Now you see it… ? : Agreement sensitivity in 'at-a-glance' reading in Spanish

[**Intro**]. Theories of language processing have focused on 'word-by-word' processing (e.g., speech, sign, careful reading). How do we process language 'at-a-glance', i.e., when peeking at a notification? Sentences displayed in parallel for 200–300 ms are identified more quickly than word lists, non-word letter strings, or scrambled sentences [1–5], and electro- / magnetoencephalography (EEG, MEG) responses diverge 150–400 ms post-sentence onset [2–5]. Proposed mechanisms include parallel activation of lexico-syntactic features [2], detection of basic constituent structure [3,4], or 'filtering' the percept using top-down expectations [5]. This neural 'sentence superiority effect' (SSE) is insensitive to agreement errors in English (*nurses* {*clean/*cleans*} *wound*) [3,4], which are normally robustly detected in EEG/MEG [6]. This suggests 'at-a-glance' readers build less detailed syntactic parses [3,4]. However, subject-verb agreement in English frequently requires detection of a visually non-salient morpheme (*–s, -Ø*), which may be unnoticed in longer stimuli. Subject-verb agreement is a non-local dependency across two phrases, dependent on an integrated parse of the sentence. We present pilot data from a two-word RPVP experiment on Spanish adjective-noun concord, which is a local relation marked on both the head and dependent. Our research question is: Do Spanish readers 'notice' agreement errors in short, two-word noun-adjective pairs? Pilot results show greater reaction times (RTs) to ungrammatical vs. grammatical noun-adjective pairs. However, this is only observed in nouns that end in *-o* or *-a*, the canonical gender inflectional endings – even if this vowel does not encode gender (*el*$_{[\text{Masc}]}$ *aut-**o***$_{[\text{Masc}]}$ 'automobile' vs. *la*$_{[\text{Fem}]}$ *moto*$_{[\text{Fem}]}$ 'motorcycle').

[**Materials & Procedures**] 44 sets of 9 two-word items (**Table 1**). The first word was a noun. We manipulated **Transparency:** Nouns ended with the canonical gender inflection (-***o***$_{[\text{Masc}]}$, -***a***$_{[\text{Fem}]}$) (Transparent; *aut-**o***$_{[\text{Masc}]}$ 'automobile'), with no canonical inflection (Opaque; *coche*$_{[\text{Masc}]}$ 'car'), or with a vowel that is 'misleadingly' associated with the opposite gender (Pseudomarked; *moto*$_{[\text{Fem}]}$ 'motorcycle'). The second word was an adjective or noun. We manipulated this word's **Grammaticality:** Adjectives that agreed (Grammatical; [$_{\text{NP}}$ *aut-**o***$_{[\text{Masc}]}$ *rápid-**o***$_{[\text{Masc}]}$] 'fast car'), adjectives that did not (Ungrammatical; *[$_{\text{NP}}$ *aut-**o***$_{[\text{Masc}]}$ *rápid-**a***$_{[\text{Fem}]}$]), or a second noun that did not compose into a constituent with the first (List; *auto camión* 'automobile, truck'). Grammatical vs. Ungrammatical comparisons establish sensitivity to agreement; Grammatical vs. List establishes the SSE. Participants (N = 7 / planned 30) read target stimuli followed by a second word pair, each for 300ms (800ms ISI) (**Fig1A**), and judged if they matched [3–5] (50% mismatch).

[**Analysis & Results**] We report preliminary behavioral results. Residual reading times were calculated and analyzed as in **Fig1B.** Results in **Fig1C**. There was a significant coefficient for **Grammaticality** (p = 0.01), and a marginally significant **Transparency:Grammaticality** coefficient (p = 0.08). Pairwise comparisons showed slower RTs for Ungrammatical vs. List (p < 0.01) and vs. Grammatical (p = 0.11). This pattern was observed within the level Pseudomarked (ps < 0.05), and a (n.s.) trend was observed in Transparent, but not Opaque. No 'SSE' was observed (Grammatical vs. List ps > 0.10). EEG results forthcoming.

[**Conclusion**] Our PRELIMINARY results suggest that Spanish readers detect ungrammatical agreement relations in noun-adjective pairs. This only occurs for nouns ending in *-o* or *-a*, whether transparent or pseudomarked. 'At-a-glance' readers only encode gender agreement relations when cued by the orthomorphographic properties of the stimulus. This is similar to 'blind' morphosyntactic decomposition theories ([7]), and is consistent with proposals that transparent vs. opaque gender marking engage distinct brain networks [8].

	GRAMMATICAL	UNGRAMMATICAL	OPAQUE
TRANSPARENT	[$_{\text{NP}}$ *aut-**o***$_{\text{[Masc]}}$ *rápid-**o***$_{\text{[Masc]}}$] 'fast automobile'	* [$_{\text{NP}}$ *aut-**o***$_{\text{[Masc]}}$ *rápid-**a***$_{\text{[Fem]}}$] 'fast automobile'	*auto camión* 'automobile, truck'
OPAQUE	[$_{\text{NP}}$ ***coche***$_{\text{[Masc]}}$ *rápid-**o***$_{\text{[Masc]}}$] 'fast car'	* [$_{\text{NP}}$ ***coche***$_{\text{[Masc]}}$ *rápid-**a***$_{\text{[Fem]}}$] 'fast car'	*coche camión* 'car, truck'
PSEUDOMARKED	[$_{\text{NP}}$ ***moto***$_{\text{[Fem]}}$ *rápid-**a***$_{\text{[Fem]}}$] 'fast motorcycle'	* [$_{\text{NP}}$ ***moto***$_{\text{[Fem]}}$ *rápid-**o***$_{\text{[Masc]}}$ 'fast motorcycle'	*moto camión* 'motorcycle, truck'

Table 1. Example set of stimuli.

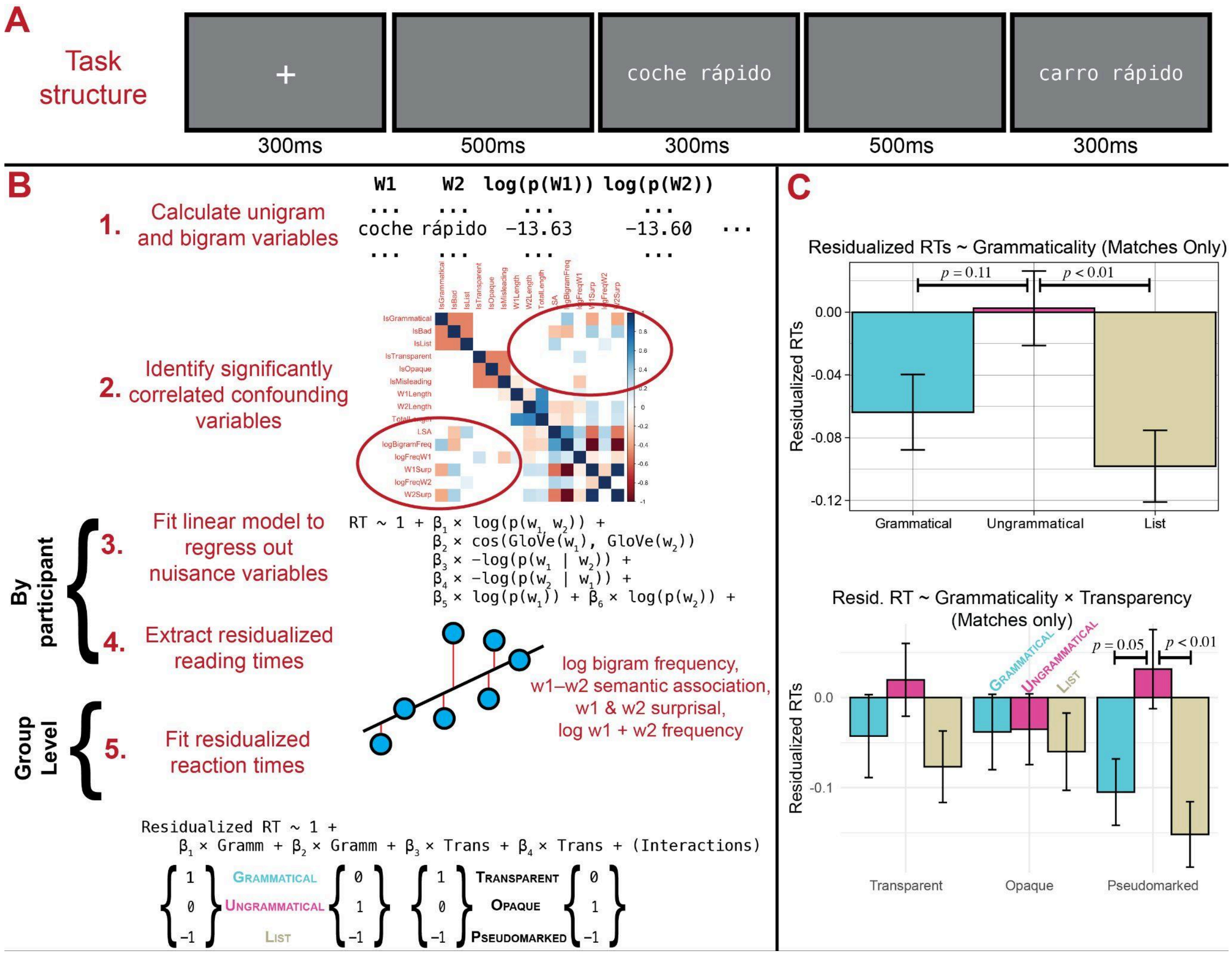

Figure 1. (A) Task structure. (B) Work-flow for analyzing behavioral data. (C) Average residual reaction time by **GRAMMATICALITY** and **GRAMMATICALITY** × **TRANSPARENCY**.

Refs. [1] Snell, J., Grainger, J. (2017). *Cognition* [2] Wen, Y., Snell, J., Grainger, J. (2019). *Cognition.* [3] Fallon, J., Pylkkänen, L. (2024). *Science Adv*. [4] Dunagan, D.G., et al. (2024). *Cognition*, submitted. [5] Flower, N., Pylkkänen, L. (2024). *J Neuro* [6] Molinaro, N., et al. (2011). *Cortex* [7] Rastle, K., Davis, M.H. (2008). *LCP*. [8] Quiñones, et al. (2018). *NeuroImage*.