Studii de lingvistică 12, nr.2, 2022, 143 - 178

Measuring the polyfunctionality of discourse markers experimentally: *eye-tracking* and visual attention as cognitive-processing indicators. Peninsular Spanish *o sea*

Shima Salameh Jiménez[1]

Abstract: Discourse markers (DMs) are generally described as polyfunctional. There are different approaches to polyfunctionality (homonymy, monosemy, polysemy), which have been widely explored theoretically; however, there are not many experimental approaches showing how polyfunctionality works (i.e., how it is assimilated by speakers or readers when it emerges in various real communicative contexts). This paper presents results on experimental polyfunctionality in DMs through eye-tracking methods applied to the Spanish marker *o sea* 'I mean'. The main question addressed is how polyfunctionality is understood in terms of ocular behavior: specifically, if processing results reveal a monosemic or a polysemic pattern for this marker.

Key words: discourse markers, polyfunctionality, experimental pragmatics, eye-tracker, Peninsular Spanish.

1. Introduction[2]

Discourse markers (henceforth, DMs) are a well-established subject of study in theoretical linguistics (Halliday & Hasan 1974; Bazzanella 1986; Schiffrin 1987; Blakemore 1993; Fraser 1999; Fischer 2006; Pons Bordería 1998; Martín Zorraquino & Portolés 1999; Briz, Pons & Portolés 2008; Loureda and Acín 2010, among others). According to Hansen (2006: 25), DMs are devices providing instructions to speakers and hearers on how contents should be assimilated. They show a polyfunctional behavior; i.e., they are related to different

[1] Postdoctoral researcher APOSTD (CIAPOS/191, Generalitat Valenciana), Departamento de Filología Española, Universidad de Valencia, Val.Es.Co. Research Group (Departamento de Filología Española, Universidad de Valencia); shima.salameh@uv.es.
[2] This paper has been supported by the following research projects: CIPROM/2021/038 "Hacia la caracterización diacrónica del siglo XX" (DIA20), Generalitat Valenciana; PID2021-125222NB-I00 "Aportaciones para una caracterización diacrónica del siglo XX", Ministerio de Ciencia e Innovación, AEI and Unión Europea.

interpretations or meanings depending on the semantic-pragmatic context (Schiffrin 2015: 62). There are three theoretical approaches to DM polyfunctionality: homonymy, monosemy and polysemy (Jucker 1993, Fretheim 2000, Travis 2006); nevertheless, polyfunctionality has been experimentally investigated to a lesser extent – contrary to experimental studies on lexical polyfunctionality (López-Cortés 2021).

This paper presents results on DM polyfunctionality through *eye-tracking* reading experiments. In particular, the analysis focuses on reformulation markers, defined as guides reflecting the ways discourses are construed and obstacles are solved (Gülich & Kotschi 1995). Reformulation markers tend to express different functions (Gülich & Kotschi 1983, Rossari 1994, Del Saz 2003, Murillo 2007, Garcés 2008): this is why their study can lead to new experimental insights into defining procedural polyfunctionality[3]. The reformulation marker addressed is Peninsular Spanish (henceforth, PS) *o sea*[4]: the experimental analysis of this marker fits our research goals given the different meanings it covers (formulation, conclusion, correction, mitigation, hedging) (Cortés Rodríguez 1991, Briz 2001, Santos 2003). The results will reveal how the polyfunctionality of this DM can be measured in terms of eye-movement patterns: specifically, through reading processing times and ocular movements.

2. Theoretical framework

2.1. Basic features of DMs

DMs have been extensively addressed in the literature (Fraser 1988, 2009; Brinton 1996; Schwenter 1996; Aijmer 2002; Haselow 2011; Cuenca 2006; Tanghe 2016; Crible 2018, etc.). They can be defined as non-propositional, metadiscursive linguistic items orienting speakers in retrieving inferences (Schourup 1999: 228) without affecting "the truth-conditional meaning of the utterance" (Lewis 2006: 44). Particularly, DMs facilitate the establishment of cohesion and coherence relationships so as to relate different parts of texts and integrating information (Van Dijk and Kintsch 1983: 91); in social interaction, they highlight how conversations are structured,

[3] In line with other works, such as Sanders & Spooren (2015), Zufferey & Gygax (2017), Recio *et al.* (2018), or Wetzel, Crible & Zufferey (2022), among others. These analyses deal namely with cause-consequence DMs; our paper will focus on polyfunctionality in reformulation markers.

[4] Sp. *o sea* can be glossed as "or to be SUBJ.PRES", which will be useful in understanding the analysis presented. Some translations to English are "I mean" and "That is": "I mean" is more related to non-paraphrastic reformulation and correction; "That is" is more accurate in paraphrastic contexts. As suggested by Del Saz (2003), there is no a perfect equivalence between Spanish and English reformulation markers concerning their translation.

modalized and developed (Pons 2006: 86-87; Briz & Hidalgo 1998: 123). Some basic features described in the literature are listed next:

a) DMs show prosodic distinguishing features; i.e., different functions of DMs are directly related to their pitch, tone, F0 or intonation (Komar 2007: 48; Estellés 2017: 242).
b) DMs are a functional category composed by linguistic devices from other categories (verbs, nouns, adjectives, conjunctions, prepositions, etc.) (Briz 1993: 40-44; López Serena & Borreguero 2010: 436).
c) DMs can work at different levels of discourse (Schiffrin 2006: 4-5): utterances/sentences (Fraser 1999; Hansen 1998), units of talk (Schiffrin 1987), discourse units (Jucker 1993), discourse segments (Redeker 1990), speech acts or prosodic cues (Erikson 1979), to name but a few.
d) DMs show a variable scope: coherence-based DMs introduce relationships between the basic message and the foregoing discourse (Fraser 1990: 389); discourse-based DMs reveal a broader scope encompassing textual, modal and interpersonal functions (Salameh, Estellés & Pons 2018).
e) DMs can vary their position in discourse: they can be typically placed in the utterance-initial position, but also internally or in the utterance-final position (Briz & Estellés 2010).
f) DMs can be combined: there are different approaches to DM combinations (Vicher & Sankoff 1989; Lohmann & Koops 2016). Some researchers (Pons 2018) distinguish between *adjacency* (DMs which are only placed together) and *combination* (DMs are together and work functionally as the same item).
g) The use of DMs is optional: given their non-propositional meaning, DMs can be removed from the discourse without changing the global grammatical meaning of the host sentence (Murillo 2010).

Beyond the basic features presented in (a) to (g), researchers show little consensus on a systematic set of definitions, classifications or labels[5] for DMs (Fischer 2006). Nevertheless, there is a feature commonly shared by all works: DMs are polyfunctional, they show different meanings related to various communicative functions (Traugott 1995: 1; Bazzanella *et al.* 2007: 10), such as formulation, digression, mitigation, evidentiality, approximation, argumentation or reformulation, among others (Martín Zorraquino & Portolés 1999).

[5] Other labels in addition to DM include "pragmatic marker" (Fraser 1999), "discourse particle" (Schourup 1985; Fischer 2006; Briz, Pons & Portolés 2008), "operator" (Brinton 2008), "connective" (Roulet 1987; Portolés 1993), "modal particle" (Diewald 2006) and "discourse relational device" (Crible 2018).

Different theoretical frameworks approach DM polyfunctionality in order to provide a concrete explanation on how their functions are developed and interrelated (Hummel 2012).

2.2. Polyfunctionality of DMs

According to Pons (2006), polyfunctionality can be read at two levels: a type-level in which "DMs are polyfunctional if they convey different meanings" (e.g., *but* expresses contrast and disagreement); second, a token-level where DMs display different functions at different levels of discourse (e.g., in a given context, a token of English *but* can express contrast at the sentence level and, at the same time, disagreement at the interactional level) (Pons 2006: 79).

There are three general approaches to polyfunctionality (or multifunctionality) in DMs literature: *homonymy* (Jucker 1993), *monosemy* (Fretheim 2000) and *polysemy* (Travis 2006) (see Hansen 1998, 2006, and 2008 for a fully review)[6]. First, homonymy addresses polyfunctionality as the result of readings/meanings which can be identified, listed and distinguished through different entries (Jucker 1993: 437). These readings are sometimes related to their usage conditions. In such cases, no relationship between readings is assumed (Fischer 2006: 13). From a critical perspective, Hansen (2006: 24) states that homonymy is an unsatisfying explanation of polyfunctionality because "it seems particularly prone to conflate the coded meaning of a given marker with the situated interpretations of the utterances in which that marker appears"[7].

Monosemy defines DMs as items covering a complete procedural meaning (called "core meaning"; Sweetster 1990) based on a basic instruction (e.g., argumentative, formulative, etc.). This basic instruction is contextually enriched: as a result, many specific uses in the discourse can be developed (Portolés 2001) and semantics has very little work to do (Hansen 1998: 240). These uses, however, are secondary and related to a main general instruction (Pons 2004: 54), which means that the DM does not code them as part of the core meaning. The biggest challenge in adopting a monosemic approach is to determine a core meaning "not so broad as to be meaningless" (Fraser 2009: 307).

Last, polysemy (Crible & Zufferey 2015; Fedriani & Molinelli 2019) involves that one single expression has more than one semantic

[6] Hummel (2012), however, points out that "semantic relationships cannot be as simple as the triple distinction homonymy, monosemy and polysemy": it is hard to establish a clear distinction between two meanings such as, for example, "confirmation" or confirmation leading to discourse continuation in Sp. *bueno*" (Hummel 2012: 56).

[7] Additionally, DM polyfunctionality as homonymy cannot be strongly supported if diachronic data are considered (Hansen, 2006: 24-25); that is, the meanings developed by DMs tend to be semantically related at some point of the evolution.

meaning related in a motivated or even predictable way (Fraser 2009: 307) and that, consequently, the polyfunctionality of DMs is not merely a matter of pragmatics (Lewis 2006: 52). Polysemic-based accounts note that other approaches could wrongly label DM senses/meanings as "side effects" or implicatures of the interaction between particles and the contexts where they are employed (Hansen 1998: 242); in other words, semantic meanings which are historically developed are defined as a contextual interpretation.

All three approaches are thus determined by the semantic-pragmatic perspective adopted by researchers, especially in corpus-based approaches addressing DMs in real communicative situations (conversations, texts, etc.). Experimental approaches to DM polyfunctionality shed some light on which defining proposal is the most accurate (i.e., DMs tend to show the same processing values in different contexts – monosemy, or, contrarily, they show differences – polysemy).

2.3. DMs, polyfunctionality and experimental approaches

Experimental studies on DMs have contributed to better define their features. Particularly, some studies address DM polyfunctionality directly or indirectly (van Bergen van Gijn, Hogeweg & Lestrade 2011; Corley 2010; Canestrelli, Mak & Sanders 2013; Zufferey, Mak, Degand & Sanders 2015; Gerwien & Rudka 2018; Rasemberg *et al.* 2020; Asr & Demberg 2020; Wetsel *et al.* 2022b, to name but a few), through different experimental techniques (e.g., EEG, eye-tracker, self-paced reading, judgement tasks, etc.). Results lead to some basic experimental principles about DMs polyfunctionality:

a) Polyfunctionality could lead to harder online processing (Rasemberg *et al.* 2020: 12) in native speakers or foreign language learners (Zufferey & Gygax 2017), especially when DMs are clearly ambiguous or underspecified (Crible & Pickering 2020).
b) There are use preferences for polyfunctional DMs which show a correlate with experimental patterns (see Asr & Demberg 2020: 395 for *but* and *although*).
c) Polyfunctionality of DMs can be disambiguated, especially in coherence relationships, even incoherencies can be detected independently of the frequency or polyfunctionality (Wetsel *et al.* 2022b; concessive or *however* or causal *aussi* 'therefore'). Then, this type of experiments can be replicated in other languages.

Experimental work on DMs in Spanish shed light on different study-cases by analyzing them with eye-tracking methods: see *por tanto*

(Recio Fernández 2020), *por ello* (Cuello Ramón 2022), *sin embargo* (Nadal 2019), *a pesar de ello* (Guillén Jiménez in preparation). However, these analyses are focused on a main meaning or instruction, contrary to reformulation markers (see Schröck 2018 for a first approach on *es decir*). Other categories, such modal adverbs or focal particles have also been experimentally addressed (*incluso* in Cruz Rubio 2020; *hasta* in Torres Santos 2020; *además* in Thome 2018), showing polysemic patterns; nevertheless, these linguistic items are not considered DMs (see Martín Zorraquino & Portolés 1999 and Fischer 2006 for a delimitation of DM as a category). Therefore, results from this paper will provide researchers with new experimental data to define DMs polyfunctionality in Spanish.

2.4. A case study: PS *o sea* as a polyfunctional DM

As said before, the DM addressed in this paper is PS *o sea*, which is frequently employed in conversational (Santos Río 2003: 379) and written contexts (Briz 2002), as shown by previous studies (Cuenca & Bach 2007; Briz, Pons and Portolés 2008; Fuentes 2009). Some basic features are summarized next:

a) PS *o sea* is part of the reformulation markers paradigm (RMP) in Spanish: *o sea*, *esto es*, *a saber* and *en otras palabras*. These DMs are similar to other reformulation markers in other languages (e.g., *that is*, *I mean* in English, *c'est-à-dire* in French, *cioè* in Italian, *ou seja* in Portuguese, *és a dir*, *o sigui* in Catalan, etc.).
b) PS *o sea* comes from two different word categories: the conjunction *o* 'or' and the present subjunctive verb *sea* 'to be'. Their combination derives from a grammaticalization procedure by which the original disjunctive meaning changes towards an inclusive meaning (Pons 2016). As a DM, the structure of the PS *o sea* is invariable (e.g., *o seas*, *o sean*, etc.).
c) PS *o sea* occupies initial, medial or final positions. In final position, this DM expresses modal values, especially in spoken discourse. Final positions in texts reflect stylistic uses (Garcés 2008).
d) Last, PS *o sea* links different linguistic contents: from words to sentences in monological discourses (independent, subordinated, coordinated) and interventions produced by other speakers in dialogical discourses (Schwenter 1996, Estellés 2017).

This DM is very polyfunctional: i.e., it expresses different meanings depending on the context (Casado 1991, Galán 1995, Briz 2001, Murillo 2007; see also Félix-Brasdefer 2006 for Mexican

Spanish): paraphrase[8], reformulation, conclusion, correction, mitigation, hedging and formulation. Examples (1) to (7) show such meanings[9]:

(1) Ella confía en sus amigos; o sea, en la gente que la ayuda cuando es necesario.
'She trusts her friends; i.e., the people who helps her when it is necessary.'

(2) Ella confía en sus amigos; o sea, esos sinvergüenzas que siempre se ríen de ella.
'She trusts her friends; I mean, those scoundrels who always laugh at her.'

(3) Está lloviendo, o sea, que no iremos a la playa.
'It's raining; then, we'll not go to the beach today.'

(4) Se gastó cuarenta euros esta semana; o sea, setenta si contamos esas botas nuevas…
'He spent 40€ this week; I mean, 70€ including those new boots…'

(5) Yo creo, o sea… no es una buena idea…
'I think… I mean… it's not a good idea…'

(6) ¡Y dijo que no! O sea…
'And he said no! I mean…'

(7) No estoy enfadada con Marcos, o sea, eh, él dijo, no sé, dijo que estaba preocupado, o sea, estaba sufriendo y yo sé que no es cosa mía, pero, o sea, es mi amigo, ¿sabes?
'I'm not against Mark, I mean, uhm, he said, I don't know, he said he was worried, I mean, he was suffering and I know this is not my business but, o sea, he is my friend, you know?'

Last, this polyfunctionality has been approached namely as polysemy and as monosemy: polysemic works describe PS *o sea* as the outcome of a historical evolution which can be tracked through diachronic corpora (Pons 2016); monosemic works suggest that this DM shows a unique instruction, "change of discourse orientation", which leads to conclusions, detachments, etc. (Martín Zorraquino & Portolés 1999). No homonymic approaches to PS *o sea* have been found: the DPDE (*Diccionario de Partículas Discursivas del español*) includes an entry subdivided into two entries; however, the first one is PS *o sea que* (related to conclusions and polyphony; Murillo 2016) and the second one is PS *o sea* without *que* (Briz 2008).

---

[8] Paraphrase has led to different labels in the literature: specification (Murillo 2007; Wetzel *et al.* 2022), clarification (Del Saz 2003), identification (Murat & Cartier-Bresson 1987), etc. Other researchers tried to keep the distinction between paraphrastic markers and other DMs expressing reformulation (Rossari 1990). Further details are developed in Salameh (2021).

[9] Examples (1) to (3) have been translated from Pons (2016).

3. Eye-tracking methods: an overview

Experimental methods have become an important tool in linguistics to test theories which, in turn, generate new experimental hypotheses. Experimental pragmatics (see Cucio *et al.* 2022) provides descriptions and intuitions with empirical data supporting, refusing or questioning current pragmatic theories and proposing new models for interpreting pragmatic phenomena (Grisot & Moeschler 2014: 9): e.g., discourse connectives and non-truth conditionality (Larralde *et al.* 2022), quantifiers (Knowlton, Trueswell & Papafragou 2022), presuppositions (Gergel *et al.* 2022), language acquisition and second language learning (Godfroid 2019), or the role of context (Donahoo *et al.* 2022) are some research topics explored in current experimental works.

Experimental pragmatics works with a big extent of techniques and tasks (Jucker *et al.* 2018; Gibbs & Colston 2020): high temporal resolution techniques, such as Event related potentials ERP (Spychalska *et al.*, 2021), MEG or electroencephalography EEG (Canal *et al.* 2021), functional Magnetic Resonance Imaging (fMRI, Friederici & Gierhan 2013); response time measuring (Hauser & Schwarz 2016), Visual World Paradigm (Tanenhaus & Trueswell 2006), or eye-tracking, among others (see Loureda *et al.* 2021: 59-60 for an overview). All these techniques allow researchers to create a picture of different neuronal and cognitive processes through real-time (online techniques) and post-experiment data (offline techniques, such as questionnaires, grammar judgement tasks, etc.).

Specifically, eye tracking methods allow to detect and record ocular movements produced after visualizing different stimuli (DMs, focus operators, adverbs, lexical devices, sentences or texts; Hyönä *et al.* 2003) in (semi)controlled experiments (Richardson, Dale & Spivey 2004). Researchers adopt the so-called "eye-mind assumption" (Just & Carpenter 1980; Rayner 1978), by which there exists a relationship between eye movements and how the contents observed have been assimilated (e.g., long fixations are related to big cognitive efforts of relevant words; Loureda *et al.* 2021, or low frequency words can be harder to process; Zufferey & Gygax 2017. The eye-mind assumption can be tested through the type of eye movements produced (fixations, saccades, regressions) and their duration in different reading stages (first-pass, second-pass and total reading time).

3.1. Eye-tracking measurements

3.1.1. Eye movements (type)

Ocular movements are produced thanks to different muscles. Eyes move horizontally (left and right) through six extraocular muscles (four rectus muscles and two oblique muscles; Wright *et al.* 2006: 24) and vertically (up and down) with the help of four muscles (superior and inferior rectus, superior and inferior oblique; Standring *et al.* 2008: 1195). Eye movements are involuntary and voluntary (Yarbus 1967: 21-23). Involuntary movements are reflex actions unconsciously produced to maintain retinal vision and retrieve information. Voluntary movements are made to bring and maintain the observed content into the foveal region.

The three main voluntary movements[10] usually employed in eye-tracking studies are "fixations", "saccades" and "regressions" (McConkie & Rayner 1976, Myers 2009). Fixations are made when the eyes stop at a specific part of the text. They directly depend on the foveal region. Their duration spans an average about 200-300 msec. (Rayner 1998: 373) and varies depending on the type of content read or other linguistic specific factors (words ending sentences; Just, Carpenter & Wolley 1982: 229; ambiguous words with two or more meanings; Cutler 1983; low-frequency words; Inhoff 1984; Rayner 1977; long words *vs* shorter words; Rayner, Sereno & Raney 1996: 1189, etc.).

Saccades are produced between each fixation when eyes move faster along different parts of the text. Saccades are very quick and jerky movements from one target to another (Enderle 2010: 16). In texts, saccades average 7-9 characters in size (i.e., they jump from one character to another, 7-9 characters downstream). During saccades, "no-information from the text is obtained because the eyes are moving so fast (about 500° per second) across the visual stable stimulus that only blurs can be perceived"[11] (Rayner 1998: 373). The number of saccades obtained during reading is related to the difficulty in processing contents: the more difficult the text, the longer the fixations, the shorter the saccades and the more regressions the subject will produce).

Regressions are backward movements to previously encountered sections of the text, which are similar to fixations (Rayner, Chace, Slattery & Ashby 2006: 243). They are produced "about the 10-15% of time" when contents seem to be non-clear and the eyes move back in the text to read again (Rayner & Castelhano 2008). Regressions[12] are

[10] Other voluntary eye-movements are smooth pursuits (Lencer & Trillenberg 2008). Smooth pursuits are usually coordinated with saccades "when a moving target must be visually tracked"; depending on the range of the target motion, "the eyes are capable of matching the velocity of the moving target" (Duchowski 2007: 45).

[11] There is, however, a high variability "within each of these measures between and within subjects: a given subject may fixate for less than 100 msec. to over 500 msec. within the same text passage and make saccades of as little as 1-character space or as much as 15 or more spaces" (Rayner & Sereno 1994: 58).

[12] Regressions are not refixations: fixations produced again are refixations. Refixated words "refer specifically to a word that is fixated more than once prior to a saccade to another word; this excludes, e.g., a word that is refixated via a regression from a later point in the text" (Sereno 1992: 305).

related to nearby contents rather than to contents earlier employed in the text: readers almost never regress to earlier lines; regressions, when they occur, are confined to the current line[13]. Regressions can also be motivated by the need to access a word all over again in case of an initial misunderstood meaning or an incorrect syntactic interpretation.

3.1.2. Eye movements (duration and reading-stage)

Depending on their duration and the reading-stage analyzed (i.e., time measurements), eye movements describe how long participants stay within a position (Holmqvist *et al.* 2011: 376). Eye-tracking studies distinguish pure fixation measurements from pure dwell measures. For example, "first fixation duration" and "single fixation duration" refer only to the first (or the only) fixation a target receives during forward reading movements (Winke, Godfroid & Gass 2013: 206); dwell times refer to the whole group of fixations and regressions in and out of specific zones of the text.

Three different dwell times represent different cognitive processes in reading (Rayner 2009: 4): first-pass reading time, second-pass reading time, and total reading time. First-pass reading time (Henderson *et al.* 1999: 2016) refers to all the fixations accumulated on a word or part of the text before leaving it and fixating other content ahead. It does not include any subsequent fixation on the region (Poynor & Morris 2003: 6). This dwell measurement has been often assumed not only to reflect lexical access but also oculomotor processes and visual properties of the read content (Demberg & Keller 2008: 202).

Second-pass reading time (Sturt 2003: 548) sums up fixations that return to a text region after having been fixated at least once (Hyönä et al. 2003: 316). This measurement has also been referred to as rereading measurement (Rayner 1998: 376) since it comprises all regressions to previously read content. The reprocessing or verification behavior second-pass involves has been associated with pragmatic meanings (Baccino 2011: 859).

Last, total reading time (Traxler & Pickering 1996: 460) encompasses the total number of milliseconds individuals attend to a particular scene (texts, in this case) and includes all the movements produced (Rayner 2009: 1463). The total reading time is sensitive to slower and longer cognitive processing, which can reflect the processing difficulty of reading sentences.

Researchers have related time measurements them to syntactic, semantic and pragmatic processing[14]: e.g., lexical recognition

---

[13] However, it is also argued that a minority of fixations are longer-range regressions to an earlier segment of the text (Booth & Weger 2013).

[14] Some studies, however, do not argue for a direct correlation between eye movements, mind processing and information retrieving (Anderson, Bothell & Douglass 2004).

processing (Baccino & Manunta 2005: 204) is usually attributed to first- pass reading time (during the first 100–150 ms; Sereno, Rayner, & Posner 1998); reanalysis is associated to second- pass reading time since the eyes regress directly to the earlier region, whose structural analysis must be revised (Meseguer, Carreiras, & Clifton 2002: 552)[15].

3.2. Experimental design

This paper follows experimental designing trends generally adopted by studies in psycholinguistics (Gries 2013, Seltman 2018). We aim to outline the experimental patterns behind PS *o sea* in different contexts in terms of eye movements and duration; such patterns, in turn, will reflect the polyfunctionality of this DM.

To do so, four micro-experiments were created: paraphrase 1, reformulation 2, conclusion 3, correction 4. These four functions are expressed by PS *o sea* (see 2.4.). The conversational values of *o sea* (i.e., mitigation, hedging or formulation; see also 2.4.) have not been considered since they should be addressed through other techniques combining oral and written stimuli (e.g., EEG, Visual World Paradigm, Time-response, etc.); otherwise, the data output would be biased. The four micro-experiments made it possible to obtain four cognitive patterns explaining how such functions work and how readers assimilate them.

3.2.1. Participants

160 participants aged between 18 and 40 years were recruited for the experiment (see 3.2.2. for the Latin Square design and participants the age average of participants was around 24 years[16]. They were undergraduate and Master's students from the University of Valencia (Faculty of Philology; Spain) and their mother tongue was Spanish. The participants were remunerated with a ticket to be employed at the Café. Bilingual or multilingual participants were excluded from the experiment. All participants consented to the use of the results obtained for research purposes.

3.2.2. Materials

8 experimental items (sentences) in Peninsular Spanish were created for this experiment. These 8 critical sentences were distributed

[15] Given that the total reading time includes subsequent regressive fixations, it is not a diagnostic of the initial processing time. Such works, not as common as eye-mind studies, state that "the use of eye movements depends on one critical assumption, however, and that although participants need to look at the words to encode them to initiate retrieval, it is possible that the gaze durations are unrelated to retrieval" (Starr & Rayner 2001: 158).
[16] Concerning gender, more females participated in the experiment (around 70%), given that there are more females than males at the Faculty of Philology at the University of Valencia.

into four main functions: paraphrase, reformulation, conclusion and correction. Each experimental item had the same structure: two subjects, a verb, a first formulation, a new formulation and the DM; a post-phrase was also added so as to allow wrap-up effects and spill over (Remington *et al.* 2018).

Two versions for each function were constructed: the first containing the DM *o sea* (4 sentences), the second without the DM (i.e., with an implicit paraphrase, reformulation, conclusion or correction) (4 sentences). These 8 experimental items were duplicated through a different topic (theme 1 and theme 2; 8x2=16, given that the "presence" and "absence" of the DM is the basic condition of the experiments). As a result, the participants did not read the same sentence with/without DM, which prevented them from detecting the linguistic item studied. The data are valid since themes 1 and 2 employ the same structure (two subjects, two similar formulations, similar contexts, etc.). Table 1 shows examples of sentences with and without SP *o sea* from themes 1 and 2:

Paraphrase	Estefanía y Miguel quieren una rosa rugosa; o sea, japonesa. Los dos viajan a Tokio el próximo mes para conseguirla. 'Estefanía and Miguel want a rough rose; i.e., a Japanese one. Next month they will travel to Tokio so as to buy it.'	Lorenzo y Alejandro reparan sumideros; desagües. Están acostumbrados a soportar malos olores. 'Lorenzo and Alejandro fix sinks; i.e., drainers. They're used to bad smells.'
Reformulation	Emilio y Javier están enfermos; o sea, indispuestos. No es tan grave como parece. 'Emilio and Javier feel sick; I mean, they feel indisposed. This is not as serious as it seems.'	Sonia y Mónica están angustiadas; nerviosas. Pronto sabrán la nota de sus exámenes. 'Sonia and Mónica are worried; I mean, nervous. They will get their exam results soon.'
Conclusion	Marina y Jaime comieron unas pizzas y vieron una serie; o sea, practicaron poco su exposición. Ahora están nerviosos. 'Marina and Jaime ate some pizzas and watched a TV show; that is, they didn't prepare for their presentation. Now, they are nervous.'	Antonio y Juan tomaron unas cervezas y vieron una película; estudiaron poco para el examen. Ahora están nerviosos. 'Antonio and Juan drank some beers and watched a film; that is, they did not study for the exam. Now, they are very nervous.'
Correction	Adrián y Elena cenaron en un restaurante italiano; o sea, mexicano. La comida estaba picante. 'Adrián and Elena dinned in an Italian restaurant; I mean, a Mexican restaurant. Their food was very spicy.'	Mar y Rafael añaden vino tinto; blanco. De este modo, la salsa queda más sabrosa. 'Mar and Rafael add red wine; I mean, white wine. This is the best way to make a delicious sauce.'

Table 1: Experimental items employed to analyze *o sea*. Examples are extracted from themes 1 and 2.

Again, in order to avoid the elicitation of biased data from the participants, a set of lists based on a Latin Square Design was created (based on the 2x8=16 pattern mentioned above). As a result, a total of 40 participants (instead of 20) read each experiment. This number of participants is adequate because it exceeds the minimum number of subjects required to cover the so-called Central Limit Theorem (CLT) by which an abnormal population can be experimentally and statistically accepted if it contains a large sample composed of thirty or more subjects. This guarantees a normal distribution for the data (Rustom 2012: 131). As Table 2 shows, all experiments fit the CLT:

Function addressed	**T.1.**	**T.2.**	**Total participants**
Paraphrase (Exp.1)	20	20	40
Reformulation (Exp.2)	20	20	40
Conclusion (Exp.3)	20	20	40
Correction (Exp.4)	20	20	40

Table 2: Participants' distribution based on the Latin Square design. T1 and T2 (theme 1 and theme 2) correspond to each replication of the experiment (two conditions, two replications).

Filler sentences were also created (in a 2:1 proportion) so as to hide de object of study addressed. Additionally, contexts were also designed for each micro-experiment with *o sea*. Last, a set of contexts was also created: contexts lead to a better comprehension of functions and enclose their interpretation. An example of context is presented next[17]:

> Estefanía y Miguel son profesores de la Universidad. Son especialistas en flora. En clase han estudiado flores autóctonas y ahora quieren estudiar flores exóticas (paraphrase context 1).
> 'Estefanía and Miguel are University Professors. They are plant specialists. They focused on local flowers in class, but right now they want to change to exotic plants.'

Last, the 8 experimental items were subdivided into different areas of interest (AOIs) related to the three reading times and the type of ocular movements produced. The next table summarizes this information, which will be considered in the results:

[17] See all the 8 contexts designed in Salameh (2019).

Reading times values	**Eye-movements**	**Areas of Interest (AOI)**
Total reading time (TRT) First-pass reading time (FPRT) Second-pass reading t. (SPRT)	FC (fixation global count) PF (progressive fixations) RF (regressive fixations) R into an AOI R out of an AOI	Ä (the whole sentence) Ä-K (the whole sentence – DM) K (the DM, PS *o sea*) M1 (first formulation) M2 (second formulation)

Table 3: AOIs, reading times and eye-movements produced. This information is needed for the qualitative and quantitative analyses.

3.2.3. Procedure

The four micro-experiments were conducted using the SMI Experiment Center™ software (version 3.0.). This software is a powerful platform to record and analyze eye-tracking data. It is complemented by SMI iView X for gaze-tracking data acquisition and SMI BeGaze for gaze-tracking data analysis. Calibration and validation on demand are also possible, and it has a randomization function to present groups of stimuli in a nondetermined order during the experiment. The participants accepted and fulfilled the consent form, which included some personal questions about their age, gender, mother tongue and professional career. After clarifying doubts, the experiments were run (calibration, reading instructions, experiment). Participants spent approximately 25 minutes in doing the experiment.

3.3. Statistics

On the one hand, the eye-movements data were statistically assessed with decision regression trees (Rokach & Maimon 2014). In our paper, the decision trees illustrate the relationship between the reading times obtained (FPRT, SPRT, TRT), the eye movements (fixations, saccades, regressions) and the function analyzed in each micro-experiment (paraphrase, reformulation, conclusion, correction). A total of 8 decision trees were drawn: 4 with PS *o sea* and 4 without the marker. This technique contributes to determining why any of the functions expressed by PS *o sea* shows a specific pattern. In particular, decision trees detect which types of movement reflect the way in which the read information is assimilated and, more importantly, whether such eye movements are more relevant during FPRT or SPRT. To do so, all the raw values obtained (reading times, eye-movements and AOIs) are introduced into the tree (see 3.2.2. for further details). Furthermore, the results from the trees reinforce the reading duration analysis. Decision regression trees were modelled with R

(R package "party"), and their data reliability was determined by p-values (p = < 0.05).

On the other hand, experimental data related to reading times (duration) was statistically treated through Generalized Additive Mixed-Models (GAMM) in *R* (R Core Team, 2018; package 'mgcv', function 'gam'). The dependent variables were eye-movements and reading stages, independent variables were the functions expressed by PS *o sea* (paraphrase, reformulation, conclusion and correction) and the condition was DM presence/absence. The participants and items were included as random effects. A set of AOIs were established as fixed effects: Ä (complete sentence), Ä-K (complete sentence minus the DM), M1 (segment 1), M2 (segment 2), K (PS *o sea*). The following cases were considered outliers: any first skip of an AOI, fast readers (<80 ms. in an AOI) and slow readers (>800 ms. in an AOI). These outliers refer only to a specific AOI of a critical item (i.e., reading times from a participant are not deleted due to one or two outliers). In our results, outliers were detected in 12 participants; an overall of 13 (i.e., 4.1%) of 320 observations were excluded. No negative reading times were found (see Appendix 1[18]).

Comparisons between conditions are allowed with mixed models. For interpreting the results and their relevance, effect sizes (or "magnitudes") are included[19]: the bigger the effect size is, the more reliable the results addressed are (Cohen 1988). The following effects were established by the DPKog Research Group (Loureda *et al.* 2021). Medium, large and very large effects show a reliable influence of the conditions addressed in the analysis. The values addressed in 4.1.2. and 4.2.2. are means resulting from "Intercept" and "Predicted values" (see Appendix 2[20]):

Percentage range	**Magnitude of effects**
>20%	Very large effects
10-19,99%	Large effects
5-9,99%	Medium effects
4-4,99%	Small effects
<3,99%	Trivial effects

Table 4: Percentage ranges employed in interpreting the magnitude of effects in eye-tracking results

[18] Check Appendix 1 in https://drive.google.com/file/d/1HXhKZyYZV749kjFuq-C2e1cxWAwSTwmg/view?usp=sharing

[19] For further details on the current polemic on how strong statistical validations with classical (p values) and new approaches (without p-values) are, see Milliken (1992).

[20] Check Appendix 2 in https://drive.google.com/file/d/1HXhKZyYZV749kjFuq-C2e1cxWAwSTwmg/view?usp=sharing

3.4. Hypotheses

As seen in 2.4., PS *o sea* expresses paraphrase, reformulation, conclusion and correction values. These functions are based on some features which must be considered in formulating experimental hypotheses. In order not to exceed the word limit of this paper, only paraphrase and correction values will be addressed in detail (4.1. and 4.2.). Then, the following features focus only on paraphrase and correction. We think that these results show the polyfunctionality behind PS *o sea*, which fits our research goals. The results on the reformulation and conclusion values can be checked in other publications (Salameh 2019a, 2019b; Salameh 2021).

Paraphrase (Gülich & Kotschi 1995) is the process where "a first utterance is restated via a second, equivalent formulation" (Pons & Lópes Macário 2013: 107). Paraphrase guarantees textual cohesion and facilitates the progression of discourses since nonclear meanings are better "explained" (Cuenca & Bach 2007: 150). Equivalence between formulations is thus established by introducing semantic and pragmatic similarities (Polanco 2016: 17). According to these features, there are some questions to answer about paraphrase related experimental results: does the new formulation (M2) retrieve further eye-movements or do participants come back frequently so as to interpret what is said in the first formulation (M1)? Does paraphrase involve bigger processing costs in establishing pragmatic interpretations during the SPRT, or first semantic assumptions during the FPRT are more relevant?

Correction (also called rectification, invalidation or repair; Crible 2018) is defined as the way(s) in which speakers and hearers address recurrent problems in speaking, hearing and understanding. Correction shows a double nature: on the one hand, this function is related to negation, given that a first formulation is invalidated by introducing a new formulation (Gülich & Kotschi 1995). On the other, correction depends on communicative aims and the context, which lead the speaker to change his/her discourse abruptly to provide the correct information. As a result, a first content (related to implicatures, presuppositions or lexical networks) is replaced by a new one (Pons 2013: 160). According to this theory, should one expect to retrieve more eye-movements in correction sentences? Will participants be able to interpret a cancelation procedure? Is the SPRT in corrections the costlier one?

According to the theoretical features behind paraphrase and correction, the following hypotheses were tested. These hypotheses combine theory with the eye-tracking measuring concepts:

Hypothesis 1): Participants will process paraphrases without difficulties (measured through eye movements and reading

times), but, probably, FPRT will involve bigger efforts. Regarding the marker, PS *o sea* will show a specific processing paraphrase pattern.
Hypothesis 2): Participants will face further difficulties in processing correction, especially in contexts without a DM; SPRT is expected to encompass key processing values. The PS *o sea* will facilitate the whole processing. This DM shows a clearly distinguished correction pattern, with better results compared to other functions.
Hypothesis 3): The PS *o sea* show polyfunctionality patterns through different reading values obtained from different functions.

The confirmation of hypotheses 1 to 3 allows to experimentally show the polyfunctionality of PS *o sea* and, specifically, how these functions lead to concrete processing patterns.

4. Results

4.1. Micro-experiment 1 (reformulation and the PS *o sea*)

4.1.1. Types of eye-movements

Concerning eye-movements, a paraphrase is expected to be rich in backward-forward movements, which would mean that equivalence requires unexpected efforts. Results from the decision regression trees confirm that PF and RF are more predictive than the other movement and temporal parameters considered, which provides us with a specific processing pattern. Apparently, PF are decisive in paraphrases expressed with PS *o sea* and RF are key in paraphrases without the marker: this is supported by a $p < 0.001$ value.

Specifically, PF and RF are related to SPRT, placed at the second node of the tree: this relationship is also supported by a p= < 0.001 value, which suggests that PF have a relevant role in processing paraphrases with SP *o sea* during this reading time (i.e., when pragmatic assumptions are established). This means that participants tend to go forward when pragmatic assumptions are established in paraphrases with the marker; as a result, a first experimental feature for the cognitive pattern of PS *o sea* is retrieved. FPRT is also relevant in paraphrases with the marker, as shown by the tree (p= <0.001). Contrarily, RF are key during the SPRT when SP *o sea* is not employed: the fact that fixations are regressive in sentences without the marker indicates that participants needed to go back, possibly to assimilate the contents previously observed due to the absence of a clear processing instruction. FPRT does not appear in this second decision tree.

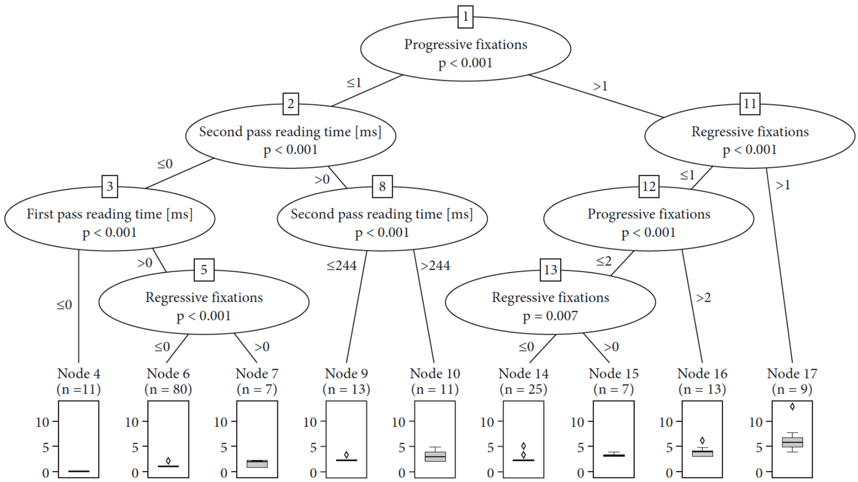

Fig. 1: Decision regression trees in paraphrases with PS *o sea*

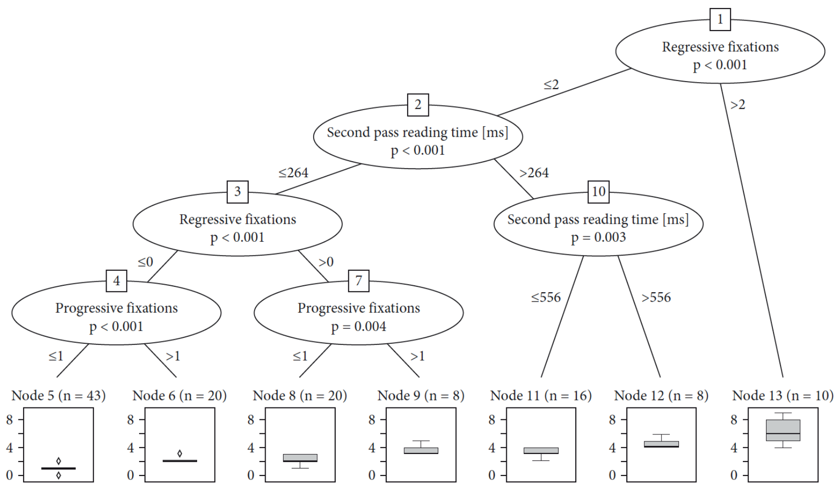

Fig. 2: Decision regression trees in paraphrases without PS *o sea*

4.1.2. Reading times (duration)

Results on paraphrase (i.e., PF in SPRT in sentences with the DM and RF in SPRT without the marker) can be completed with reading times patterns (see Fig. 3). Some results are detailed[21] next:

[21] Other results of paraphrase without PS *o sea* can be explained (e.g., how much the M2 costs vs. the M1, how much the DM costs compared to the two formulations, etc.). However, we do not address them in this paper because our research goals focus on the polyfunctionality of the DM. See Salameh (2019) for further details.

a) A first result to be highlighted is that PS *o sea* retrieves big efforts to be assimilated (TRT=514,42 msec., FPRT=328,48 msec., SPRT=181,27 msec.). The fact that a DM receives more attention from readers than the whole sentence (Ä) in terms of average values reflects the key role of *o sea* in establishing paraphrases. This idea is supported by some statistical effects: PS *o sea* vs Ä TRT=28,19% (very large effects); *vs* Ä FPRT=3,89% (trivial effects, this is the less reliable result); vs. Ä SPRT=116,18% (very large effects).

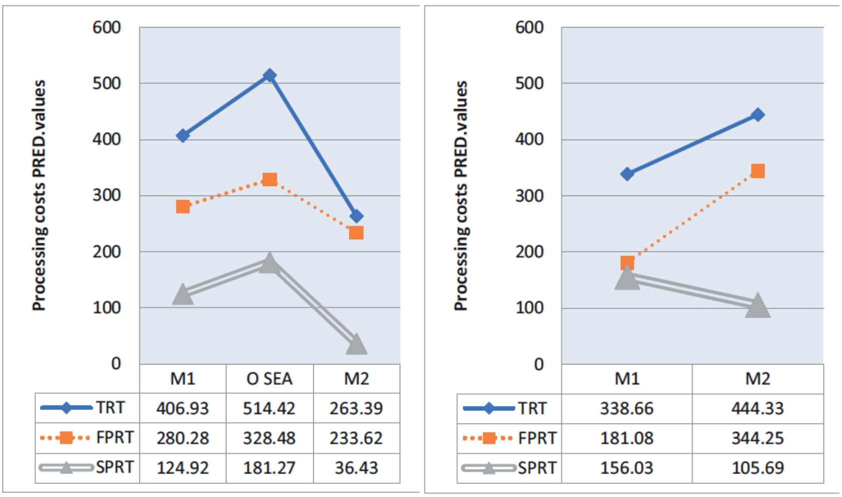

Fig. 3: Reading times processing pattern for paraphrases. The figure on the left is paraphrase expressed with PS *o sea*. The figure on the right shows a paraphrase expressed without PS *o sea*.

b) Big efforts on PS *o sea*, however, lead to a clear reduction of processing costs behind the new formulation M2. See Tables 5, 6 and 7. As the results show, TRT, FPRT and SPRT reveal that M2 in sentences without PS *o sea* cost more to be assimilated, which is statistically supported by very large effects (68,70% for TRT, 47,35% for FPRT and 190,12% for SPRT). In other words, participants need time to process PS *o sea* but this extra-effort is useful for a less costly assimilation of the new formulation, which can be easily related to the previous formulation (see the eye-movements results above). This task becomes harder when the DM is not employed: participants must disambiguate, integrate and understand M1 and M2 as equivalent without a clear instruction of the relationship they share.

TRT	**M1, first formulation**	**PS *o sea***	**M2, new formulation**
With PS *o sea*	406,93 msec.	514,42 msec.	263,39 msec.
Without PS *o sea*	338,66 msec.		444,33 msec.
Effects	16,78%		68,70%

Table 5: Total reading time in paraphrases with and without PS *o sea*

FPRT	**M1, first formulation**	**PS *o sea***	**M2, new formulation**
With PS *o sea*	280,28 msec.	328,48 msec.	233,62 msec.
Without PS *o sea*	181,08 msec.		344,25 msec.
Effects	35,39%		68,70%

Table 6: First-pass reading time in paraphrases with and without PS *o sea*

SPRT	**M1, first formulation**	**PS *o sea***	**M2, new formulation**
With PS *o sea*	124,92 msec.	181,27 msec.	36,43 msec.
Without PS *o sea*	156,03 msec.		105,69 msec.
Effects	24,90%		190,12%

Table 7: Second-pass reading time in paraphrases with and without PS *o sea*

c) Last, it can be observed that the FPRT shows greater values than SPRT in paraphrases with and without PS *o sea*. This is true for all the AOIs (first formulation M1, new formulation M2 and PS *o sea*). These differences are supported by large and very large effects: M1 costs 280,28 msec. vs. 124,92 msec. (55,43%, very large effects); 233,62 msec. vs. 36,43 msec. (84,41%, large effects) in sentences with PS *o sea*. The same comparisons can be made in sentences without the marker: M1 costs 181,08 msec. vs. 156,03 msec. (13,83%, large effects); 344,25 msec. vs. 105,69 msec. (69,30%, very large effects). Linguistically, these results can be related to the establishment of an equivalence semantic relationship between (1) *rosa rugosa* and *japonesa* and (2) *sumideros* and *desagües*. The pragmatic interpretation of this relationship costs less, which reveals an easy reinterpretation validating linguistic assumptions previously established (Escandell 2005). M1 tends to be costlier in both sentences.

In conclusion, paraphrase and paraphrastic values behind PS *o sea* are related to a nonlinear cognitive pattern after observing eye-movements and duration. Concerning eye-movements, PFs are highly related to this function, especially during the SPRT. Concerning duration, the paraphrase values behind PS *o sea* are related to high processing costs (514,42 msec. for the TRT distributed into the FPRT and SPRT). The absence of the PS *o sea* increases the reading costs, especially concerning M2; such an increase is statistically supported by large and very large effects.

4.2. Micro-experiment 2 (correction and PS *o sea*)

4.2.1. Types of eye-movements

Correction leads to different results compared to paraphrase: both decision regression trees (see Figs. 4 and 5) present Second pass reading time (SPRT) as the most determinant parameter in the experiment.

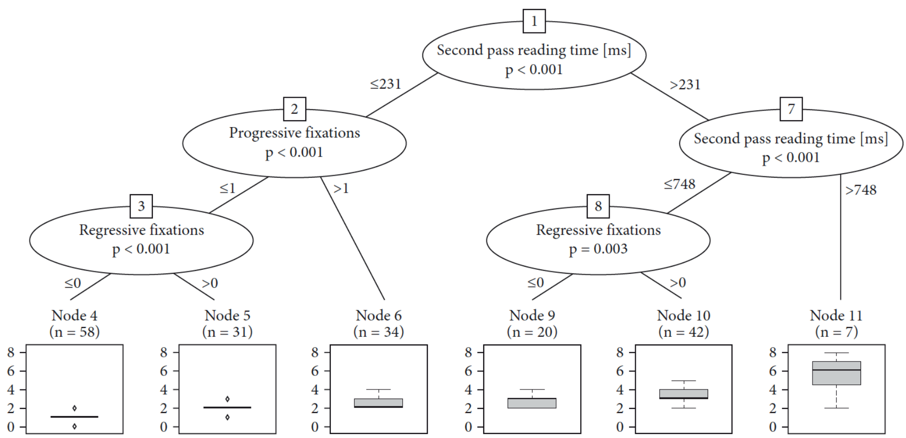

Fig. 4: Decision regression trees in corrections with PS *o sea*

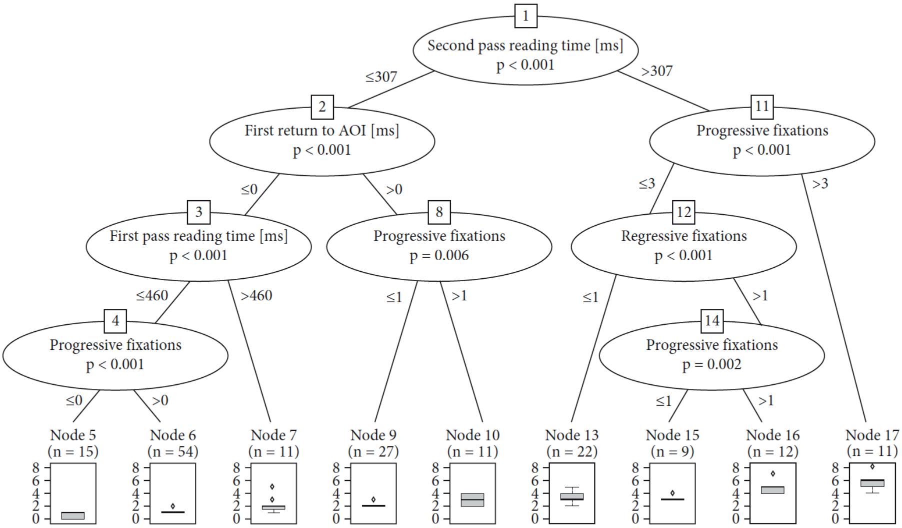

Fig. 5: Decision regression trees in corrections without PS *o sea*

This suggests that this reading stage will be relevant for participants in understanding this function with and without the PS *o sea* (p= < 0.001), and that this relevance is even more important than the type of eye-movement produced (this is a first difference from the paraphrase results). Both trees show differences: sentences with the marker are namely related to PF, which means that the participants are probably able to continue reading and assimilating when the DM is employed. However, sentences without the marker show a more complex tree: again, the SPRT is decisive, but further reading stages are related to PF and RF. The first return to AOI is detected by the tree, which suggests that the first rereading triggers high processing costs in assimilating corrections. Additionally, the tree predicts the importance of the FPRT, which is not as relevant as the SPRT, but its presence suggests that correction is neither easy in establishing first lexical assumptions (again, data are supported by low p-values (p= <0.001 to 0.006). This result is expected given the semantic-pragmatic basis of correction: a negation relationship produced so as to invalidate a previous formulation.

4.2.2. Reading times (duration)

However, decision regression tree results (i.e., a SPRT determined by PF when the PS *o sea* is introduced vs. a more complex function during SPRT and FPRT without the marker) need to be validated by reading times (see Fig. 6):

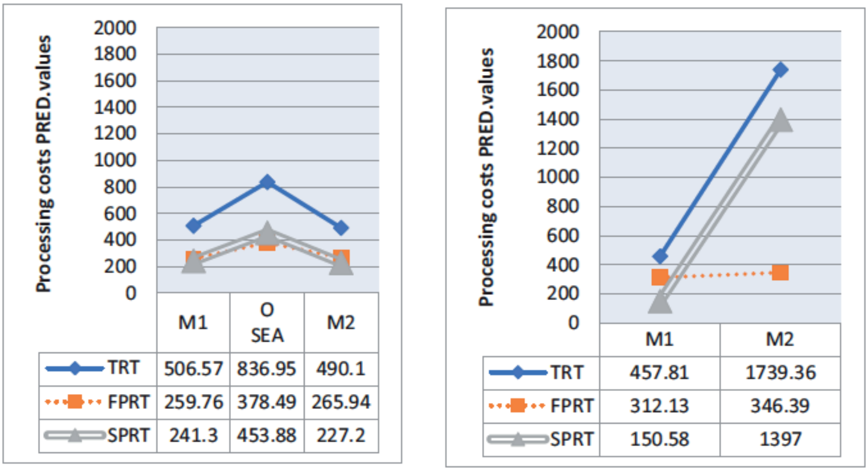

Fig. 6: Reading times processing pattern for corrections. The figure on the left is correction expressed with PS *o sea*. The figure on the right shows a correction expressed without PS *o sea*.

Some of the main results retrieved are:

a) A big TRT is obtained, which involves a clear difference from the paraphrase results, especially on PS *o sea* (836,95 msec., the highest value obtained for the DM in the four micro-experiments). Reading values are even greater in sentences without the DM for both TRT and SPRT: this, again, leads to the idea that the PS *o sea* is relevant in the contextual assimilation of correction. This is supported by very large effects (3760% and 514,88%), as shown by Table 8.

TRT correction	**M1, first formulation**	**PS *o sea***	**M2, new formulation**
With PS *o sea*	241,3 msec.	453,88 msec.	227,20 msec.
Without PS *o sea*	150,58 msec.		1397 msec.
Effects	3760%		514,88%

Table 8: Total reading time in correction with and without Sp *o sea*

b) Lexical word recognition and construction of first communicative assumptions are regular processes in correction (i.e., during the FPRT), but invalidation triggers assimilation difficulties during the pragmatic interpretation (i.e., during the SPRT). As can be observed in Table 9, this is the biggest difference between correction and paraphrase. The FPRT reflects this idea: participants seem to assimilate the new formulation M2 under both conditions; however, M2 without being preceded by the PS *o sea* is a bit costlier (265,94 msec. vs. 346,39 msec.; supported by very large effects of 30,25%).

FPRT correction	**M1, first formulation**	**PS *o sea***	**M2, new formulation**
With PS *o sea*	259,76 msec.	378,49 msec.	265,94 msec.
Without PS *o sea*	312,13 msec.		346,39 msec.
Effects	20,16%		30,25%

Table 9: First-pass reading time in correction with and without Sp *o sea*

c) Finally, the SPRT confirms what the FPRT partially shows (see Table 10). This reading stage triggers several cognitive processing costs in sentences without the PS *o sea*. Sentences with the DM present a subtle reduction, which suggests an adequate assimilation of the contents read: M1 costs 241,3 msec. and M2 costs 227,20 msec. (supported by 14,57% of large effects). The sentences without the PS *o sea* reflect an abrupt change: M1 loses its regularity to 150.58 (3760% of very large effects) and M2 increases its processing costs to 1397 msec. (514,88% very large effects).

SPRT correction	**M1, first formulation**	**PS *o sea***	**M2, new formulation**
With PS *o sea*	241,3 msec.	453,88 msec.	227,20 msec.
Without PS *o sea*	150,58 msec.		1397 msec.
Effects	3760%		514,88%

Table 10: Second-pass reading time in correction with and without Sp *o sea*

To sum up, according to the data, the assimilation of correction is resolved during the SPRT (as predicted by decision regression trees; 4.2.1.). The PS *o sea* correction values show a processing pattern which can be described as follows: the marker requires further efforts to be processed, but this effort contributes to understanding adequately both formulations; the new formulation (*blanco*, *mexicano*) costs even less than M1 (*tinto*, *italiano*). However, the absence of the DM complicates the invalidation of M1 through M2, especially during the SPRT, which clearly distinguishes correction from paraphrase.

In general, thus, correction is hard but balanced, showing similar FPRT and SPRT despite the semantic-pragmatic basis of this function.

5. Discussion and future research

After commenting on the data, hypotheses 1 and 2 can be confirmed or rejected[22]. Hypothesis 1 stated that a paraphrase can be processed without difficulties:

(i) Generally, the participants did not face many problems in processing the whole function, as shown by eye-movements patterns and reading duration results (which are supported by the statistical effects presented in 4.1.2.). The values obtained can be compared to other eye-tracking studies of DMs with similar results and stable reading times (see, for example, Schröck 2018, also in Loureda *et al*. 2021).

(ii) Regarding the relevance of the FPRT (i.e., the FPRT involves greater efforts), the statistical results lead to a partial confirmation of hypothesis: according to the reading times, the FPRT presents higher reading values which suggest that the equivalence relationship behind the paraphrase is established during the first assumptions in reading (i.e., participants understand that *rugosa* and *japonesa* are employed as equivalent terms and that *japonesa* allows a better assimilation of the former sentence; they are not merely appositions or coordinated elements); this is why the SPRT leads to more reduced costs. According the decision regression trees, the FPRT is important (especially in sentences with the DM), but not the most determinant parameter affecting all the data (in sentences without the DM).

(iii) Last, the paraphrase PS *o sea* can be distinguished from other values expressed by the same marker through the processing values (514,42 TRT, 328,48 FPRT, 181,27 SPRT). This last idea will be tested in a future paper comparing how participants process the same marker through different experimental tasks confirming such differences.

Hypothesis 2 proposed that the participants would face difficulties in processing correction, especially in contexts without the DM:

(i) Eye-movements patterns and reading duration results (both statistically supported by p-values and effects) show correction as a more complicated function compared to paraphrase.

[22] Hypotheses 1 and 2, thus, can be accepted since results have been obtained under specific and controlled experimental conditions which are also replicable in other studies; this said, these hypotheses can also be complemented through further experiments (e.g., time-response measurements, analyses of oral interaction, or Visual World Paradigm, among others), which will be carried out in future papers.

Again, if these data are compared to results from other works, differences and less-stable values can be observed (especially when the PS *o sea* is not employed).

(ii) SPRT is presented as a relevant reading stage, which is confirmed by decision regression trees and statistical effects. The DM clearly leads to a more stable M2 value, which means that the participants can understand better that *mexicano* and *italiano* are not merely antonyms: *italiano* involves a cancelation of the first term *mexicano*. The values obtained for the M2 are not influenced by wrap-up effects (Warren, White & Reichle 2009) or spillovers (Remington, Burt & Becker 2018)[23], since sentences were designed with a post-phrase in order to prevent the participants from stopping for longer on the new formulation.

(iii) The correction values for the PS *o sea* show a specific processing pattern based on high values (836,95 TRT, 378,49 FPRT, 453,88 SPRT). Again, this last result will be tested in future papers through complementing experimental tasks.

In order to complete the results presented in sections 4.1. and 4.2., all the reading values behind PS *o sea* can be directly compared. Table 11 includes values from paraphrase, correction and also reformulation and conclusion values (these latter values were retrieved from Salameh 2019, and not commented on in detail in this paper in order not to exceed the word limit). As explained before, these values are not the result of individual processing, neither a mean obtained from raw data without excluding outliers, but the result of applying statistical mixed models to clean data (see Appendix 2).

PS *o sea* values	**TRT**	**FPRT**	**SPRT**
Paraphrase	514,42 msec.	328,48 msec.	181,27 msec.
Reformulation	577 msec.	373,72 msec.	198,60 msec.
Conclusion	491,54 msec.	284,60 msec.	202,75 msec.
Correction	836,95 msec.	378,49 msec.	453,88 msec.

Table 11: Comparative results pn the Sp. discourse marker *o sea* in different contexts

[23] An anonymous reviewer suggested that the PS *o sea* greater costs could be the result of a spillover effect triggered by the M1; the same could be true for the M2 greater costs in sentences without the PS *o sea*. We agree on the fact that spillover, like other contextual or reading factors, could affect the reading values. However, the word length and number of characters were also included as "random effects" in the mixed-models conducted for each experiment. Future papers will test, specifically, the possible influence of spillovers on reformulation eye-tracking studies.

Different reading patterns were found:

(a) Paraphrase and reformulation are similar but not identical. This result is expected since these two functions have been traditionally described as subtypes of reformulation (paraphrastic and non-paraphrastic reformulation). Participants require some extra time to assimilate the reformulation meaning behind the marker in the three reading times, especially during the first-time when first lexical and structural assumptions are established.
(b) Conclusion reveals very close reading values: TRT is smaller than in paraphrase and reformulation, in line with the theoretical status of conclusion as a more structural-semantic function which does not involve a discourse reorientation; this idea is supported by FPRT and SPRT, which are very similar throughout results.
(c) Finally, correction involves the biggest processing costs for the three reading times, according to the theory about this function based on a cancelation of the previous formulation. Participants require extra time to completely assimilate the procedural instruction behind correction in *o sea*.

Despite the similarity of the data, some subtle differences can be found which at least could lead to a first distinction between the functions expressed by the PS *o sea*. In order to confirm if these differences are or not statistically supported, an ANOVA test crossing all the reading times was performed. The test provided us with significant results (p= <0.00741)[24] showing that there are differences between the groups of data compared (and, thus, between the functions compared). Then, hypothesis 3 can be accepted.

These data seem to be related to Pons's (2013, 2017) idea of reformulation as a *continuum*, by which *paraphrase*, *reformulation* and *correction* share gradual differences; *conclusion* seems to show a different behavior compared to the other functions (closer to cause-consequence DMs). The data, thus, lead to a first experimental pattern for the polyfunctionality of the PS *o sea* also observed through the global experimental results of the whole sentence (at least, for the paraphrase and correction values detailed in sections 4.1. and 4.2.).

To conclude, the results of this paper could be seen as a point of departure for future experimental research on the polyfunctionality

[24] This test is applied so as to assess the mixed models obtained for each micro-experiment. TRT represents Group 1 including paraphrase, reformulation, conclusion and correction values; FPRT represents Group 2 including paraphrase, reformulation, conclusion and correction values; SPRT represents Group 3 including paraphrase, reformulation, conclusion and correction values. No outliers are part of these data since they were deleted before their statistical processing with mixed-models.

of reformulation DMs in Peninsular Spanish by replicating the same experimental design to other DMs in the PS paradigm (*esto es*, *a saber*, *en otras palabras*, etc.) and also completing this technique with other experimental methods, such as time-response measurements and questionnaires.

References

Aijmer, K. (2002), *English Discourse Particles: Evidence from a Corpus*, John Benjamins Publishing Company, Amsterdam.

Anderson, R., Bothell, D. & Douglass, S. (2004), "Eye Movements do not Reflect Retrieval Processes: Limits of the Eye-Mind Hypothesis", *Psychological Science*, 15/4, p. 225-231; doi: 10.1111/ j.0956- 7976.2004.00656.x.

Asr, F., Demberg, V. (2020), "Interpretation of Discourse Connectives Is Probabilistic: Evidence From the Study of Butand Although", *Discourse Processes*, 57/ 4, p. 376-399.

Baccino, T. (2011), "Eye Movements and Concurrent ERP's: EFRPs Investigations in Reading", in Liversedge, S., Gilchrist, Ian D., Everling, S. (eds), *Handbook on Eye Movements*, Oxford University Press, Oxford, p. 857-870; doi:10.1093/ oxfordhb/ 9780199539789.013.0047.

Baccino, T., Manunta, Y. (2005), "Eye Fixation Related Potentials: Insight into Parafoveal Processing", *Journal of Psychopsychology*, 19/3, p. 204-215.

Bazzanella, C. (1986), "I connettivi di correzione nel parlato: Usi metatestuali e fatici", in Lichem, K., Mara, E. & Knaller, S. (eds), *Parallela 2. Aspetti della sintassi dell'italiano contemporáneo*, Gunter Narr Verlag p. 35-45.

Bazzanella, C., Bosco, C., Garcea, A., Gili Fivela, B., Miecznikowskii, J., Tini Brunozzi, F. (2007), "Italian *allora*, French *alors*: Functions, convergences and divergences", *Catalan Journal of Linguistics*, 6, p. 9-37.

Blakemore, D. (1993), "The relevance of reformulations", *Language and Literature*, 2, p. 101-120.

Booth, R. W., Weger, U. W. (2013), "The function of regressions in reading: Backward eye movements allow rereading", *Memory & Cognition*, 41/1, p. 82-97.

Brinton, L. J. (1996), *Pragmatic markers in English: Grammaticalization and discourse functions*, Mouton de Gruyter.

Brinton, L. K. (2008), *The comment clause in English: Syntactic origins and pragmatic development*, Cambridge University Press.

Briz, A. (1993), "Los conectores pragmáticos en la conversación coloquial (II). Su papel metadiscursivo", *Español actual*, 59, p. 39-56.

Briz, A. (2001), "El uso de *o sea* en la conversación", in De Kock, J. (ed.), *Gramática española. Enseñanza e investigación. Apuntes metodológicos*, Ediciones Universidad de Salamanca, p. 287-318.

Briz, A. (2002), "Otra vez sobre *o sea*", in Saralegui Platero, C., Casado Velarde, M. (eds), *Pulchre, bene, recte. Estudios en homenaje al Prof. Fernando González Ollé*, EUNSA, p. 169-190.

Briz, A., Estellés, M. (2010), "On the relationship between Attenuation, Discourse Particles and Position", in Kaltenböck, G., Mihatsch, W., Schneider, S. (eds), *New Approaches to Hedging*, *Studies in Pragmatics*, 9, p. 289-304.

Briz, A., Hidalgo Navarro, A. (1998), "Conectores pragmáticos y estructura de la conversación", in Montolío Durán, E., Martín Zorraquino, M. A. (eds), *Los marcadores del discurso. Teoría y análisis*, Arco Libros, p. 121-142.

Briz, A., Pons, S., Portolés, J. (eds) (2008), *Diccionario de partículas discursivas del español*, www.dpde.es.

Canal, P., Bambini, V., Breimaier, F. Meo, D., Pescarini, D., Loporcaro, M. (2021), "Capturing language change through EEG: Weaker P600 for a fading gender value in a southern Italo-Romance dialect", *Journal of Neurolinguistics*, 59, https://doi.org/10.1016/j.jneuroling.2021.101004.

Canestrelli, A, Mak, W, Sanders, T (2013), "Causal connectives in discourse processing: How differences in subjectivity are reflected in eye-movements", *Language and Cognitive Processes*, 28, p. 1394-1413.

Cohen, J. (1988), *Statistical power analysis for the behavioural sciences*, Erlbaum Associates.

Corley, M. (2010), "Making predictions from speech with repairs: Evidence from eye movements", *Language and Cognitive Processes*, 25/5, p. 706-727; https://doi.org/10.1080/01690960903512489.

Cortés Rodríguez, L. (1991), *Sobre conectores, expletivos y muletillas en el español hablado*, Librería Ágora, Málaga.

Crible, L. (2018), *Discourse markers and (Dis)fluency: Forms and functions across languages and registers*, John Benjamins Publishing Company, Amsterdam.

Crible, L., Pickering, M. (2020), "Compensating for processing difficulty in discourse: Effect of parallelism in contrastive relations" *Discourse Processes*, 57/10, p. 862-879; DOI: 10.1080/0163853X.2020.1813493.

Crible, L., Zufferey, S. (2015), "Using a unified taxonomy to annotate discourse markers in speech and writing", in *Proceedings of the 11th Joint ACL-ISO Workshop on Interoperable Semantic Annotation (ISA-11)*, London, UK, Association for Computational Linguistics.

Cruz Rubio, A. (2020), *Processing Patterns of focusing: An experimental study on Pragmatic scales Triggered by the Spanish focus operator* incluso, Universität Heidelberg, Heidelberg.

Cucio, V., Perconti, P., Steen, G., Shtyrov, Y., Huang, Y. (2022), "Editorial: Experimental Approaches to Pragmatics", *Frontiers in Psychology*, 13, p. 1-3.

Cuello Ramón, C. (2022), *Psycholinguistic Correlates of Grammaticalization of Discourse Markers: Analysis of a Consecutive Subparadigm through Eye-Tracking*, Universität Heidelberg/ Universidad de Valencia, Heidelberg/ Valencia.

Cuenca, M. J. (2006), *La connexió i els connectors. Perspectiva oracional i textual*, Eumo.

Cuenca, M. J., Bach Martorell, C. (2007), "Contrasting the form and use of reformulation markers", *Discourse Studies*, 9, p. 149-175.

Cutler, A. (1983), "Semantics, syntax and sentence accent", in *Proceedings of the Tenth International Congress of Phonetic Sciences*, Vol. 2A, Utrecht, p. 85-91.

Del Saz, M. (2003), *An analysis of English discourse markers of reformulation*, unpublished doctoral dissertation, Universitat de València.

Demberg, V., Keller, F. (2008), "Data from eye-tracking corpora as evidence for theories of syntactic processing complexity", *Cognition*, 109/2, p. 193-210.

Diewald, G. (2006), *Discourse particles and modal particles as gramatical elements. Approaches to discourse particles*, Elsevier, Amsterdam.
Dijk, T. A. van, Kintsch, W. (1983), *Strategies of discourse comprehension*, Academic Press, New York.
Donahoo, S. A., Pfeifer, V. A., Lai, V. T. (2022), "Cursed Concepts: New insights on combinatorial processing from ERP correlates of swearing in context", *Brain & Language*, 226, 105079; https://doi.org/10.1016/j.bandl.2022.105079.
Duchowski, A. (2007), *Eye-tracking methodology: Theory and Practice*, Springer, Berlin.
Enderle, J. (2010), *Models of horizontal eye-movements, Part I: Early models of saccades and smooth pursuit*, Springer Cham, p. 1-163.
Erikson, F. (1979), "Talking down: Some cultural sources of miscommunication in interracial interviews", in Wolfgang, A. (ed.), *Nonverbal behavior: Applications and Cultural implications*, Academic Press, New York, p. 99-126.
Fedriani, C., Molinelli, P. (2019), "Italian *ma* 'but' in deverbal pragmatic markers: Forms, functions, and productivity of a pragma-dyad", *Cuadernos de Filología Italiana*, 26, p. 29-56; https://doi.org/10.5209/cfit.62864.
Félix-Brasdefer, J. C. (2006), "Pragmatic and Textual Functions of *o sea*: Evidence from Mexican Spanish", in Timothy L. Face, Carol A. Klee (eds), *Selected Proceedings of the 8th Hispanic Linguistics Symposium*, Somerville, MA, p. 191-203; https://www.lingref.com/cpp/hls/8/paper1266.pdf
Fischer, K. (ed.) (2006), *Approaches to discourse particles*, Elsevier, Amsterdam.
Fraser, B. (1988), "Types of English discourse markers", *Acta Linguistica Hungarica*, 38/1-4, p. 19-33.
Fraser, B. (1990), "Perspectives on politeness", *Journal of Pragmatics*, 14, p. 219-236.
Fraser, B. (1999), "What are discourse markers?", *Journal of Pragmatics*, 31, p. 931-952.
Fraser, B. (2009), "An account of discourse markers", *International Review of Pragmatics*, 1, p. 1-28.
Fretheim, T. (2000), "Procedural encoding of propositional attitude in Norwegian conditional clauses", in Andersen, G., Fretheim, T. (eds), *Pragmatic markers and propositional attitude*, John Benjamins, p. 53-84.
Friederici, A. D., Gierhan, S. M. (2013), "The language network", *Current Opinion in Neurobiology*, 23/2, p. 250-254.
Garcés, M. P. (2008), *La organización del discurso: Marcadores de ordenación y de reformulación*, Iberoamericana/Vervuert.
Gergel, R., Puhl, M., Dampfhofer, S., Onea, E. (2022), *The rise and particularly fall of presuppositions: Evidence from duality in Universals*, ELM 2.
Gerwien, J., Rudka, M. (2018), "Expectation changes over time. How long it takes to process focus imposed by German *sogar*", in Loureda, O. *et al.* (eds), *Empirical studies of the Construction of Discourse*, John Benjamins Publishing Company, Amsterdam, p. 229-252.
Gibbs, R.W., Colston, H. (2020), "Pragmatics Always Matters: An Expanded vision of Experimental Pragmatics", *Frontiers in Psychology*, 11; DOI=10.3389/fpsyg.2020.01619.
Godfroid, A. (2019), *Eye tracking in second language acquisition and bilingualism: A research synthesis and methodological guide*, Routledge, New York.

Gries, S. (2013), *Statistics of Linguistics with R. A Practical Introduction*, De Gruyter, Berlin.
Grisot, C., Moeschler, J. (2014), "How do empirical methods interact with theoretical pragmatics? The conceptual and procedural contents of the English past simple and its translation to French", *Yearbook of corpus linguistics and pragmatics*, Springer, p. 7-33.
Guillén Jiménez, D. (in preparation), *Experimental Analysis of the Processing Schemas of Counter-Argumentation and Anaphoric Substitution Signaled by the Spanish Connective* a pesar de ello, Universität Heidelberg, Heidelberg.
Halliday, M. A. K., Hasan, R. (1974), *Cohesion in English*, Longman.
Hansen, M. (1998), "The semantic status of discourse markers", *Lingua*, 1041, p. 235-260.
Hansen, M. (2006), "A dynamic polysemy approach to the lexical semantics of discourse markers (with an exemplary analysis of French *toujours*", in Fischer, K. (ed.), *Approaches to discourse particles*, Elsevier, Amsterdam, p. 21-42.
Hansen, M. (2008). *Particles at the semantics/ pragmatics interface: Synchronic and diachronic issues.* Elsevier, Amsterdam.
Haselow, A. (2011), "Discourse particle and modal particle: The functions of utterance final *then* in spoken English", *Journal of Pragmatics*, 14, p. 3603-3623.
Hauser, D. J., Schwarz, N. (2016), "Attentive Turkers: MTurk participants perform better on online attention checks than do subject pool participants", *Behavior Research Methods*, 48/1, p. 400-407.
Henderson, J. M., Weeks, P. A., Hollingworth, A. (1999), "Effects of semantic consistency on eye movements during scene viewing", *Journal of Experimental psychology: Human & Perception performance*, 25/1, p. 210-228.
Holmqvist, K., Nyström, M., Andersson, R., Dewhurst, R., Jarodzka, H., van de Weijer, J. (2011), *Eye tracking: A comprehensive guide to methods and measures*, Oxford University Press.
Hummel, M. (2012), *Polifuncionalidad, polisemia y estrategia retórica. Los signos discursivos con base atributiva entre oralidad y escritura*, Behiefte zur zeitschrift für romanische philologie, De Gruyter, Amsterdam.
Hyönä, J., Lorch, R., Rinck, M. (2003), "Eye movement measures to study global text processing", in Radach, R., Hyönä, J., Deubel, H. (eds), *The mind's eyes: Cognitive and applied aspects of eye movement research*, Elsevier, Amsterdam, p. 313-334.
Inhoff, A. W. (1984), "Two stages of word processing in the reading of prose during eye fixations in reading", *Journal of Verbal Learning & Verbal Behavior*, 23, p. 612-624.
Jucker, A. (1993), "The discourse marker *well*: A relevance-theoretical account", *Journal of Pragmatics*, 19, p. 435-452.
Jucker, A., Schneider, K., Bublitz, W. (eds) (2018), *Methods in Pragmatics*, De Gruyter, Berlin.
Just, M. A., Carpenter, P. A. (1980), "A theory of reading: From eye fixations to comprehension", *Psychological Review*, 87/4, p. 329-354.
Just, M. A., Carpenter, P. A., Woolley, J. D. (1982), "Paradigms and processes in reading comprehension", *Journal of Experimental Psychology*: *General*, 111/ 2, p. 228-238.

Knowlton, T., Trueswell, J., Papafragou, A. (2022), "A mentalistic semantics explains *each* and *every* quantifier use", *Proceedings on the annual Meeting of Cognitive Society*, 44, p. 395-401.

Komar, S. 2007, "The interface between intonation and function of discourse markers in English", *ELOPE: English Language Overseas Perspectives and Enquiries*, 4/1-2, p. 43-55.

Larralde, C., Pouscoulos, N., Noveck, I. (2022), *Exploring the pragmatic import of non-truth-conditional discourse connectives*, ELM 2.

Lencer, R., Trillenberg, P. (2008), "Neurophysiology and neuroanatomy of smooth pursuit in humans", *Brain and Cognition*, 68, p. 219-228.

Lewis, D. (2006), "Discourse markers in English: A discourse-pragmatic view", in Fischer, K. (ed.), *Approaches to discourse particles*, Elsevier, Amsterdam, p. 43-60.

Lohmann, A., Koops, C. (2016), "Aspects of discourse marker sequencing. Empirical challenges and theoretical implications", in Kaltenböck, G., Keizer, E., Lohmann, A. (eds), *Outside the clause: Form and Function of extra-clausal constituents*, Studies in Language Companion Series, 178, p. 417-446.

López Serena, A., Borreguero Zuloaga, M. (2010), "Los marcadores del discurso y la variación lengua hablada *vs* lengua escrita", in Loureda Lamas, Ó., Acín Villa, E. (eds), *Los estudios sobre marcadores del discurso en español, hoy*, Arco Libros, Madrid, p. 415-496.

Loureda, Ó., Acín, E. (2010), *Los marcadores del discurso en español, hoy*, Arco Libros, Madrid.

Loureda, Ó., Cruz Rubio, A., Recio-Fernández, I., Rudka, M. (2021), *Comunicación, partículas discursivas y pragmática experimental*, Arco Libros, Madrid.

Loureda, Ó, Recio, I., Cruz, A., Nadal, L. (2020), "La pragmática experimental", in Escandell-Vidal, M. V., Amenós, J., Ahern, A. (eds), *Pragmática*, p. 358-383.

Martín Zorraquino, M. A., Portolés Lázaro, J. (1999), "Los marcadores del discurso", in Demonte, V., Bosque, I. (eds), *Gramática descriptiva de la lengua española*, Espasa Calpe, p. 4051-4214.

McConkie, G., Rayner, K. (1976), "Asymmetry of the perceptual span in reading", *Bulletin of the Psychonomic Society*, 8/5, p. 365-368.

Meseguer, E., Carreiras, M., Clifton, C. Jr. (2002), "Overt reanalysis strategies and eye movements during the reading of mild garden path sentences", *Memory & Cognition*, 30/4, p. 551-561.

Milliken, G. A. (1992), "Analysis of mixed models without mixed models software", Conference on applied statistics in agriculture, New Prairie Press.

Murat, M., Cartier-Bresson, B. (1987), « C'est-à-dire ou la reprise interprétative. La reformulation du sens dans le discours », *Langue Française*, 73, p. 5-15.

Murillo, S. (2007), *A contribution to the pragmalinguistic contrastive study of explicatory reformulative discourse markers in contemporary journalistic written English and Spanish*, Unpublished doctoral dissertation, Universidad de Zaragoza.

Murillo, S. (2010), "Los marcadores del discurso y su semántica", in Loureda Lamas, Ó., Acín Villa, E. (eds), *Los marcadores del discurso, hoy*, Arco Libros, Madrid, p. 151-190.

Murillo, S. (2016), "Sobre el uso de *que* con los marcadores de reformulación explicativa en español escrito", in Borreguero Zuloaga, M., Gómez-Jordana Ferrary, S. (eds), *Marqueurs du discours dans les langues romanes, une approche contrastive*, Lambert-Lucas, p. 168-179.

Myers, J. (2009), "Syntactic judgment experiments", *Language and Linguistics Compass*, 3/1, p. 406-423.

Nadal, L. (2019), *Lingüística experimental y contraargumentación: un estudio del conector* sin embargo *en españo*l, Peter Lang, Frankfurt.

Polanco, F. (2016), "Marcadores del discurso y contextos funcionales: La reformulación como construcción discursiva", *Onomázein*, 34, p. 14-35.

Pons Bordería, S. (1998), *Conexión y conectores: estudio de su relación en el registro informal de la lengua*, Universitat de València.

Pons, S. (2004), *Conceptos y aplicaciones de la teoría de la relevancia*, Arco Libros, Madrid.

Portolés, J. (1993), "La distinción entre conectores y otros marcadores del discurso en español", *Verba*, 20, p. 141-170.

Portolés, J. (2001), *Marcadores del discurso*, Ariel.

Poynor, D. V., Morris, R. K. (2003), "Inferred goals in narratives: Evidence from self- parced reading, recall and eye movements", *Journal of Experimental Psychology: Learning, Memory and Cognition*, 29/1, p. 3-9.

Rasemberg, M., Özyürek, A., Dignemanse, M. (2020), "Alignement in Multimodal Interaction: an Integrative Framework", *Cognitive Science*, 44, p. 1-29.

Rayner, K. (1977), "Visual attention in reading: Eye movements reflect cognitive processes", *Memory & Cognition*, 5, p. 443-448.

Rayner, K. (1978), "Eye movements in reading and information processing", *Psychological Bulletin*, 85/3, p. 618-660.

Rayner, K. (1998), "Eye movements in reading and information processing: 20 years of research", *Psychological Bulletin*, 124/3, p. 372-422.

Rayner, K. (2009), "Eye movements and attention in reading, scene perception and visual search", *Quarterly Journal of Experimental Psychology*, 62/ 8, p. 1457-1506.

Rayner, K., Castelhano, M. S. (2008), "Eye movements during reading, scene perception, visual search, and while looking at print advertisements", in Wedel, M., Pieters, R. (eds), *Visual marketing: From attention to action*, Taylor & Francis Group/Lawrence Erlbaum Associates, p. 9-42.

Rayner, K. K., Chace, H., Slattery, T. J., Ashby, J. (2006), "Eye movements as reflections of comprehension processes in reading". *Scientific Studies of Reading*, 10/3, p. 241-245.

Rayner, K., Duffy, S. (1986), "Lexical complexity and fixation times in reading: Effects of word frequency, verb complexity, and lexical ambiguity", *Memory & Cognition*, 14, p. 191-201.

Rayner, K., Sereno, S. C. (1994), "Regressive eye movements and sentence parsing: On the use of regression-contingent analyses", *Memory & Cognition*, 22/3, p. 281-285.

Rayner, K., Sereno, S. C., Raney, G. (1996), "Eye movement control in reading: A comparison of two types of models", *Journal of Experimental Psychology: Human Perception and Performance*, 22/5, p. 1188-1200.

Redeker, G. (1990), "Ideational and pragmatic markers of discourse structure", *Journal of Pragmatics*, 14/3, p. 367-381.

Remington, R., Burt, J., Becker, S. (2018), “The curious case of *spillover*: Does it tell us much about saccade timing in reading?”, *Attention, Perception and Psychopshysics*, 80, p. 1683-1690.
Richardson, D., Dale, R., Spivey, M. (2004), “Eye movements in language cognition: A brief introduction”, in González-Márquez, M. *et al.* (eds), *Methods in cognitive linguistics*, John Benjamins.
Rokach, L., Maimon, O. (2014), *Data mining with decision trees. Theory and Applications*, Series in Machine Perception and Artificial Intelligence, 69, World Scientific.
Rossari, C. (1990), « Projet pour une typologie des opérations de reformulation », *Cahiers de Linguistique Française,* 11, p. 345-359.
Rossari, C. (1994), *Les opérations de reformulation: analyse du processus et des marques dans une perspective contrastive française-italien*, Peter Lang, Frankfurt.
Roulet, E. (1987), « Completude interactive et connecteurs reformulatifs », *Cahiers de Linguistique Française*, 8, p. 111-140.
Rustom, A. (2012), *Estadística descriptiva, probabilidad e inferencia. Una visión conceptual y aplicada*, Santiago de Chile: Departamento de Economía Agraria, Facultad de Ciencias Agronómicas, Universidad de Chile.
Salameh, S. (2019a), *Reformulation and Neighboring categories: A Theoretical-Experimental Approach through the Sp. Discourse Marker “o sea” / Reformulación y categorías vecinas: un acercamiento teórico-experimental a través del marcador discursive “o sea” en español*, Universidad de Heidelberg / Universidad de Valencia, Tesis doctoral.
Salameh, S. (2019b), “Los límites entre paráfrasis y reformulación: un acercamiento teórico-experimental a las nociones de igualdad y distancia”, in Robles, F., Bertomeu, P. (eds), *La construcción del discurso en español y en catalán / La construcció del discurs en espanyol i en català*, Buske Helmut Verlag, p. 157-180.
Salameh, S. (2021), *Reframing reformulation: A theoretical-experimental approach. Evidence from the Sp. Discourse Marker* o sea, Peter Lang.
Salameh, S., Estellés, M., Pons, S. (2018), “Beyond the notion of periphery”, in Beeching, K., Ghezzi, C., Molinelli, P. (eds), *Positioning the Self and the Others*, John Benjamins Publishing Company, Amsterdam / Philadelphia.
Sanders, T. J. M., Spooren, W. P. M. (2015), “Causality and subjectivity in discourse: The meaning and use of causal connectives in spontaneous conversation, chat interactions and written text”, *Linguistics*, 53/1, p. 53-92.
Santos Río, L. (2003), *Diccionario de partículas*, Luso-Española de Ediciones.
Schiffrin, D. (1987), *Discourse markers*, Cambridge University Press.
Schiffrin, D. (2006), “From linguistic reference to social identity”, in de Fina, A., Schiffrin, D., Bamberg, M. (eds), *Discourse and identity*, Cambridge University Press, p. 103-132.
Schiffrin, D. (2015), *Discourse markers: Language, meaning and context*, in Schiffrin, D., Tannen, D., Hamilton, H. E. (eds), *The handbook of discourse analysis*, Blackwell.
Schourup, L. (1985), *Common Discourse Particles in English Conversation*, Routledge, London.
Schourup, L. (1999), “Discourse markers”, *Lingua*, 107, p. 227-265.
Schröck, J. (2018), *Die Reformulierung und ihre kognitive Verarbeitung: Eine*

experimentelle Studie zur Verwendung des Markers es decir *im Spanischen*, Unpublished master's thesis, Universität Heidelberg.
Schwenter, S. (1996), "Some reflections on *o sea*: A discourse marker in Spanish", *Journal of Pragmatics*, 25, p. 855-874.
Seltman, H. (2018), *Experimental design and analysis*, http://www.stat.cmu.edu/hseltman/309/Book/Book.pdf
Sereno, S. C. (1992), "Early lexical effects when fixating a word in reading", in Rayner, K. (ed.), *Eye movements and visual cognition: Scene perception and reading*, Springer Verlag, p. 304-316.
Sereno, S. C., Rayner, K., Posner, M. I. (1998), "Establishing a time-line of word recognition: Evidence from eye-movements and event-related potentials", *Neuroreport: An International Journal for the Rapid Communication of Research in Neuroscience*, 9/10, p. 2195-2200.
Spychalska, M., Reimer, L., Schumacher, P., Werning, M. (2021), "The cost of the epistemic step: Investigating scalar implicatures in full and partial information contexts", *Frontiers in Psychology: Language Science*; doi: 10.3389/fpsyg.2021.679491.
Standring, S., Borley, N. R., Gray, H. (2008), *Gray's anatomy: The anatomical basis of clinical practice*, Churchill Livingstone/ Elsevier.
Starr, M. S., Rayner, K. (2001), "Eye movements during reading: Some current controversies", *Trends in Cognitive Science*, 5, p. 156-163.
Sturt, P. (2003), "The time-course of the application of binding constraints in reference resolution", *Journal of Memory and Language*, 48, p. 542-562.
Tanenhaus, M. K., Trueswell, J. C. (2006), "Eye movements and spoken language comprehension", in Traxler, M. J., Gernsbacher, M. A. (eds), *Handbook of Psycholinguistics*, Elsevier Academic Press, New York, p. 863-900.
Tanghe, S. (2016), *Marcadores derivados de verbos de movimiento. Una aproximación cognitiva a su polifuncionalidad*, Beihefte zur Zeitschrift für romanische Philologie, 408, De Gruyter.
Thome, S. (2018), *Additive konnektoren mit argumentativer Funktion. Eine experimentelle studie zu esp.* además *und it.* inoltre, Universität Heidelberg, Heidelberg.
Torres Santos, L. (2020), *The scalar focus operator* hasta*: An experimental study on processing costs in Spanish*, Universität Heidelberg, Heidelberg.
Traugott, E. C. (1995), "Subjectification in Grammaticalization", in Stein, D., Wrightm S. (eds), *Subjectivity and Subjectivisation: Linguistic Perspectives*, Cambridge University Press, Cambridge, p. 31-54.
Travis, C. (2006), "The Natural Semantic Metalanguage approach to discourse markers", in Fischer, K. (ed.), *Approaches to Discourse Particles*, p. 219-241.
Traxler, M. J., Pickering, M. J. (1996), "Plausability and the processing of unbounded dependencies: An eye- tracking study", *Journal of Memory and Language*, 35/3, p. 454-475.
Van Bergen, G., Van Gijn, R., Hogeweg, L., Lestrade, S. (2011), "Discourse marking and the subtle art of mind-reading: The case of Dutch *eigenlijk*", *Journal of Pragmatics*, 43/15, p. 3877-3892.
Van Dijk, T. A., Kihtsch, W. (1983), *Strategies of discourse comprehension*, Academic Press.
Vicher, A., Sankoff, D. (1989), "The emergent syntax of pre-sentential turn openings", *Journal of Pragmatics*, 13, p. 81-97.

Warren, T., White, S., Reichle, E. (2009), "Investigating the causes of wrap-up effects: Evidence from eye movements and E-Z Reader", *Cognition*, 111/1, p. 132-137.
Wetzel, M., Crible, L., Zufferey, S. (2022), "Processing clause-internal discourse relations in a second language: A case study of specifications in German and French", *Journal of Second Language Studies*, 5/2; DOI:10.1075/jsls.21032.wet.
Wetzel, M., Zufferey, S., Gygax P. (2022), "How Robust Is Discourse Processing for Native Readers? The Role of Connectives and the Coherence Relations They Convey", *Frontiers in Psychology*; https://doi.org/10.3389/fpsyg.2022.822151.
Winke, P. M., Godfroid, A., Gass, S. M. (2013), "Introduction to the special issue: Eye-movement recordings in second language research", *Studies in second language acquisition*, 35/2, p. 205-212.
Wright, K.W., Spiegel, P., Thompson, L.S. (2006), *Handbook of Pediatric Strabismus and Amblyopia*, Springer, Berlin.
Yarbus, A. (1967), *Eye movements and vision*, Plenum Press.
Zufferey, S., Mak, W., Degand, L., Sanders, T. (2015), "Advanced learners' comprehension of discourse connectives: The role of L1 transfer across on-line and off-line tasks", *Second Language Research*, 31/3; https://doi.org/10.1177/0267658315573349.
Zufferey, S., Gygax, P. (2017), "Processing explicit and implicit discourse relations in a second language", *Frontiers in Psychology*, 8:1198; doi: 10.3389/fpsyg.2017.01198.

Appendixes

Appendixes can be checked in: https://drive.google.com/file/d/1HXhKZyYZV749kjFuq-C2e1cxWAwSTwmg/view?usp=sharing