Case marking influences the apprehension of briefly exposed events

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When preparing to describe an event depicted in a picture, speakers need to apprehend its gist, including event roles (the "who does what to whom"), rapidly—sometimes in as little as 100–300 ms [1]. Event apprehension has been argued to be a prelinguistic process [2], i.e., grammar should play no role (yet) in speakers' gist extraction, but only later should impact the message and linguistic encoding. Here we present two experiments using the brief exposure paradigm [3,4,5] that test whether case differences in Basque and Spanish affect not only linguistic encoding but can impact event apprehension. The two languages differ in their case marking systems: In Basque, agentive subjects are marked by ergative case (*-k*), while patients (subjects of unaccusative intransitive verbs and objects of transitive verbs) receive absolutive case. In Spanish, by contrast, subjects always carry the same unmarked nominative case regardless of their thematic role (cf. Figures 1–3). This may require Basque speakers to commit to a level of subject agentivity (ergative or absolutive) early during planning [6], which may in turn afford heightened attention to agents in event apprehension, as compared to Spanish.

In our experiments, participants saw photographs of events with four different actors (e.g., a man watering a plant) for 300 ms in a randomly assigned corner of the screen. As planning and executing saccades requires up to 200 ms [7], this left only approximately 100 ms to take up visual information foveally after a gaze shift from a central fixation cross into the picture. Following this brief exposure, participants either produced a sentence description (Event Description task) or determined whether a subsequent picture matched a participant from the primary picture (Probe Recognition task). In Exp. 1 (online, without eye tracking), native speakers of Basque (N=90) and Spanish (N=88) completed a block of 58 trials per task and typed sentences after each picture in the event description task. In Exp. 2 (in-lab, with eye tracking), native Basque and Spanish speakers (N=32 each) received two blocks per task and described the pictures orally. In Exp. 2 we tracked the location of fixations on the briefly presented pictures. We analyzed first and second fixations to event pictures with Bayesian hierarchical binomial regression [8] to test whether the marked vs. unmarked status of agents in Basque and Spanish was reflected in increased looks towards agent areas of interest in Basque speakers as compared to Spanish speakers. Accuracy in Exp. 1 and Exp. 2 was analyzed with Bayesian hierarchical ordinal models.

Results: In probe recognition, Basque speakers were more accurate in recognizing agents than Spanish speakers in both experiments (mean log odds: Exp. 1, $\hat{\beta} = 0.06$, $P(\hat{\beta} > 0) = 0.81$; Exp. 2, $\hat{\beta} = 0.13$, $P(\hat{\beta} > 0) = 0.93$). In event description, Basque speakers were more accurate describing agents than Spanish speakers ($\hat{\beta} = 0.15$, $P(\hat{\beta} > 0) = 0.98$) in Exp. 2. A different pattern was found in Exp. 1: Basque speakers were more accurate describing patients ($\hat{\beta} = -0.06$, $P(\hat{\beta} > 0) = 0.87$), possibly due to the modality difference in this task across experiments (i.e., written vs spoken descriptions). Analyses of first and second fixations revealed that Basque speakers fixated more often on patients than Basque speakers ($\hat{\beta} = 0.08$, $P(\hat{\beta} > 0) = 0.95$), while Spanish speakers fixated more often on patients than Basque speakers ($\hat{\beta} = -0.09$, $P(\hat{\beta} > 0) = 0.98$). In addition, in event description these effects were stronger than in probe recognition (Agent, $\hat{\beta} = 0.04$, $P(\hat{\beta} > 0) = 0.91$; Patient, $\hat{\beta} = -0.05$, $P(\hat{\beta} > 0) = 0.93$).

Our results suggest that the grammatical features of a language shape not only structural and linguistic encoding [9] but can also affect event apprehension [2,10]. In particular, these results show that language-related task requirements can influence attention to agents during event apprehension. These findings suggest the possibility of an interaction between language and event cognition [11].

Example event pictures and sentences in Basque (B) and Spanish (S)



Fig.1. Transitive human-human event:
(1) B: Lisa-k Emma orraztu du Lisa-ERG Emma brushed has
(2) S: Lisa-Ø ha peinado a Emma Lisa-NOM has brushed DOM Emma "Lisa has brushed Emma"



Fig. 2. Transitive human-inanim. event:
(1) B: Tim-ek bizikleta konpondu du Tim-ERG bike fixed has
(2) S: Tim-Ø ha arreglado la bici Tim-NOM has fixed the bike "Tim has fixed the bike"



Fig.3. Intransitive event:
(1) B: Paul-Ø makurtu da Paul-ABS crouched has
(2) S: Paul-Ø se ha agachado Paul-NOM REFL has crouched "Paul has crouched"



Fixations to event roles by language across tasks

Fig 4. Proportion of first and second fixations to agents and patients in the briefly exposed event pictures, by language. Black dots represent participant means.

References: [1] Dobel et al., 2007. *Acta Psychol.* [2] Griffin & Bock, 2000. *Psychol Sci.* [3] Gerwien & Flecken, 2016. *Proceed Cog Sci.* [4] Sauppe & Flecken, 2021. *Cognition.* [5] Hafri et al., 2018. *Cognition.* [6] Sauppe et al., 2021, *PLOS Biology.* [7] Pierce et al., 2019. *Eye movement research.* [8] Burkner, 2017. *J Stats Soft.* [9] Norcliffe et al., 2015. *Lang Cog Neurosci.* [10] Gleitman et al., 2007. *JML.* [11] Lupyan et al., 2020. *Trends Cogn Sci.*