

Ageing improves the use of morphosyntactic information during predictive processing

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Background: Comprehenders use morphosyntactic relationships to predict upcoming sentence constituents [1–3]. Previous work suggests that predictive processing is modulated by both non-linguistic and linguistic abilities. For instance, comprehenders with higher working memory capacity or higher language experience show stronger and faster predictive effects [2, 3]. However, most evidence comes from studies with young adults, which leaves a critical gap in understanding how predictive processing changes over the adult lifespan. Moreover, ageing brings changes in several factors that are likely to modulate predictive processing. This includes age-related declines in working memory and processing speed across the whole adult lifespan [4], but gains in lexical knowledge. Specifically, older adults tend to exhibit richer and larger vocabularies [5, 6], likely due to increased lifelong language experience [7, 8]. In light of these changes in lexical abilities, it remains unclear whether age-related advantages are limited to single word recognition or also extend to morphosyntactic processing in sentence contexts. We bridge these gaps by examining the use of morphosyntactic relationships for language prediction using a continuous-age design with a well-distributed sample of participants.

Method: We tested 135 European Portuguese native speakers (age range: 19–69 years) in a visual world eye-tracking experiment. In each trial, participants saw two objects while hearing an auditory instruction that included a determiner and a possessive pronoun (e.g., *o seu* ‘(the)[+masc] his/her[+masc]’), both expressing gender information that allowed predicting the target noun (e.g., *gelado* ‘ice cream’ [+masc]) (Figure 1A). The eye-tracking data was analysed with a novel GAMM-based method [9] that allowed estimating the effects of age on three complementary measures: (i) overall proportion of looks to the target object during the predictive time-window; (ii) timecourse of fixations over time; and (iii) temporal onset of predictive effects. Participants also completed working memory and processing speed tasks.

Results and discussion: Our results revealed (i) more predictive looks to the target object with increasing age (Figure 1B); (ii) a significant age effect on the timecourse of fixations (Figure 1C); and (iii) earlier prediction onsets for older than younger adults, at least until the mid-50s (Figure 1D). Sensitivity analyses showed that the effects were robust, being observed both when controlling for working memory and processing speed and when age was unadjusted for any covariates. Thus, the observed age-related improvements occurred even alongside declines in non-linguistic cognitive abilities. Overall, our findings suggest that increasing age can enhance the use of morphosyntactic gender cues to predict upcoming words. We propose that lifelong language experience strengthens the links between the noun’s lemma and gender nodes, enabling gender information to be activated more quickly during prediction [7, 8]. These results support the view that access to morphosyntactic features is not only well-preserved, but might even improve at older ages. Moreover, our findings show that improvements are not limited to gains in lexical knowledge, but also extend to morphosyntactic processing in sentence contexts [5, 6].

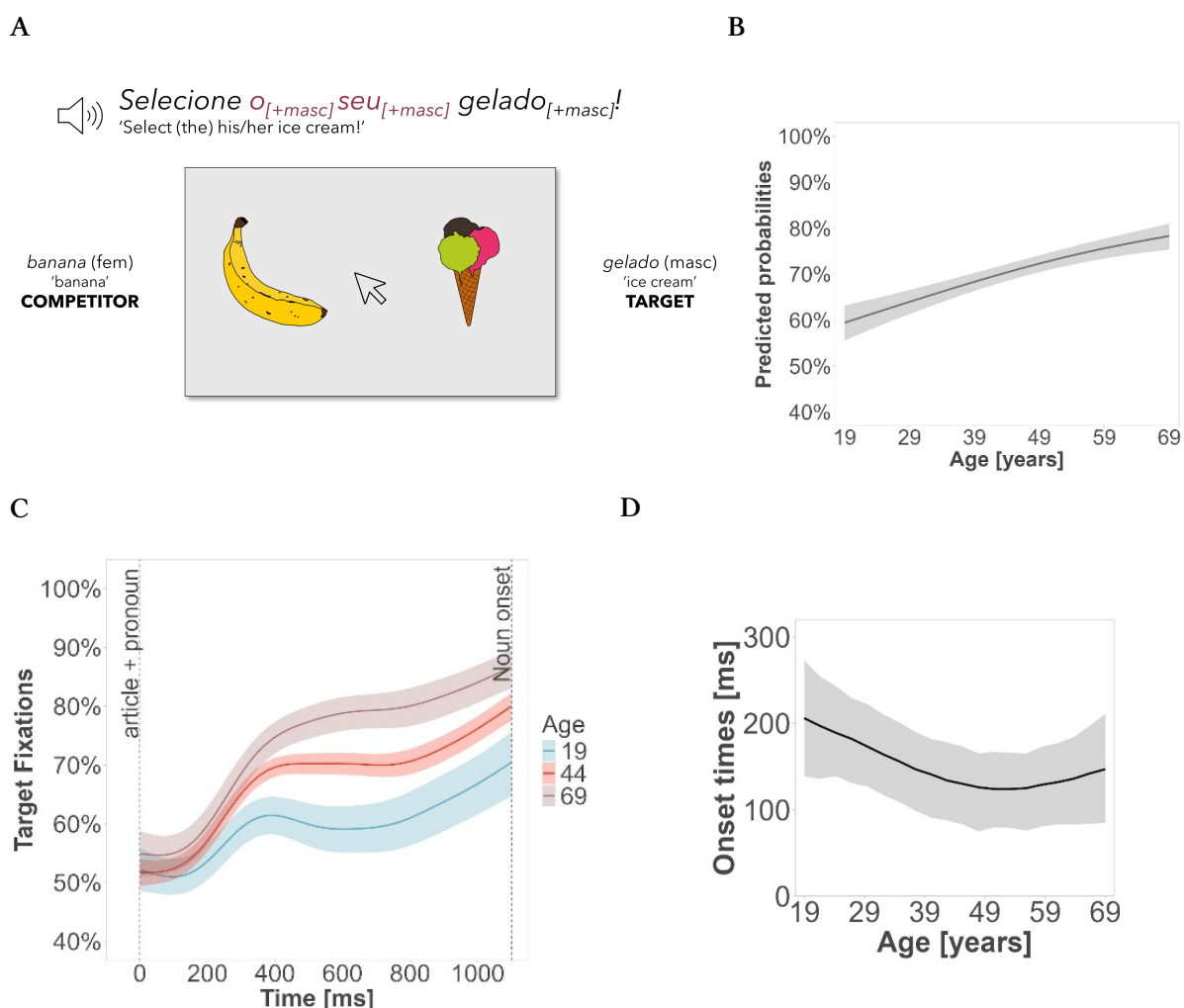


Figure 1: (A) Sample experimental trial. The images depict objects that differ in grammatical gender, e.g., *banana* 'banana' [+fem] vs. *gelado* 'ice-cream' [+masc]. Participants were introduced to a gender-neutral character GliPi, and asked to find their belongings by selecting a target object mentioned in the auditory instruction. Age effect on: (B) predictive looks to the target object; (C) timecourse of fixations across all ages and for the minimum, mean and maximum ages in the samples; (D) predictive onset times. The ribbons show 95% confidence

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