extends the results found in literature[5]. Already at 12 months of age, and with an improvement seen at 20 months of age, Italian toddlers seem to be able to extract and use the grammatical gender carried by determiners, to make predictions about the following target noun. The results found in the 12-month group with the informative determiner may suggests that infants at this age have access to the grammatical traits. Alternatively, we can hypothesize that 12-month-olds rely on other cues (i.e. the probability of occurrence between the determiner and the noun) that are not relevant when the determiner is uninformative. When infants have no cues, they can rely only on the meaning of the noun, and this process could be slower and not detectable before the trial's end. Future studies are needed to further understand these aspects.

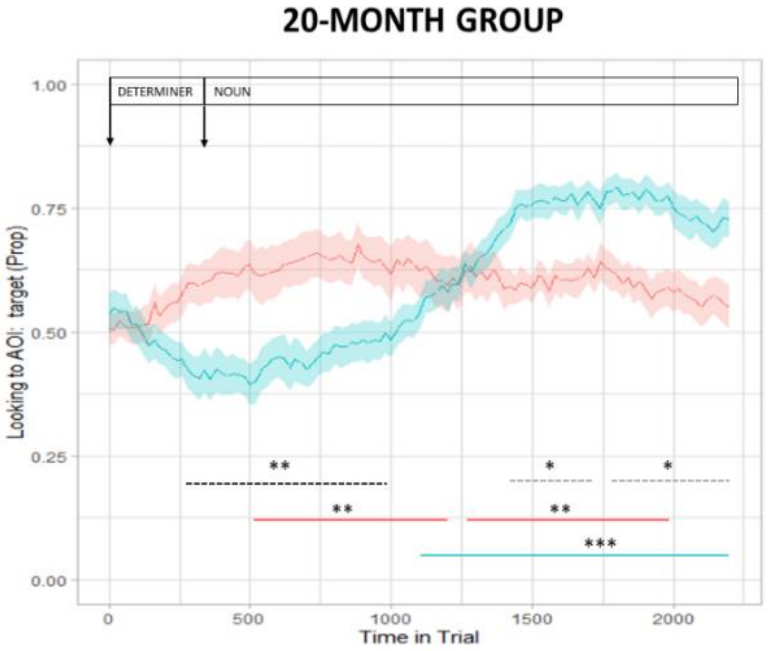
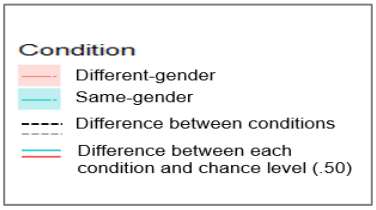


Fig. 1 Proportion towards the target picture from the determiner onset till the end of the trial for the same-gender condition (blue line) and the different-gender condition (red line) in toddlers aged 20 months. In the different gender condition, the looks to the target significantly increased (above the chance level of 0.5) in two time-windows from 560ms to 1160 and from 1260ms to 1920ms (red lines). In the same-gender condition, the looks to the target significantly raised above the chance level from 1120 to 2220ms (blue line). Moreover, toddlers behaved differently according to the conditions: they detected the target picture faster when the determiner was informative (different-gender condition) than when it was uninformative (same-gender condition), as shown by the dashed black line (from 260ms to 980ms). However, in the same-gender condition, toddlers were able to detect the target picture when they heard its name (dashed grey lines, from 1400 to 1740ms and from 1760-2220 respectively).



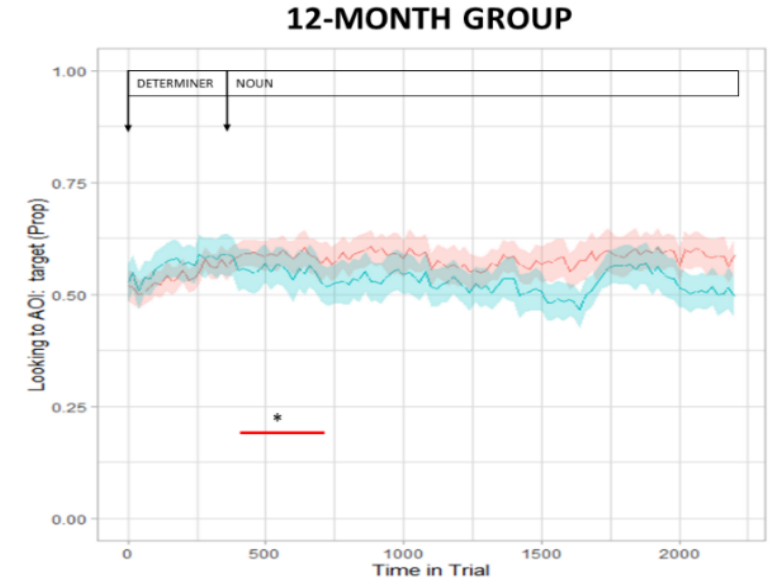


Fig2. Proportion towards the target picture from the determiner onset till the end of the trial for the same-gender condition (blue line) and the different-gender condition (red line) in infants aged 12 months. Despite there was no difference between the two conditions, infants significantly increased the looks to the target picture above the chance level (0.5) just after hearing the determiner (red line from 360ms to 700ms).

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