

Article

Discourse Construction Mechanisms: An Eye-Tracking Study on L1, L2, and Heritage Speakers of Spanish

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Abstract

This study explores the cognitive processing of discourse construction mechanisms in Spanish, focusing on counter-argumentative relations that involve anaphoric encapsulation through either pronominal (e.g., *a pesar de ello*) or lexical forms (e.g., *a pesar de [NP]*). These constructions combine procedural meaning with referential retrieval, placing complex demands on discourse integration. Using eye-tracking data from 77 participants across three speaker groups, namely, L1, heritage, and L2 speakers, this study yields three main findings: (1) nominal expressions do not incur greater processing effort than pronominal ones under optimal communicative conditions; (2) heritage and L2 speakers exhibit higher processing effort than L1 speakers due to less automatized processing of discourse cues; and (3) heritage speakers show greater difficulty than L2 speakers, particularly with pronominal forms, likely due to the lower transparency of procedurally encoded meanings.

Keywords: discourse relations; counter-argumentative relation; pronominal and lexical encapsulation; heritage speakers; second language speakers; experimental pragmatics; discourse markers



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1. Introduction

This study investigates the cognitive processing of different discourse construction mechanisms and examines how such processing varies depending on the speaker's linguistic background. The connective structure under analysis combines counter-argumentative instruction (*a pesar de*, “despite”) and anaphoric encapsulation. The anaphoric function can rely on a neutral pronoun, as in *a pesar de ello* (“despite this”), or on an encapsulating noun phrase (NP). The semantic structure underlying each variant has implications for decoding and inferential processes aimed at maintaining discourse continuity. The study of these structures is essential, as their resolution reflects the speaker's pragmatic competence and their ability to construct complex representations. The combination of encapsulation and discourse marking processes may be approached differently by learners acquiring the language through instruction (L2 speakers) and by those whose acquisition combines early natural exposure with later formal learning (heritage speakers). This is explored through an eye-tracking experiment in Spanish.

1.1. Mechanisms of Discourse Construction

One of the ongoing issues in pragmatics is the explanation of how discourse builds contextually negotiated mental representations between interlocutors, how these representations are connected to one another, and how they are modified throughout interaction. Among the operations involved in discourse construction, particular attention has been devoted to discourse marking, as in (1), through which specific linguistic units establish relations between discourse segments and guide the inferential processing of meaning in context (Martín Zorraquino & Portolés Lázaro, 1999; Loureda & Acín, 2010; Mosegaard Hansen & Visconti, 2024), and to anaphoric encapsulation, as in (2), an anaphoric mechanism that enables the retrieval of a predicate-based antecedent (Francis, 1986; Schmid, 2000; López Samaniego, 2014):

- (1) El trabajo del equipo de márketing fue excelente. *Sin embargo*, la dirección aplicará una fuerte reducción presupuestaria.
 (“The work of the marketing team was excellent. *However*, management will implement a significant budget cut.”)
- (2) Ana y Marta alabaron el trabajo del equipo de márketing. *La alabanza* no impedirá que se aplique una fuerte reducción presupuestaria.
 (“Ana and Marta praised the work of the marketing team. *The praise* will not prevent a significant budget cut from being implemented.”)

Although these relations typically occur independently, as shown in (1) and (2), they also frequently appear in combination, as in examples (3) and (4). In these cases, *a pesar de + ello/a pesar de + NP* connects two discourse segments in such a way that the second segment mitigates or cancels a conclusion that could otherwise be inferred from the first, thereby blocking the conclusion that would automatically follow from the assumption made in the initial segment (Briz Gómez et al., 2008).

- (3) Ana y Marta alabaron el trabajo del equipo de márketing. *A pesar de ello* no impedirá que se aplique una fuerte reducción presupuestaria.
 (“Ana and Marta praised the work of the marketing team. *Despite this*, the management will implement a significant budget cut.”)
- (4) Ana y Marta alabaron el trabajo del equipo de márketing. *A pesar de la alabanza* no impedirá que se aplique una fuerte reducción presupuestaria.
 (“Ana and Marta praised the work of the marketing team. *Despite the praise*, the management will implement a significant budget cut.”)

The meaning of *a pesar de* is fundamentally procedural (Wilson & Sperber, 1993; Blakemore, 2002; Pons Bordería, 2006; Escandell-Vidal, 2017; Loureda Lamas et al., 2021). *A pesar de* allows the speaker to establish relations between discourse segments and to impose constraints on how those segments should be interpreted considering the context and the hearer’s expectations.¹ The instruction encoded by the marker imposes specific interpretive conditions on the rest of the utterance, and if these are not met, communicative relevance may be reduced.

In contrast to other connectives such as *sin embargo* (1), *a pesar de (+ello/NP)* combines procedural marking with a referential relation. Through the second element of the prepositional phrase, a coreferential structure is created with an *explicature*, that is, a minimal representational schema composed of linguistically encoded predicative material that has already been contextually enriched, and from which the most appropriate inferential routes can be activated (Francis, 1986, 1994; Schmid, 2000; Carston, 2002; Wilson & Sperber, 2012; Kolhatkar & Hirst, 2014; Carston & Hall, 2017).² The NP or the pronoun retrieves and transforms this antecedent. In either case, the expression activates a representational con-

struction that selects the assumptions most relevant to the context, aiming to guide a specific inferential path that maximizes contextual effects while minimizing processing effort.

Encapsulating nominal structures can be classified according to their informational content, which may be either categorizing or recategorizing. Categorizing encapsulating NPs reactivate an already existing discourse representation and summarize it through a nominal label that does not introduce additional information, as in the example (4). Recategorizing encapsulating NPs, by contrast, shift the perspective on the referred segment by reframing it under a new conceptual, evaluative, or contrastive category (López Samaniego, 2014).

- (5) Ana y Marta alabaron el trabajo del equipo de márketing. A pesar de la caricia, comunicaron una fuerte reducción presupuestaria.
 (“Ana and Marta praised the work of the marketing team. *Despite the flattery*, they announced a substantial budget cut.”)

The first relevant question is whether the nominal or pronominal nature of the element accompanying the prepositional phrase *a pesar de* conditions processing effort. There are at least two arguments suggesting that the connection with a pronoun entails greater cognitive cost. The first is that pronoun resolution relies on inferential strategies. The meaning of the pronoun *ello* does not provide a representation of the referent; instead, it merely initiates an interpretive process based on saturation, which is inferential and governed by general pragmatic principles (Carston, 2002; Escandell-Vidal, 2004; Recanati, 2017). It differs from a categorizing NP in that the semantic structure of the latter is more specific and linked to encyclopedic knowledge (Gundel et al., 1993; Cornish, 1999; Ariel, 2001; Carston, 2002; Wilson & Sperber, 2004). The NP offers a categorical representation that serves as a decodable guide for reconfiguring the referred context as a conceptually specific entity (Leonetti & Escandell-Vidal, 2004; Carston & Hall, 2017). This guiding effect is enhanced when no new information is added (Loureda et al., 2025). Additional evidence suggesting that pronominal processing is cognitively demanding comes from the fact that the neuter pronoun in Spanish is highly underdetermined, especially in comparison to personal pronouns, since gender and number no longer function as retrieval cues for the antecedent (Eguren, 1999; Zulaica-Hernández & Gutiérrez-Rexach, 2009).

Conversely, two arguments appear to suggest that pronoun resolution may be more favorable: the absence of a need to reify the antecedent, due to the lack of conceptual and encyclopedic content, and the high accessibility of the referent. In this regard, Almor’s (1999) *Informational Load Hypothesis*, which holds that the processing cost of anaphoric expressions primarily depends on the specific discourse context in which they appear, implies that if the representation of the antecedent is sufficiently prominent, a semantically more general anaphor will be required. In other words, the relationship between function and processing cost may be more balanced when a pronoun is used.

A holistic interpretative approach is that, when combined with a discourse-marking instruction, the resolution of the pronoun may be cognitively less demanding at the local level, as it does not require ad hoc lexical adjustment (Wilson, 2011, 2016; Carston, 2016; Escandell-Vidal, 2020). However, the saturation processes and the activation of additional inferences demanded by the pronoun may penalize the overall processing of the utterance, since these inferences must be subsumed under a connective instruction that itself requires further adjustment to activate a contextual relationship between assumptions (research question 1).

1.2. Cognitive Processing of Discourse Construction Mechanisms and Speaker Profiles

Recent research in experimental pragmatics has advanced our understanding of the discourse mechanisms through which meaning is constructed, connected, and interpreted. However, most of these studies have focused on L1 speakers, with limited attention

given to L2 and heritage speakers. Investigation of L1 speakers demonstrates that the implementation of structures as *a pesar de ello* in optimal contexts activates systematic inferential processes, and these function as gravitational centers of discourse (Loureda Lamas et al., 2021). These effects have led to the formulation of Principles of Discourse Marking, which aim to explain how the presence of a marker in a given context conditions the inferential routes and processing effort required for interpretation (Loureda Lamas et al., 2021). The Principles of Discourse Marking describe the cognitive behavior of these units and give rise to four systematic effects: the creation of new access routes to information, the limitation of the semantic complexity being processed, the optimization of initial interpretation, and the facilitation of early integration within a rigid, non-negotiable frame (Escandell-Vidal & Leonetti, 2011; Loureda Lamas et al., 2021; Loureda et al., 2022a; Larralde et al., 2024).

Additional experimental studies have compared the processing of counter-argumentative connectives such as *sin embargo* and *a pesar de ello*. Despite some microstructural differences, both markers behave similarly and are processed within the boundaries predicted by the Principles of Discourse Marking (Loureda Lamas et al., 2021; Guillén Jiménez, 2021; Loureda et al., 2022b). Research focusing on the anaphoric role of *a pesar de ello* has shown that its processing may be affected by variables such as the length of the antecedent or its distance in the discourse (Parodi et al., 2018; Parodi et al., 2019; Guillén Jiménez, 2021).

Various experimental studies have demonstrated that several factors interact in the resolution of pronominal coreferential anaphora. Among these, syntactic parallelism, grammatical agreement, and alignment of argument structure between antecedent and anaphor significantly facilitate reference resolution (Smyth, 1994; Carminati, 2005; Almor, 2008; Zulaica-Hernández & Gutiérrez-Rexach, 2009). Additional factors such as the syntactic hierarchy of the antecedent and the prominence of the referent also play a central role (Brown-Schmidt et al., 2005; Fukumura & van Gompel, 2015; Çokal et al., 2016). Further research on anaphoric encapsulation reveals cognitive differences between pronominal and lexical forms. Hernández Pérez et al. (2025) show that utterances linked by textual anaphora, specifically, the Spanish demonstrative pronoun *ello* in the subject position, do not require a greater processing effort than utterances linked by categorizing encapsulating NPs.

Empirical findings on how L2 and heritage speakers process discourse mechanisms reveal systematic differences in processing effort. To date, only a limited number of studies have specifically examined how different speaker groups handle various discourse relations, or what strategies heritage and L2 speakers employ to retrieve discourse referents depending on whether the referential expression is lexical or pronominal in nature (Zufferey & Gygax, 2017; Wetzel & Zufferey, 2021). In L2 contexts, there is evidence suggesting that when discourse connectives present complex form-function mappings in comparison to the speakers' L1, even advanced speakers may experience interpretive difficulties (Zufferey & Gygax, 2017; Recio Fernández, 2020; Loureda Lamas et al., 2021). Consequently, L2 readers may prefer implicit formulations, even at the expense of coherence, and rely more heavily on conceptual content and inferential reasoning rather than on procedural cues.

Due to differences in exposure or underlying mechanisms of language acquisition, both L2 and heritage speakers are expected to show different processing times than L1 speakers when handling the combination of discourse-marking instructions and anaphoric encapsulating NPs, regardless of whether these are realized through pronouns or lexical NPs (research question 2). This research question assumes that such operations pose a different processing effort for L1, heritage, and L2 speakers due to a lower degree of automatization in the processing at pragmatic and discourse-level information in the latter (Segalowitz & Hulstijn, 2005; Zufferey & Gygax, 2017; Wetzel & Zufferey, 2021).

Differences in acquisition context between heritage and L2 speakers may lead to distinct processing effort. Heritage speakers are expected to experience different processing effort than L2 speakers, not only due to their proficiency level but because their acquisition trajectories affect how discourse-level information is processed and integrated. Their path is typically characterized by early, but often highly variable, exposure to the heritage language depending on multiple factors. These include the geographic and sociolinguistic environment in which the heritage language is used (Kupisch, 2021; Moreno-Fernández & Loureda Lamas, 2023), communicative practices within the family (Scheele et al., 2010; Grose-Hodge et al., 2024), and the availability of educational programs that may support and stabilize early acquired competence. In contrast, L2 speakers usually acquire the language later in life and in formal contexts where exposure tends to be more systematic and controlled (research question 3).

Research on heritage languages provides insight into how multilingual environments shape the cognitive development of heritage speakers. Experimental studies have explored various linguistic domains, including syntactic parsing (Roberts & Felser, 2011; Jegerski et al., 2016; Jegerski & Keating, 2023), gender agreement (Felser et al., 2009), and verbal mood and aspect (Perez-Cortes et al., 2019). Heritage speakers often outperform L2 speakers in certain syntactic and pragmatic domains, such as subject–verb agreement and the use of null versus overt pronouns (Montrul, 2006; Montrul & Rodríguez Louro, 2008; Bella, 2012; Mills & Grainger, 2016; Israa, 2017; Torregrossa & Bongartz, 2023). However, this advantage is not consistent across all grammatical domains.

Two patterns stand out in heritage speakers' linguistic behavior. First, frequent exposure to certain structures, especially within specific registers, fosters stronger mental representations and more automated processing routines, as predicted by usage-based models of acquisition (Croft, 2000; Tomasello, 2003; Bybee, 2006, 2010; MacWhinney, 2012; Ellis, 2016). Second, heritage speakers show a marked preference for explicitness, favoring analytically rich, conceptually transparent forms over reduced or semantically underspecified alternatives (Montrul, 2004; Gullberg, 2006; Yoshioka, 2008; Azar et al., 2020). For instance, they tend to use full noun phrases rather than pronouns, particularly at intermediate proficiency levels, indicating less entrenched referential forms. Montrul (2004) found that intermediate heritage speakers of Spanish used overt pronouns in redundant contexts in 50% of cases, compared to only 9% among advanced speakers and none among monolinguals. Although the phenomenon remains underexplored, similar tendencies have been documented across other linguistic domains (Polinsky, 2018; Azar et al., 2020).

2. Methodology

This study tests whether different types of speaker groups exhibit distinct processing patterns of specific discursive mechanisms due to their unique language acquisition and learning processes. Concretely, this study investigates how these groups process counter-argumentative discourse markers in combination with encapsulating structures (see examples (3) and (4)), which play a crucial role in structuring inferential processes and guiding discourse comprehension.

2.1. Materials, Preliminary Validation Tests, and Areas of Interest

The experiment included two variables: a subject variable distinguishing the three speaker groups (L1, heritage, and L2 speakers), and an object variable representing discourse construction mechanisms, with two conditions: a pronominal and a lexical anaphoric encapsulation, both embedded within a counter-argumentative structure. In language acquisition these mechanisms are introduced for reading comprehension tasks at the B1 level. At the B2 level, speakers “can recognize different structures in discursive text: contrasting

arguments, problem-solution presentation and cause-effect relationships” (Council of Europe, 2020; Instituto Cervantes, 2006). To ensure the adequacy of the selected mechanisms in the experimental stimuli, a preliminary survey was conducted among Spanish instructors. The instructors confirmed that the target expressions had been explicitly addressed in their courses, both through teaching content and syllabus inclusion, and that they are commonly used in L2 and heritage classroom contexts as part of students’ explicit instruction. Additionally, a complementary comprehension test was carried out with all three participants groups to verify that participants can correctly establish the referential relation between the anaphoric expression and its intended discourse antecedent and that they were familiar with the lexical encapsulations used in the stimuli. The test was conducted online using LimeSurvey and presented in written. The stimuli used in the comprehension test were not identical to those in the main experiment, but they followed the same structural templates, combining counter-argumentative constructions with either pronominal or lexical encapsulation. For each item, participants were asked a multiple-choice question that required them to correctly identify the discourse relation expressed in the utterance. Correct answers could only be provided if participants had accurately understood both the anaphoric encapsulation and the counter-argumentative relation. In all participant groups, accuracy rates exceeded 90%, confirming that the referential mechanisms under investigation were fully accessible and correctly interpreted prior to the eye-tracking task.

Eye-tracking data were recorded during a reading task across six areas of interest (AOI) (Holmqvist et al., 2011). The present study focuses on the following three AOI:

- Relational expression: The segment containing the counter-argumentative instruction, introduced by *a pesar de* and followed by either a pronoun (*a pesar de ello*) or a lexical NP (*a pesar de la alabanza*).
- Referential expression: The anaphoric element embedded in the relational expression marker: *ello/la alabanza*.
- Context segment: The whole discourse segment, excluding the relational expression itself. Considering this area allows for a more holistic observation of how the relational expression interacts with its surrounding context to guide discourse construction. While a narrower comparison between the relational expression and its antecedent would inform us of the referential links, the broader segment captures how these expressions contribute to recover and transform the mental representation of the utterance: *Ana y Marta alabaron el trabajo del equipo de marketing. [. . .], comunicaron una fuerte reducción presupuestaria.*

2.2. Experimental Design and Measures

This study follows a 2×3 design. Latin square counterbalancing was implemented to control for hidden variables such as word frequency and length (Rayner, 2009). The experiment comprised, in total, 12 critical stimuli, distributed across 2 Latin square-based experimental lists. Each list contained a 1:2 ratio of critical to filler items, presented in a pseudo-randomized sequence (Arunachalam, 2013). Each participant read 6 critical stimuli.

The dependent variables were participants’ reading times, measured in milliseconds (ms). Total reading time (TRT) served as the indicator of processing effort, capturing the duration of fixations on a given stimulus (Holmqvist et al., 2011; Rayner, 1998). This measure reflects the processes involved in hypothesis formation and inferential adjustments during reading.

While TRT also includes contributions from lower-level processing, it has been widely used as an indicator of processing effort in the interpretation of reference. In line with this theoretical grounding, the analysis reported in the main section of this paper focuses on TRT. First-pass reading time and re-reading time were additionally included as part of an

exploratory analysis of earlier and later processing stages. These complementary measures are not discussed in detail here but may inform future investigations into the temporal dynamics of referential processing.

2.3. Participants

- *L1 Spanish speakers*: This group included 32 participants, all L1 speakers of Spanish, aged 18–25 years. The gender distribution was 62% female and 38% male. All participants were university students residing in Spain, recruited at the Universidad Nebrija (Spain). They reported normal or corrected-to-normal vision.
- *L2 Spanish speakers*: The second group consisted of 25 university students from the United States, aged 18–25. Among them, 58% were female and 42% male. The participants were L1 speakers of English with no Hispanic parental background. Although participants were tested during a temporary academic stay of three months at the Universidad Nebrija, all L2 speakers were permanent residents in the United States. Therefore, their linguistic profile reflects the typical learning environment of L2 speakers, with limited long-term immersion in Spanish-speaking contexts. All had a certified B2 proficiency CEFR-level in Spanish and were currently enrolled in a C1 level course. They were also recruited at the same university. All reported normal or corrected vision.
- *Heritage Spanish speakers*: This group comprised 20 heritage speakers of Spanish, 19 of whom were born in the United States, between 18–25 years. Among them, 65% were female and 35% were male. All heritage speakers were permanent residents in the United States and were participating in a short-term academic program of three months at the Universidad Nebrija. Consequently, their exposure to Spanish remained characteristic of U.S.-based heritage speakers, with no extended immersion in Spanish-speaking environments prior to or beyond this temporary stay. All were university students with second-generation Hispanic backgrounds: 19 out of 20 had both parents of Hispanic origin and 1 out of 20 had one parent of Hispanic origin. Their dominant language was English, and Spanish is their non-dominant language. As L2 speakers, they had a certified Spanish proficiency B2-level, with ongoing C2-level coursework. They were recruited at the Universidad Nebrija and met the same visual health criteria as the other groups. To verify early exposure, participants completed a background questionnaire during pre-screening, which included questions about language use at home during childhood (e.g., whether Spanish was spoken by one or both parents), age of initial exposure, and current patterns of use. All heritage speakers reported exposure to Spanish from birth or early childhood, with Spanish being used regularly in the home environment. Regarding current use, the group was relatively homogeneous: 18 out of 20 participants reported continued active use of Spanish in academic or family contexts.

2.4. Apparatus and Procedure

Eye-tracking data were collected using the EyeLink 1000 Plus system by SR Research, manufactured in Ottawa, Canada, recorded at 2000 Hz with an accuracy of $<0.15^\circ$. Experiment Builder software (version 2.6.11) was used for stimulus presentation.

Participants read silently at their own pace, completing the test within a maximum of 10 min per person. Stimuli were displayed on a computer screen with a chin rest. Instructions were provided before testing. Calibration was performed twice before practice trials and validated between experimental blocks. Each participant completed a total of 13 stimulus blocks: 6 blocks containing discourse contexts, fillers, and critical items related to the present study; 6 blocks from an unrelated experiment on idiomatic expressions

(not reported here); and 1 initial practice block. Informed consent was obtained from all participants.

2.5. Statistical Analysis

To ensure data quality, observations were excluded if extreme values were detected in the AOI corresponding to the entire stimulus under the following conditions (Pickering et al., 2000; Reichle et al., 2003):

- (1) Track loss: First-pass reading time of the entire stimulus = 0 ms.
- (2) Fast readers: First-pass reading time of the entire stimulus < 80 ms and second-pass reading time of the whole stimulus < 80 ms.
- (3) Slow readers: Total reading time of the entire stimulus > 800 ms.

After exclusions, data from one participant were removed, leading to a final dataset of 463 observations, with only 1 (0.2%) observation affected. Additive mixed models (Fahrmeir et al., 2013; Wood, 2017) were computed in R (version 4.3.2) (R Core Team, 2018) using the *mgcv* package (version 1.9-0). Two models were applied. The first model type, namely, additive mixed models, contains all experimental conditions and their interaction with all AOI as independent variables. The dependent variable is set to be the reading time per word, modeling the three different reading times in separate models. Further, this model type incorporates a nonlinear effect for flexible estimations of potential word length effects. Random effects were included to account for participant and item variability (Diggle et al., 2002).

The primary model was used to obtain predictions for a fixed-average character count per word, enabling the investigation of variations in reading time in milliseconds and their interpretation in terms of predicted absolute and relative differences between conditions. The obtained percentage differences between conditions, alongside their respective standard errors, formed the primary descriptive basis for evaluating processing effort. Effects were classified as irrelevant (<±4%), medium (±4–10%), or large (>±10%) (Loureda Lamas et al., 2021).

The second type of model, namely, linear mixed models, while containing the same random effects, estimates the associations between the experimental conditions on a letter level. Three separate models are estimated for the AOI of the context segment, as well as the relational and the referential expression. The reported *p*-values in Tables 1–4 are based on the computed marginal effects for the second model type, using a significance level of 0.05 to determine statistical significance.

Table 1. TRT (ms) of pronominal and lexical expressions in L1 speakers with percentage difference and *p*-values.

	Context Segment	Relational Expression (<i>a pesar de ello/a pesar de la alabanza</i>)	Referential Expression (<i>ello/la alabanza</i>)
Pronominal	201.07 (SE: 15.77)	207.45 (SE: 16.45)	151.36 (SE: 16.17)
Lexical	192.61 (SE: 15.75)	191.72 (SE: 15.76)	168.67 (SE: 16.02)
Percentage difference	−4.21%	−7.58%	11.44%
<i>p</i> -value	0.267	0.005	0.837

Table 2. TRT (ms) of pronominal and lexical forms in L1, L2, and heritage speakers (LH) with percentage difference and *p*-values, grouped by construction mechanism.

	Context Segment	Relational Expression (<i>a pesar de ello/a</i> <i>pesar de la alabanza</i>)	Referential Expression (<i>ello/la alabanza</i>)
Pronominal	L1	201.07 (SE: 15.77)	207.45 (SE: 16.45)
	L2	245.94 (SE: 17.21)	249.89 (SE: 17.88)
	% diff.	22.32%	20.46%
	<i>p</i> -value	0.018	0.021
	L1	201.07 (SE: 15.77)	207.45 (SE: 16.45)
	LH	298.01 (SE: 18.92)	328.19 (SE: 19.49)
	% diff.	48.21%	58.20%
	<i>p</i> -value	0.000	0.000
Lexical	L1	192.61 (SE: 15.75)	191.72 (SE: 15.76)
	L2	242.56 (SE: 17.27)	256.47 (SE: 17.28)
	% diff.	25.93%	33.77%
	<i>p</i> -value	0.007	0.004
	L1	192.61 (SE: 15.75)	191.72 (SE: 15.76)
	LH	279.96 (SE: 18.92)	283.10 (SE: 18.93)
	% diff.	45.35%	47.66%
	<i>p</i> -value	0.000	0.000

Table 3. TRT (ms) of pronominal and lexical forms in L2, and heritage speakers (LH) with percentage difference and *p*-values, grouped by construction mechanism.

	Context Segment	Relational Expression (<i>a pesar de ello/a</i> <i>pesar de la alabanza</i>)	Referential Expression (<i>ello/la alabanza</i>)
Pronominal	L2	245.94 (SE: 17.21)	249.89 (SE: 17.88)
	LH	298.01 (SE: 18.92)	328.19 (SE: 19.49)
	% diff.	21.17%	31.33%
	<i>p</i> -value	0.01	0.000

Table 3. Cont.

	Context Segment	Relational Expression (a pesar de ello/a pesar de la alabanza)	Referential Expression (ello/la alabanza)
Lexical	L2	242.56 (SE: 17.27)	256.47 (SE: 17.28)
	LH	279.96 (SE: 18.92)	252.27 (SE: 19.13)
	% diff.	15.42%	5.16%
	<i>p</i> -value	0.081	0.776

Table 4. TRT (ms) of pronominal and lexical forms in L1, L2, and heritage speakers (LH) with percentage difference and *p*-values, grouped by speaker group.

	Context Segment	Relational Expression (a pesar de ello/a pesar de la alabanza)	Referential Expression (ello/la alabanza)
L1	Pronominal	201.07 (SE: 15.77)	151.36 (SE: 16.17)
	Lexical	192.61 (SE: 15.75)	168.67 (SE: 16.02)
	% diff.	−4.21%	11.44%
	<i>p</i> -value	0.267	0.837
L2	Pronominal	245.94 (SE: 17.21)	190.65 (SE: 17.63)
	Lexical	242.56 (SE: 17.27)	239.90 (SE: 17.51)
	% diff.	−1.37%	25.83%
	<i>p</i> -value	0.771	0.349
LH	Pronominal	298.01 (SE: 18.92)	266.06 (SE: 19.25)
	Lexical	279.96 (SE: 18.92)	252.27 (SE: 19.13)
	% diff.	−6.04%	−5.18%
	<i>p</i> -value	0.052	0.008

3. Results

3.1. Processing of Counter-Argumentative Encapsulating Structures in L1 Speakers

Examining L1 speaker behavior in isolation provides a reference framework against which the processing patterns of heritage and L2 speakers can be compared:

- Faster processing of the pronoun compared to the NP. L1 total reading time is higher when the referential relationship is established through a lexical expression (11.44%). The effect is broad and statistically significant.
- Slower processing of the relational expression with a pronoun compared to that with a NP, with reading times of the lexical form decreasing by 7.58%. The observed TRT for the referential mechanism is relevant and significantly higher for *ello* than for the

NP ($p = 0.005$), underscoring the reliability with which L1 speakers integrate this type of referential expression, and compensating for the associated cognitive demands.

- Total processing of the context segment in the condition with a lexical referential structure is 4.21% less costly than its counterpart condition in which counter-argumentation is built on a pronominal encapsulation. While these effects do not reach statistical significance, the differences are sufficiently large to indicate a pattern.

In sum, L1 speakers exhibit a pattern characterized by the efficient processing of the pronoun *ello*; however, two challenges emerge with this type of referential connection: first, the integration of the pronoun within a discourse-marking structure; and second, the processing of the context segment (cf. Table 1).

3.2. The Processing of Discourse Construction Mechanisms in L1, L2, and Heritage Speakers

Both L2 and heritage speakers require a greater processing effort than L1 speakers when dealing with the discourse relations under analysis, whether these are established through pronominal or lexical reference. Taking the TRT of the context segment as an indicator, structures that combine counter-argumentative marking with pronominal reference are processed by L2 speakers in 22.32% more time than by L1 speakers; for heritage speakers, this difference reaches 48.21% compared to the L1 group. These differences are large and statistically significant. In structures that combine counter-argumentative marking with lexical encapsulation, both heritage and L2 speaker groups also show increased processing costs relative to L1 speakers, with substantial and significant increases in reading times ranging between 25.93% and 45.35% at the level of the context segment (cf. Table 2).

The relative processing difficulties of L2 and heritage speakers compared to L1 speakers are also evident in the processing of the referential expression and the entire relational structure. In the case of pronominal expressions, L2 speakers exceed the reading time of L1 speakers by 25.96%, while heritage speakers show an increase of 75.78%. Similarly, lexical forms result in an increase of between 42.23% and 49.56% in TRT for L2 and heritage speakers, respectively. All these effects are large according to the established categorization and most are statistically significant. The processing of the structure combining the discourse marker and the encapsulating element results in additional processing efforts ranging from 20.46% to 58.20%. These differences are also large and statistically significant (cf. Table 2).

Finally, differences between heritage and L2 speakers must be considered. The data indicate that heritage speakers encounter greater difficulties in managing the discourse construction mechanisms under analysis (cf. Table 3). Three indicators support this:

- The TRT of the context segment of utterances combining a *pesar de* with either a pronominal or lexical referential element: Compared to L2, heritage speakers require 15.42% more processing effort for lexical encapsulation and 21.17% more for pronominal encapsulation. The results are highly relevant and statistically significant for utterance processing of pronominal structures.
- The TRT of the relational expression: In the case of pronominal expressions, heritage speakers process this integration 31.33% slower than L2 speakers. For lexical expressions, the disadvantage amounts to 10.38%. The results are large and statistically significant for the pronominal relational expression.
- The TRT of the referential expression: Pronominal anaphoric expressions register 39.55% longer reading times for heritage compared to L2 speakers. For lexical expressions, this difference is 5.16%. The results range between medium and large differences and are statistically significant for the pronominal referential expression.

The increased processing effort observed for heritage relative to L2 speakers is also evident in their differential handling of discourse construction. Both groups show that

the processing of the context segment of the utterance with a lexical referential expression is never more demanding than with pronominal expressions. L2 speakers process the context segment of both sentence types in almost identical times, with a minimal difference of -1.37% , which is neither relevant nor statistically significant. In contrast, for heritage speakers, the context segment of utterances with lexical referential units are processed more easily than those with pronominal units, showing a medium difference of -6.04% , which is at the threshold of statistical significance ($p = 0.052$). A similar pattern appears in the processing of the full relational expression, with slight and non-significant differences (2.63% , $p = 0.093$) for the L2 speakers, and large, relevant, and statistically significant differences for heritage speakers (-13.74% , $p < 0.01$). However, access to the encapsulating element differs across groups: L2 speakers show lower processing effort for the pronominal form than for the lexical NP (with a disadvantage of between 11.44% and 25.83% for the NP), whereas heritage speakers appear to exhibit greater difficulty with the pronominal form, showing lower processing effort for the NP (5.18%). This medium difference is considered relevant and statistically significant ($p = 0.008$) (cf. Table 4).

3.3. Overview

In relation to the research questions concerning the processing of discourse relations, two key patterns are observed: first, heritage and L2 speakers consistently show elevated reading times across all areas of interest compared to L1 speakers (see Figure 1a–c); second, heritage speakers exhibit greater processing costs than L2 speakers, particularly when resolving pronominal reference, a pattern visible across all three AOI and especially pronounced in the relational and referential segments (see Figure 1b,c).

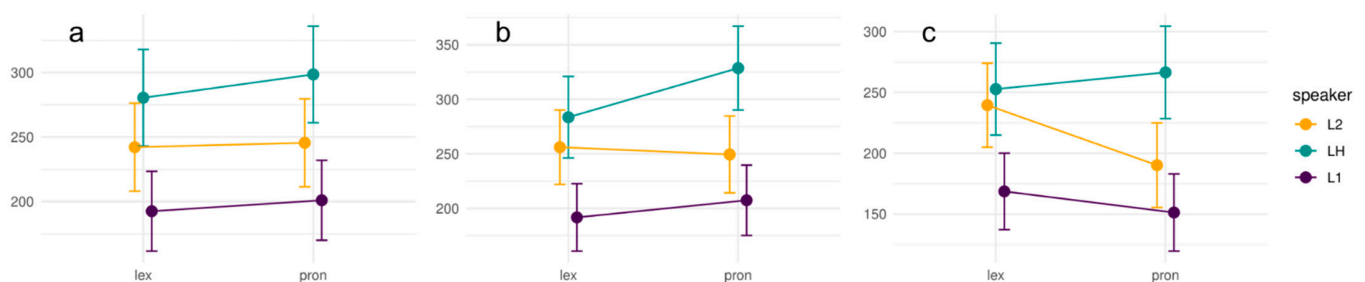


Figure 1. (a–c) Combined visualization of predicted total reading times with 95% confidence intervals for the context segment (a), relational expression (b), and referential expression (c), shown by speaker group and reference type. In each plot, lexical reference appears on the left and pronominal reference on the right. Predicted values derived from the first statistical model.

4. Discussion and Conclusions

The results of this study confirm that anaphoric encapsulation activates specific cognitive processes at the discourse level and that their processing differs across speaker groups.

The findings support research question 1, which predicts locally different processing demands for encapsulating NPs, offset at the level of the utterance. Among L1 speakers, encapsulating NPs trigger greater processing effort for two reasons: the lexical retrieval cost and the ad hoc inferential adjustment of the semantic category to the context. These local processing demands are compensated by the benefits of generating a referential representation that can be efficiently integrated into a counter-argumentative instruction and, consequently, into the supra-sentential structure of discourse (Carston, 2002; Wilson & Carston, 2007; Recanati, 2017). The increased cost of the context segment of utterances containing the pronoun can be explained by the saturation process required by *ello*, which imposes an inferential burden on discourse context. This suggests that while encapsulating NPs function as more asymmetric mechanisms, since the content of the referential expres-

sion plays a greater role in shaping and continuing the discourse, *ello* primarily serves the purpose of retrieving an antecedent and contributes less to the transformation of the discourse representation.

These results are compatible with [Loureda et al. \(2025\)](#), in which categorizing NP represent the minimal form of lexical encapsulation, where no new information is introduced, and the antecedent is not reinterpreted. Their specific semantic structure, linked to an already established category in encyclopedic knowledge, allows for successful referent identification without penalizing processing at the level of discourse integration.

The data also support research question 2, which posits that heritage and L2 speakers require a different degree of processing effort than L1 speakers to process both pronominal and lexical encapsulating structures. These additional demands manifest in the relational segments and at discourse integration level, as evidenced by longer reading times and a greater reliance on context-sensitive inferential strategies. For heritage and L2 speakers, these discourse construction mechanisms are not fully automatized, which increases the likelihood of resorting to non-automatic or contextually driven strategies that are computationally more complex ([Zufferey & Gygax, 2017](#); [Recio Fernández, 2020](#); [Loureda Lamas et al., 2021](#)).

Automatic processing requires minimal cognitive resources, making it effortless, unconscious, and faster ([Segalowitz & Hulstijn, 2005](#)). The reading patterns observed in heritage and L2 speakers suggest a greater processing effort compared to L1 speakers, which may reflect a higher reliance on context-driven interpretive mechanisms under the specific conditions of this study. This reduced automatization of inferential recovery is to be expected, given the type and amount of Spanish input to which heritage and L2 speakers have been exposed. As a result, their discourse handling is more effortful and dependent on attentional control during reading, which involves, among other things, “intention, possibly awareness, and the consumption of cognitive resources, all in the service of dealing with limited processing capacity” ([Kahneman, 1973](#); *apud* [Segalowitz & Hulstijn, 2005](#), p. 371).

Finally, the data for research question 3, which posits different processing patterns in heritage compared to L2 speakers, also reveal convincing findings. Heritage speakers display longer processing times across all experimental conditions, with differences that are relevant and statistically significant. Heritage speakers exhibit significantly greater effort in processing pronominal forms compared to L2 speakers. In the specific experimental conditions of this study, neutral pronouns—with their low transparency and high inferential demands—appear to pose a particular challenge for real-time interpretation in this group, especially when combined with discourse markers. Lexical expressions, which are conceptually more accessible, allow for smoother discourse integration than pronominal forms, whose procedural opacity significantly penalizes heritage speakers.

These findings can be explained by heritage speakers’ documented preference for explicit, analytic forms rich in conceptual content over more synthetic or semantically underspecified forms ([Montrul, 2004](#); [Gullberg, 2006](#); [Yoshioka, 2008](#); [Azar et al., 2020](#)). Moreover, higher-frequency structures are known to support more robust and automatized mental representations ([Croft, 2000](#); [Bybee, 2010](#); [MacWhinney, 2012](#); [Ellis, 2016](#)). Such traits are particularly characteristic of intermediate-level heritage speakers.

The data also reveal that, regarding antecedent identification, the conceptual advantage of lexical expressions does not translate into a processing benefit for heritage speakers, who exhibit greater difficulties than L2 speakers in retrieving both pronominal and lexical referential forms. This behavior suggests that the processing challenges faced by heritage speakers are not primarily related to the lexical content of the referent, but rather to the effective activation of the anaphoric link between the antecedent and the encapsulating NP.

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Notes

- ¹ The distinction between procedural and lexical meaning has been widely discussed, particularly within the framework of Relevance Theory (Espinal, 1996; Escandell-Vidal et al., 2011; Wilson, 2011, 2016; Carston, 2016; Romero González & Soria Clivillés, 2020).
- ² This feature makes it possible to create discourse continuities through the retrieval and reification of large amounts of information, unlike, for instance, “reiterative cohesion mechanisms” (López Samaniego, 2014), such as coreferential anaphora, whose antecedent consists of a shorter and discourse-dependent linguistic segment (Almor, 1999; Moxey et al., 2011; Almor et al., 2017; Gelormini-Lezama, 2018; Ye & Arnold, 2023).

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