Comprehension and Processing of Grammatical Aspect in Spanish monolinguals: Early production, delayed comprehension?

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Introduction: Spanish marks perfective and imperfective aspect obligatorily in the past tense: *caminó* (3sg.walked.perfective) vs. *caminaba* (3sg.walked.imperfect). By age 3 children use both forms productively (e.g., Hernandez Pina 1984, Perez Pereira 1989). However, children younger than 5 have shown not to understand the completed event entailment of the perfective vis-à-vis the imperfective (Hodgson 2003). To further our understanding of comprehension of grammatical aspect, we conducted an eye-tracking experiment to test monolingual Spanish-speaking children's and adults' online and offline comprehension of perfective and imperfective aspect.

Methodology: We used a visual-world paradigm task, consisting of two components: (i) a preamble where participants only heard an introductory sentence such as "It was Sunday" with a smiley face in the center of the screen and (ii) the test phase. The test phase consisted of two images side by side in the center of the screen together with audio stimuli describing one of the images, e.g., "A girl was closing the window" (Fig 1). The preamble was used to set a background to the test sentence to make it sound more natural. Participants were asked to raise their right or left hand according to where in the screen the picture described by the sentence appeared. We tested 32 adults (mean age 38.25) and two children groups: 6-8 year olds (N= 52) and 9-12 year olds (N= 36).

Results: We compared the proportion of looks to the Ongoing event picture by Aspect, calculated in 50 ms time bins from the onset of the verb. A cluster-based permutation analysis (cf. Maris & Oostenveld 2007) revealed a significant effect of aspect ($\alpha = 0.05$) in all groups of participants, with more looks to the Ongoing event picture in the Imp than the Perf condition. We identified the following significant clusters of difference between the two conditions for the three groups of participants (see Fig. 2): Adults 850-3000 ms after verb onset (sum $t = 209.98$, $p < 0.001$); Older children 850-3000 ms after verb onset (sum $t = 176.05$, $p < 0.001$); Younger children 2150-3000 ms after verb onset (sum $t = 49.1$, $p < 0.01$).

Offline accuracy (Table 1) for the adult group shows that adults pointed to the right picture in both conditions significantly more often than to the wrong picture, with higher accuracy with imperfective verbs. Offline accuracy for children varies by age group but follow the same trend as the adults, with higher accuracy for imperfective aspect. However, the younger group's accuracy for perfective aspect is surprisingly very low whereas the imperfective condition is barely different from the older group. To analyze the offline responses, we fit a generalized linear mixed effects model where offline accuracy was predicted by the interaction of Aspect (Perf vs. Imp) and Group (Younger children vs. Older children vs Adults). Participants and items were included as random slopes. Model output is summarized in Table 2. We ran post-hoc pairwise comparisons to analyze the differences between the groups within conditions and the differences between condition within the groups. All groups performed significantly better in the Imp condition than the Pf condition ($p<0.01$ In the Imp condition, Younger children performed significantly worse than the Adults ($p<0.001$) and marginally worse than the Older children ($p=0.06$); the difference between the Older children and the Adults was not significant ($p=0.2$,). In the Pf condition, Younger children were significantly less accurate than the Adults and the Older children ($p<0.001$), while the Older children were marginally worse than the Adults ($p=0.07$).

Conclusion: The results show a stark difference with production studies. However, since adults also show lower accuracy of perfective aspect, we will need to conduct a production task using the same stimuli to reach a more definitive conclusion.

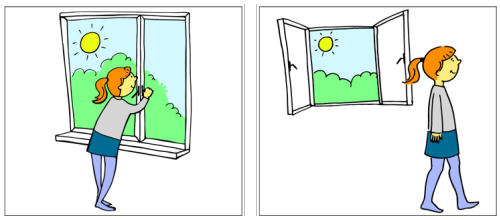

Figure 1. Sample stimuli. Left: Imperfective Condition
Right: Perfective Condition

	Imperf.Condition	Perfective. Condition
Younger children	0.87	0.37
Older children	0.93	0.72
Adults	0.97	0.84

Table 1. Offline accuracy by group and condition

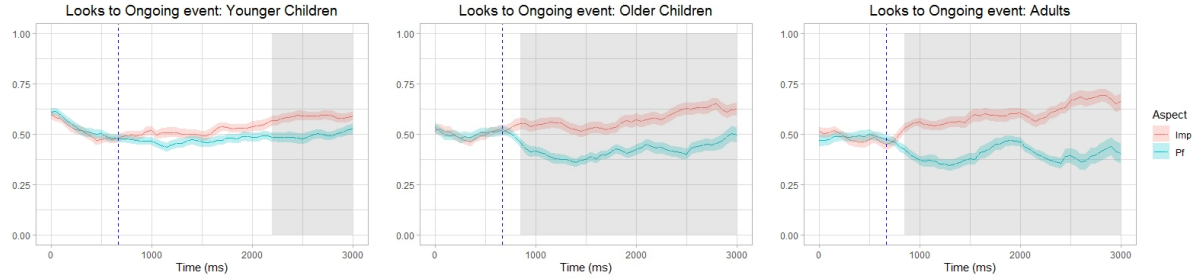

Figure 2. Proportions of looks to the Ongoing Event picture in 50 ms time bins starting from verb onset by condition (Imperfective vs. Perfective) for the four groups of participants. Vertical blue lines represent the average verb offset.

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Formula: Accuracy ~ 1 + Aspect * AgeGroup + (1 + Aspect | Code) +
(1 + Aspect | Item)

                   Estimate Std. Error z value Pr(>|z|)
(Intercept)         4.407900   0.495036   8.904  < 2e-16 ***
AspectPf           -2.068233   0.645678  -3.203 0.001359 **
AgeGroupO          -0.879944   0.511058  -1.722 0.085104 .
AgeGroupY          -1.762716   0.473287  -3.724 0.000196 ***
AspectPf:AgeGroupO -0.006903   0.646953  -0.011 0.991487
AspectPf:AgeGroupY -1.365432   0.604696  -2.258 0.023943 *
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Table 2. Generalized linear regression analysis results

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