

Eye-tracking Effects of Visual Antecedents in English and Dutch Ellipsis Resolution

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Background: Comprehenders utilize nonlinguistic visual information for sentence processing when such cues are accompanied or followed by full syntactic material [1]. This leads to the question of whether visual information is only secondary in parsing, or whether it can bridge comprehension even in the absence of overt syntactic input. The present study probed the latter possibility and investigated if such visual cues would be flexibly integrated with the unfolding discourse and help resolve an ellipsis downstream by serving as the “visual antecedent” online (cf. [2] for an offline rating study of discourse-based ellipsis resolution).

Method: In two experiments, L1 English (n=51, items=90, fillers=48) and Dutch readers (n=34, items=90, fillers=48) viewed an image depicting an action followed by a sentence with Verb-phrase Ellipsis and Sluicing, respectively. Participants first saw a preamble sentence fragment, followed by either a visual antecedent (an image of a woman knitting a scarf) or a linguistic antecedent (“knitting a scarf” in text). Subsequently, a sentence with an elliptical gap was displayed (see **Table. 1** for example items). Participants’ eye movement patterns at the elision sites and spillover regions were compared to those of the controls to examine whether retrieving the visual antecedent would either yield increased cognitive effort (interference), be just as successful as with a linguistic antecedent (null) or boost the processing (facilitation). To further disentangle the observed effects, we included Canonical conditions without any anaphoricity and Pronoun conditions with a similar retrieval operation to ellipsis, yielding a 2x3 design. Linear-mixed models were fitted to log-transformed reading measures with Antecedent type and Resolution type as fixed effects, and items and participants as random effects.

Results+Discussion: In Exp.1, a significant main effect of *Antecedent* emerged only for the Canonical condition; namely, visual antecedents sped up the reading times of Canonical ($t=2.01$, $p=.043$), but not Ellipsis or Pronoun conditions in English. For Exp.2, a significant main effect of *Antecedent* was found across all Resolution types ($t=-3.17$, $p=.001$), meaning visual antecedents disrupted the resolution of not only the Ellipsis and Pronoun, but also the processing of the non-anaphoric Canonical conditions in Dutch (**Fig. 1**). Results suggest that in Exp.1 (English), visual information facilitates processing when integrating a new discourse element (Canonical), but not when retrieving old information (Ellipsis & Pronoun). Whereas in Exp.2 (Dutch), visual information momentarily disrupts both anaphoric and non-anaphoric processing (Ellipsis, Pronoun, & Canonical); revealing differences in the way visual cues are utilized across different grammatical constructions.

References

[1] Falk Huettig, Rommers Joost, and Antje S. Meyer. Using the visual world paradigm to study language processing: A review and critical evaluation. *Acta psychologica*, 137(2), 151-171, 2011.

[2] Jeffrey Geiger and Ming Xiang. At the syntax-discourse interface: Verb phrase ellipsis interpretation in context, *Language* 97.1, 2021.

Exp.1 English	Preamble sentence fragment	Antecedent	Critical sentence	Exp.2 Dutch	Preamble sentence fragment	Antecedent	Critical sentence
Condition 1. (Visual-Ellipsis)	Last Friday Joanna was		Elise was too because...	Condition 1 (Visual-Ellipsis)	Afgelopen vrijdag was Joanna "Last Friday Joanna was"		Elise weet waarom , omdat ze...
Condition 2 (Linguistic-Ellipsis)		Knitting a scarf		Condition 2 (Linguistic-Ellipsis)		een sjaal aan het breien "knitting a scarf"	"Elise knows why because they..."
Condition 3 (Visual-Canonical)			Elise was readi because...	Condition 3 (Visual-Canonical)			Elise weet veel , omdat ze...
Condition 4 (Linguistic-Canonical)		Knitting a scarf		Condition 4 (Linguistic-Canonical)		een sjaal aan het breien "knitting a scarf"	"Elise knows well because they..."
Condition 5 (Visual-Pronoun)			Elise was doing too because...	Condition 5 (Visual-Pronoun)			Elise weet het , omdat ze...
Condition 6 (Linguistic-Pronoun)		Knitting a scarf		Condition 6 (Linguistic-Pronoun)		een sjaal aan het breien "knitting a scarf"	"Elise knows that because they..."

Table.1: Example items in all six Conditions: Exp1. English (left) and Exp2. Dutch (right)

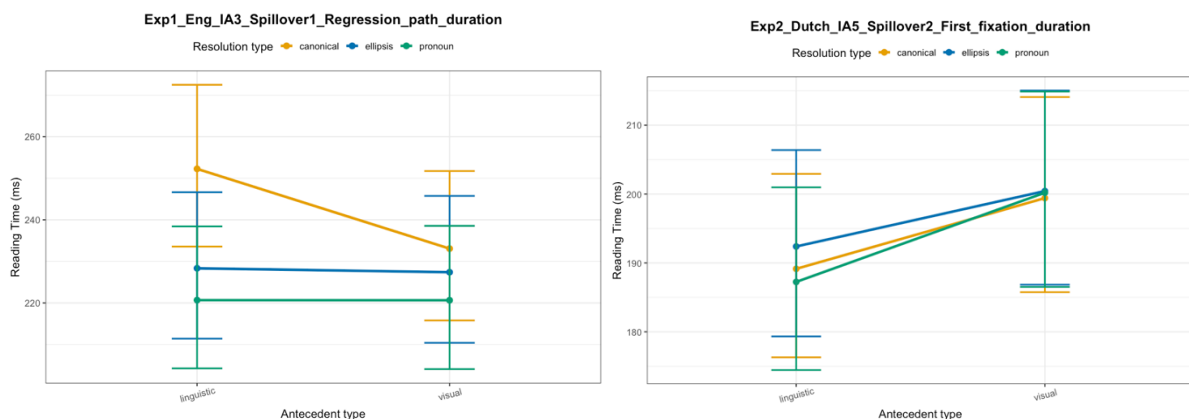


Fig. 1: Illustrations of *Antecedent type* effects for Exp.1 IA3 (first spillover post critical) Regression-path duration (left) and Exp. 2 IA5 (second spillover post critical) First-fixation duration (right). For both plots, Y-axis represents the reading times that are exponentiated back to milliseconds, while X-axis juxtaposes the two different Antecedent types (Linguistic vs Visual). Three Resolution types (Linguistic vs Visual). Three Resolution types are color-coded such that yellow, blue, and green lines represent Canonical, Ellipsis, Pronoun conditions, respectively.