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The Impact of Procedural Meaning on Second Language Processing: A Study on Connectives

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Nothing comes from nothing

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Acknowledgments

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Introduction

The main aim of this work is providing experimental evidence of how procedural meanings and communicative competence interact during discourse processing. Specifically, our interest lies in elucidating to what extent certain characteristics of discourses—the type of discourse relation at issue, the presence or absence of procedural interpretive guides, the consonance between procedural meaning and mind-stored assumptions—have a cognitive impact on participants with different proficiency levels in Spanish and are determinant for communicative success.

The major motivation to approach these phenomena is the scarcity of experimental studies on L2[1] discourse processing, despite the increasing use of experimentation that L1 linguistic research has been witnessing over the past decades. Experimental evidence available on L2 processing is, furthermore, to a great extent still inconclusive. Aside from this, there is barely any experimental evidence of L2 speakers' performance at different stages of the learning process, especially as regards the discourse level. By selecting two participant groups with different proficiency-levels in Spanish (either intermediate or advanced), this study seeks to make a contribution to alleviating these shortages by providing more than a snapshot of cognitive behavior and supplying evidence of whether and how processing changes as L2 proficiency develops. The results of the study shall hence provide further empirical evidence that helps refine or revise available theoretical claims on L2 discourse processing.

The methodological approach of this study is experimental: giving account of processing patterns requires gaining insight into cognitive processes, which are non-accessible by means of theoretical formulations or descriptions of language use (Noveck & Sperber 2004). Within linguistics, the basic assumption in experimentation is that "cognitive processes are time-demanding, and that complex processes are more time-demanding than simpler ones" (Dietrich 2002: 17). This work concerns specifically the field of experimental pragmatics, which "draws on pragmatics, psycholinguistics and the

[1] Throughout this work, "L1" is used as a synonym for native language; similarly, "L2" refers to the non-native or foreign language. Hence, "L2", "non-native language" or "foreign language" are employed indistinctly and alternated only on stylistic grounds.

psychology of reasoning" (Sperber & Noveck 2004: 1), *pragmatics* being understood as "the study on how linguistic properties and contextual factors interact in the interpretation of utterances" (idem). In this sense, evidence on processing has been collected in a series of eye-tracking reading experiments in order to answer a general and some specific research questions.

Our study aims at answering the general question of whether the procedural instructions encoded by connectives influence discourse processing differently depending on language proficiency. To that extent, the following four phenomena will be investigated:

1. Processing causal versus counter-argumentative relations respectively marked by the Spanish connectives *por tanto* ('therefore') and *sin embargo* ('however') (study 1).
2. Processing explicit versus implicit causal relations (study 2).
3. Processing mismatches between mind-stored assumptions and the communicated assumption derived from utterances marked by the causal connective *por tanto* (study 3).
4. Processing mismatches between mind-stored assumptions and the communicated assumption derived from utterances marked by the counter-argumentative connective *sin embargo* (study 4).

By exploring the data obtained in an eye-tracking reading study, we will try to provide answers to the following specific research questions:

Study 1
• Are marked causality and marked counter-argumentation processed differently? • Is there a correlate between participants' **degree of development of communicative competence** in Spanish and the effort needed to process causality and a counter-argumentation? • Do the effects of the type of argumentative operation deploy at a **particular processing stage** (initial construction, stage of re-activation, global processing)? • Do the effects translate into differences in processing **effort**, into differences in processing **patterns** (affecting different regions), or in both?

Study 2
• Are explicit and implicit causality processed differently? • Is there a correlate between the participants' **degree of development of communicative competence** and the processing effort invested in retrieving a communicated assumption from an explicit or an implicit causal utterance? • Do the effects of the implicitness of the causal relation at issue deploy at a **particular processing stage** (initial construction, re-analysis, all)? • Do the effects translate into differences in processing **effort**, into differences in processing **patterns** (affecting different regions), or in both?
Study 3
• Are plausible and implausible causal utterances processed differently? • If so, is there a correlate between the participants' **degree of development of communicative competence** and the effort invested by them to process plausible and implausible causal relations? • If so, do the effects of implausibility deploy at a **particular processing stage** (initial construction, re-analysis, all)? • If so, do the effects translate into differences in processing **effort**, into differences in processing **patterns** (affecting different regions), or in both?
Study 4
• Are plausible and implausible counter-argumentative utterances processed differently? • If so, is there a correlate between the participants' **degree of development of communicative competence** and the effort invested by them to process plausible and implausible counter-argumentative relations? • If so, do the effects of implausibility deploy at a **particular processing stage** (initial construction, re-analysis, all)? • If so, do the effects translate into differences in processing **effort**, into differences in processing **patterns** (affecting different regions), or in both?

Table 1. Research questions

In addition to contributing to the refinement theoretical claims, the experimental evidence provided in this work is also intended to serve as a basis for a broader issue of an applied nature: determining to what extent the processing patterns and strategies observed correlate with the thresholds and the content-sequencing established in frameworks of reference for (Spanish) language teaching/learning. Processing data are taken as a complement to assumptions about the teaching-learning process that rely upon descriptive and empirical, non-experimental data, gained most notably in analyses of written and spoken corpora. While developing specific applications of our data to the L2 classroom or to textbook design are not the object of this work, the analyses presented here and their anchoring in a broader theory of communication and in models of L2 processing can contribute to foster the incorporation of experimentally gathered evidence into teaching practices and materials that map not only on declarative knowledge, the *savoir*, but also on skills and know-how, the *savoir faire* of learners of a second language. Considering discourse as activities as occurs in experimentation permits researchers and professionals working in the realm of L2 teaching to do so.

The study is organized in three blocks and a conclusion chapter. The first block comprises chapters 1, 2, 3 and 4. It sets out the theoretical framework for the experimental studies. Chapter 1 provides an overview on communication as a cognitive process and revises some cognitively-grounded theoretical approaches to linguistic communication. Chapter 2 presents the notion and features of procedural meaning by focusing on discourse markers and, specifically, on connectives. Chapter 3 describes the morphosyntactic, semantic, pragmatic and diachronic features of *por tanto* ('therefore') and *sin embargo* ('however'), the connectives that constitute the subject matter of this study as carriers of procedural meaning. Chapter 4 focuses on pragmatic competence and its sub-competencies in a second language. It sets out potential factors influencing L2 discourse processing and reviews empirical results, particularly experimental studies dealing with discourse marking, to situate this study's research questions within the context of previous experimental research.

Chapter 5 forms the second block itself. It describes the methodology, the experimental design, the participants and the procedure of the study.

The third block comprises chapters 6, 7, 8 and 9. It provides the experimental results and data discussion for the four phenomena under study. Chapter 6 explores how native and non-native speakers at different proficiency levels handle causality versus counter-argumentative discourse relations when both relations are marked by a connective. Chapter 7 deals with the processing of explicit and implicit causal utterances by the participants of the study. Chapter 8 looks into how mismatches between the procedural meaning of *por tanto* and mind-stored assumptions influence the participants' processing patterns and cognitive effort. Chapter 9 deals with this same phenomenon, albeit in counter-argumentative relations marked by *sin embargo*. General conclusions and perspectives to be pursued as a follow-up of this work are provided in chapter 10.

1. Communication

Any study dealing with language processing and comprehension is a study on communication. Communication is a cognitive process[2], psychological in nature, and a "powerful mean for interpersonal relations" (Escandell Vidal 1996: 159)[3]. In a communicative exchange, "the interlocutors share at least one goal: having the hearer recognize the *speaker's meaning*" (Sperber & Noveck 2004: 2), which is performed by means of both decoding and inferencing under involvement of contextual information.

These claims, initially put forward by Herbert Paul Grice in the mid-20th century, lie at the basis of current views of (verbal) communication and contrast with earlier proposals that set their focus in the process of coding and decoding the linguistic material provided by the speaker, thus conferring addressees a markedly more passive role than in inferential models. They also constitute the theoretical background of current psycholinguistic investigations (cf. Noveck & Sperber 2004 and references therein) or have served as a basis for the development of alternative proposals, specifically in the fields of pragmatics (cf. Horn 1984, 1988, 2007; Levinson 1987, 2000), for theories of communication (Sperber & Wilson 1995[1986]; Blakemore 1987, 2002; Carston & Uchida 1998; Carston 2002a, among others) and for coherence-based approaches to linguistic processing and comprehension (van Dijk 1977, 1979; Kintsch & van Dijk 1978; van Dijk & Kintsch 1983; Hobbs 1990; Sanders et al. 1992, 1993; Schnotz 2005; Spooren & Sanders 2008).

Despite their divergences, one of the main conceptual challenges shared by approaches to communication that transcend the code model is providing satisfactory explanations of how the speaker's meaning is arrived at by the recipient of a discourse, which is done largely by means of inferencing[4]. To address that question, linguistic

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[2] This view is, however, relatively recent and still nowadays "it seems that the code model of communication corresponds to the common representation of communication held by many speakers" (Zufferey 2010: 15).

[3] All quotes in other languages than English supplied throughout this work have been translated by the author.

[4] Note that Relevance Theory rejects a purely code-based functioning of verbal communication, but still considers that coding and decoding intervene in communication together with inferential processes (Sperber & Wilson 1995[1986]: 175).

description can profit from results of investigations of language-related cognitive processes:

> The linguistic approach is based on the analysis of the structure of utterances. The psychological approach analyses how processing takes place, the interplay between a linguistic task and its observed result, the time needed to come to that result, any disturbances in processing and the logic of wrong productions. (Dietrich 2002: 29)

The psychological character of communication and the psychological connection that arises between the interlocutors in a communicative exchange is referred to in some code-based views of communications (see e.g., Saussure 1916; Jakobson 1960[5]), but they do not acknowledge an essentially cognitive nature to it. Instead, hearers are considered to access the content of a message by applying deterministic rules. Under that view, communication would only fail due to structural factors, such as using a code not shared by the interlocutors, physical barriers precluding the speaker to use the code, etc. (cf. Bazanella & Damiano 1999: 820-821).

What is said, however, is merely a template to be enriched by a hearer to arrive to what is actually communicated by a speaker: language is underdetermined (Carston 2002: 19 ff.). Thus, formally (linguistically) identical utterances[6] may not convey the same or not convey exclusively what is explicitly stated:

(1) [A psychologist to a patient during consultation]
- *It is five thirty.*

(2) [Anne and Mike at a party]
ANNE: - *Shall we stay a bit longer?*
MIKE: - *It is five thirty.*

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[5] "The ADDRESSER sends a MESSAGE to the ADDRESSEE. To be operative, the message requires a CONTEXT referred to (…), seizable by the addressees, and either verbal or capable of being verbalized; a CODE fully, or at least partially, common to the addresser and the addressee (in other words, to the encoder and decoder of the message); and, finally, a CONTACT, a **physical channel** and a **psychological connection** between the addresser and the addressee, enabling both of them to enter and stay in communication." (Jakobson 1960: 353, bold emphasis is mine, small capitals as in the original)

[6] Portolés (2007: 53) considers that utterances possess two main features: "[F]irstly, they represent the material segments of a discourse"; and, secondly, "(…) as defended by authors like Oswald Ducrot, (…) [utterances are] minimal intentional units within communication; in other words, minimal ostensive verbal stimuli. From the viewpoint of intentionality, we would thus be facing relatively autonomous discourse segments in relation to the rest of the discourse".

In (1) and (2), an analysis from code-based perspective would deliver only partial results as to what is actually communicated. In both cases, an addresser (the psychologist / Mike) conveys a message (the hour) to an addressee (the patient / Anne) through an auditory channel and by means of an identical linguistic output, i.e., a shared code (the English language). Nonetheless, what is communicated by 'It is five thirty', differs between both conversations. Explaining why this is possible requires considering the notion of *intention*: a speaker must not only *intend* to convey a message but also signal the "communicative intention" of the linguistic material that he utters (Grice 1957, 1989). An intention is, by definition, a volitive action, so in producing an utterance, the speaker *intends* to convey his mental state to the audience, i.e., "the speaker's meaning" or "meaning$_{NN}$" (idem; cf. Portolés 2007: 47). As non-natural signs, linguistic expressions "mean$_{NN}$"[7]:

> (…) for *x* to have meant$_{NN}$ anything, not merely must it have been "uttered" with the intention of inducing a certain belief but also the utterer must have intended an "audience" to recognize the intention behind the utterance (Grice 1989: 217).

That uttering the same linguistic material may lead to conveying different intentions as in (1) and (2) can be explained by the fact that human linguistic behavior is highly situation-dependent[8] (Grice 1989). Resorting to the co-text of a linguistic expression and to extra-linguistic factors[9] is thus key to recovering the speaker's meaning.

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[7] In contrast, natural signs "mean$_{N}$" (mean *naturally*).

[8] Humans "tend to refer to the **context** (linguistic or otherwise) of the utterance and ask which of the alternatives would be relevant to other things he [the speaker] is saying or doing, or which intention in a particular situation would fit in with some purpose he [the speaker] obviously has (…)." (Grice 1989: 222, emphasis is mine).

[9] Co-text and extra-linguistic factors are equal to what Grice calls "context". Pragmatics and communication studies usually identify several types of contexts. Frequent classifications (cf. for instance, Chandler & Munday 2011) distinguish between a social context, a situational context, a cultural context, a historical context, a psychological context, a task-context, a formal context and a linguistic context. Verschueren (1999: 75 ff.) differentiates between a communicative and a linguistic context. They are integrated respectively by the mental, the social and the physical world, and by the sort of channel employed and the properties and features of the discourse. Verschueren considers eventually that "any ingredient of a communicative event is a potential contextual correlate of [language] adaptability" (idem: 112), thus remarking that in principle all factors of communication play a role in determining the linguistic choice-making of the speaker and the interpretation choice-making of the hearer. The notion of context is also crucial in relevance-theoretic approaches (see further down below). For an overview of prominent notions of context within pragmatics see Yus Ramos (2003: 49).

From a Gricean perspective, in a communicative exchange, the hearer's behavior is motivated by him presupposing a *cooperative attitude* by the speaker, who, in turn, takes situation-specific factors into account at the time of producing his utterance. In other words, during speech production and in the absence of information indicating otherwise, a hearer presupposes the speaker to be acting under the *Cooperative Principle* (CP, 1975: 45): "Make your conversational contribution such as is required, at the stage at which it occurs, by the accepted purpose or direction of the talk exchange in which you are engaged."[10] Grice's is, thus, a context-dependent and inference-based model of communication in which, on the one hand, linguistic expressions are decoded and enriched contextually (polysemic expressions are disambiguated and referents are assigned), leading to *what is said*, a truth-conditional first level of signification with fully propositional form. On the other hand, by means of inference individuals arrive at *what is meant*, which brings about additional meanings, a second level of sense or *implicature* (Grice 1975: 47-48).

From this follows that an ability to derive metarepresentations, i.e., "a representation of a representation" (Wilson 1999: 127), is required to recover the *meaning*$_{NN}$ of utterances, which ties in with theory of mind abilities attributed to human beings[11], i.e., their "capacity to attribute mental states to oneself and to others, and to reason on the basis of this information in order to interpret and predict others' behaviors" (Zufferey 2010: 6; see also Sperber & Wilson 2002; Sodian & Thoermer 2006). The following Gricean claims illustrate this:

> Our exchanges do not normally consist of a succession of disconnected remarks, and would not be rational if they did. They are characteristically, to some degree at least, cooperative efforts; and

[10] The CP is operationalized by Grice in the form of four maxims that echo Kant's maxims: *Quantity*, *Quality*, *Relation* and *Manner*. The maxims can be *violated*, *flouted*, *opted out*, *infringed* or *suspended* (Grice 1975: 45 ff.) for communicative purposes ranging from interpersonal reasons (e.g., someone opting out to fulfill the maxim of quantity to save his face) up to utterance-related reasons (e.g., someone being as informative as required and therefore violating the supermaxim of Quality).

[11] Empirical evidence from psychological tests and neuroscience experiments (Perner et al. 2006; Saxe et al. 2004) seems to confirm the existence of a theory of mind module located in the temporo-parietal region of the brain.

> **each participant recognizes in them, to some extent, a common purpose or set of purposes, or at least a mutually accepted direction.**[12] (Grice 1975: 45)
>
> (…) for *x* to have meant$_{NN}$ anything, not merely must it have been "uttered" with the **intention of inducing a certain belief**[13] but also the utterer must have **intended an "audience" to recognize the intention** behind the utterance. (Grice 1989: 217)
>
> A general pattern for the working out of a conversational implicature might be given as follows: 'He [the speaker] has said that p; there is no reason to suppose that he is not observing the maxims, or at least the CP; **he could not be doing this unless he thought that *p***; **he knows (and knows that I know that he knows)** that I can see that the supposition that he thinks that *q* IS required; he has done nothing to stop me thinking that *q*; **he intends me to think**, or is at least willing to allow me to think, that *q*; and so he has implicated that *q*.' (Grice 1975: 49)

These postulates clearly point to a "a second level of intentionality" (Zufferey 2010: 17), necessary for a speaker to induce a belief in the hearer and make him recognize his belief-inducing intention, so it implies highly complex conscious reasoning, and this poses some problems for the cognitive plausibility of the CP model. Firstly, interlocutors are required to derive metarepresentations *ad infinitum*, and, therefore, to put to use "not too few but too many mind-reading abilities" [14] (Zufferey 2010: 19; see also Wilson 1999: 131); secondly, marked consciousness is needed to attribute meanings to utterances, which seems to be at odds with the generally spontaneous, unconscious character of inferences implied in mind-reading (Wilson 1999: 131-132). Thirdly, some (generalized conversational) implicatures are derived from "what is said", thus leaving out contextual factors such as speakers' intentions (Levinson 2000: 186; Wilson 1999: 132-133), while, from the other side of the coin, recovering the meaning of literal expressions relies on processes that are at least partly inferential[15]. Finally, "Grice's framework suggests no explicit procedure for identifying the content of particular speaker meanings" (Wilson

[12] This view of communicative exchanges reminds of coherence-based approaches to communication and discourse, some of which (Giora 1985a, 1996, 1997; see also further down below) are partly grounded on Grice's proposals.
[13] For Perner (1999), desires—the belief-inducting intention in Grice's quote above—and beliefs are the central concepts in humans' theory of mind. In this respect, theory-of-mind abilities are required in any case to deliberately leave out the CP.
[14] Zufferey (2010: 17-19) offers evidence from studies on theory of mind abilities with speakers suffering from certain forms of communicative impairment that provide further support to these objections to Grice's model.
[15] In the sense that they are not only dependent on the context but also on linguistic expressions. Levinson (2000) speaks of cases of "pragmatic intrusion into semantic interpretation", strongly reminding of the concept of *explicature* in Relevance Theory (Sperber & Wilson 1995[1986], see below).

1999: 135), so his working-out schema for implicatures renders it impossible to calculate them in practice (Moeschler 1989: 114, 116; Wilson 1999).

1.1. *A cognitive theory of communication: Relevance Theory*

A solution to endless metarepresentations comes from the hand of Sperber & Wilson's *Relevance Theory* (1986, 1995 [RT]), in which the notion of "mutual knowledge" is replaced by the notion of "mutually manifestness"[16] (Sperber & Wilson 1995: 42), i.e., any manifest assumption in a shared cognitive environment. The notion of *manifestness*

> is weaker than knowledge (or belief) (…). An assumption cannot be known or believed without being explicitly represented; but it can be manifest to an individual if it is merely capable of being non-demonstratively inferred. By defining communication in terms of a notion of mutual manifestness, the theoretical requirement of transparency and the practical requirement of psychological plausibility can be reconciled. (Wilson 1999: 140)

From a cognitive viewpoint, this [Relevance Theory] "is (…) much more plausible, because it does not involve a regression of metarepresentations that cannot be dealt with by the human mind." (Zufferey 2010: 20). Theory-of-mind abilities are indispensable to process utterances, but from this view mind-reading turns out a cognitively plausible task for human beings (cf. Saussure 2007).

Relevance Theory simplifies Grice's model in a further manner by reducing his maxims to a sole principle, the *principle of relevance*[17]. Communication is considered a cognitive process that combines *ostension* and *inference*: a speaker produces a stimulus overtly intended for a hearer, who, in his turn, processes it by means of decoding and

[16] *Manifestness (of an assumption to an individual)* is "the degree to which an individual is capable of mentally representing an assumption and holding it as true or probably true at a given moment." (Carston 2002a: 378)

[17] As stated by Carston (2002: 1-2), RT also responds to Fodor's modular view of communication that assumes that the central systems, as context-dependent and non-domain specific modules, cannot be subject to scientific analysis due to their lack of "architectural constraints on the information that may be consulted in arriving at their decisions". RT sees two features in interpretative processes involved in communication, "the time pressure inherent in on-line processes and the speaker's responsibility for the quality of the stimulus she produces." (idem) This is reproduced in their notion of "optimal relevance".

inferential computations. By uttering a message, the speaker communicates an *informative intention*: he seeks to make manifest or more manifest a series of propositions to his interlocutor; and a *communicative intention*: he seeks to make mutually manifest that he has an informative intention (Sperber & Wilson 1995[1986]: 58-61; Portolés 2007: 48). Both the informative and the communicative intention are recovered by a hearer driven by the expectation that the utterance's meaning—the assumption the speaker intends to communicate—will be *relevant* for him:

> *1. First (cognitive) principle of relevance:*
> Human cognition is geared towards the maximization of relevance (that is, to the achievement of as many contextual (cognitive) effects as possible for as little processing effort as possible).
>
> *2. Second (communicative) principle of relevance:*
> Every act of ostensive communication (e.g. an utterance) communicates a presumption of its own optimal relevance." (Carston 2002a: 379)

The notion of *relevance* is powerful to explain why human beings engage at all in communicative exchanges. Utterances are worth processing because hearers take for granted that the cognitive effort that they will invest in doing so will be efficient, that is, balanced in terms of the "degree of achievement and expenditure" that processing involves (Sperber & Wilson 1995[1986]: 46).

As "efficient information-processing devices" (idem), human beings process a new piece of information—or bits of it—and combine it with the assumptions that they already entertain and/or with the representations derived from previous utterances. In doing so, they seek for a benefit, operationalized by RT in terms of *contextual effects*: "the result of a fruitful (i.e., relevant) interaction between a newly impinging stimulus and a subset of the assumptions already in the cognitive system" (Carston 2002a: 377).

Contextual effects are triggered by inference and lead to a change in the interlocutors' mutual cognitive environment[18]. They can be of three types (Sperber & Wilson 1995[1986]: 107-108; Blakemore 2002: 61):

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[18] Note Sperber and Wilson's remark on the social importance of the alteration of the mutual cognitive environment of two people, "a change in their possibilities of interaction (and in particular, in their possibilities of further communication)" (Sperber & Wilson 1986: 62). This crucially affects discourse dynamics and can be connected with the postulates put forward by Anscombre and Ducrot's *Argumentation Theory* (1980) that, because of their meaning, it is linguistic expressions themselves that condition the

- New information can be contextualized with old (mind-stored) information. In those cases, both types of information can be taken as premises for a conclusion that could not have been inferred by resorting to just the new *or* the old information, and *contextual implications* or *new assumptions* are synthetically[19] derived.
- A contextual effect[20] can also lead to *strengthening* the degree to which an already stored assumption is held. This takes place when new information is processed as evidence to strengthen the stored assumption by confronting it with it.
- Finally, new information can lead to the *abandonment* or the *elimination* of an entertained assumption.

Relevance as a notion is relative and gradable: the greater the contextual effects of a linguistic stimulus are, the greater its relevance[21] (Sperber & Wilson 1995[1986]). Failure to meet an interlocutor's expectations of relevance in a given context may result in only partial or no success of a communicative act[22], further proof that communication does not follow a perfect heuristic but consists in "giving a representation of the world accessible for the interlocutor" (Moeschler 1989: 108).

Relevance Theory proposes a fine-grained deconstruction of the steps from linguistic decoding to the completion of inferential processes and introduces the notion of *explicature* (Sperber & Wilson 1986, 1995). While implicatures are purely inferential and detached from the conventional meaning of words, an *explicature* is "an ostensively communicated assumption which is *inferentially* developed from one of the incomplete conceptual representations (logical forms) encoded by the utterance" (Carston 2002a: 377, our emphasis). Pragmatic inferences carried out to recover explicatures rely thus on

progression of discourse, rather than the state of facts they represent (Portolés 2007: 233). It is certainly not the kind of "possibilities of further communication" (cf. above) intended by Sperber and Wilson, since AT is not a cognitive theory, but it evidences nonetheless that both theories, one of a cognitive and the other of a semantic nature, can be combined to explain more comprehensively how discourse dynamics unfolds.

[19] Contextual implications are *synthetic* because they are derived by means of *synthetic rules*, i.e., rules which take "two separate assumptions as input." (Sperber &Wilson 1995[1986]: 104)

[20] Different discourse connectives can be linked to different kinds of cognitive effects (Blakemore 2002: 95, see chapters 2 and 3).

[21] Moeschler (1989: 119) adds "an utterance is relevant in a context *iff* it brings about at least one contextual effect within that context (for example, a contextual implication)."

[22] Blass (1990: 12) remarks that "a speaker who makes no effort to conform to this expectation [of optimal relevance] risks being misunderstood". This being true, even if the speaker sticks to relevance expectations in producing an utterance, communication can still fail.

decoded linguistic meanings, but still in their *logical form*, which is a draft of what is communicated and still lacks truth values. The logical form is thus more incomplete than Grice's notion of decoded meanings[23]. Hence, further processes are needed to transform it into an actual proposition (the proper *explicature*) and, subsequently, into an assumption schema (or *higher-level explicature*). Guided by the principle of relevance, a hearer starts from the logical form of an utterance and completes it up to a propositional form by disambiguating polysemic elements, assigning referents and carrying out enrichment processes to solve further indeterminacies (the where and when of a given action, for instance). The obtained *propositional form* is then further completed with speech-act information and the speaker's propositional attitude. The obtained sense of the utterance now takes the form of an *assumption schema*. By completing these processes, "we have squeezed out all senses explicitly transmitted; it is, so to say, as if we had squeezed out as much as we can get from an utterance" (Pons 2004: 50). Finally, *implicatures* are assumptions arrived at inferentially by combining the derived explicatures with the contextual information accessible by a hearer when he is processing an utterance[24].

The concept of *context* in RT is *cognitive* and *dynamic*. It comprises information obtained from previous utterances or the environment and any assumption entertained in short or long-term memory; and it is not given *a priori*, but chosen during utterance interpretation: "relevance is given and the context functions as a variable" (Moeschler 1989: 121). Hence, when confronted with an ostensive stimulus, the reader activates certain information in his search for relevance, which, as a principle, constrains the selection of only those contextual elements needed to arrive to a communicated assumption (cf. Reboul & Moeschler 1998: 49) and, as a result, to obtain the largest contextual effects.

[23] With the dichotomous distinction between "what is said" and "what is communicated", Grice drew a clear boundary between the meaning of the code and utterance-meaning derived inferentially, and, subsequently, between the scope of semantics and of pragmatics. In contrast, for RT "explicit content is much more inferential and much more worthy of pragmatic investigation than Grice envisaged" (Sperber & Wilson 1995: 183).

[24] Taken together, for RT "the only linguistic-semantic notion in play is that of the schematic logical form which is the output of context-immune linguistic decoding" (Carston 2004: 649-650).

The explanatory power of the concept of relevance defined "as a property of inputs to cognitive processes" (Sperber & Noveck 2004: 5) stems, thus, from its status as a principle, and this has repercussions for explaining the dynamics of linguistic communication. A speaker cannot rule out the principle of relevance, nor pursue its fulfilment. Similarly, hearers cannot try to intentionally determine the relevance of an utterance:

> As defined within the framework of Relevance Theory, communication is not contractual: no legal nor interactional contract lies at the origin of the decision of how to manage an ostensively communicated piece of information. Only a cognitive constrain (the presumption of optimal relevance) ensures how communication is regulated. (Moeschler 1989: 135)

1.2. *Coherence, discourse processing and relevance*

The notion of relevance is also managed in some coherence approaches to communication. Coherence is treated as a function of an utterance and its host discourse[25] (Moeschler 1989: 109) in virtue of a "relevance requirement"[26] (Giora 1985a, 1985b, 1997, 1998), understood as "*relatedness* to a discourse topic"[27] (Giora 1985a, 1985b, 1997; see also van Dijk 1977). Relevance is not assumed to be the sole principle governing communication; instead, it is coherence considerations that "constrain communication and play a major role in *discourse* structuring and understanding" (Giora 1997: 31, emphasis is mine). Modelling the interpretive process implies attributing a key role to *discourse well-formedness*, which is dependent on several rules (Giora 1997: 22-23, but see also Giora 1985a):

[25] By contrast, in Gricean pragmatics relevance takes on the status of a function of the individual (the utterer) and the context (Moeschler 1989: 109).
[26] "(…) a discourse segment is coherent *iff* its various propositions are either related to a discourse topic, preferably mentioned and placed in the beginning of the discourse, or marked as digressing from relevance (…)" (Giora 1998: 80).
[27] Giora develops an interesting concept of discourse topic (DT) anchored in the claims of Cognitive Linguistics. A discourse topic "represents the redundancy structure of the set. It is thus clear that the DT is the least informative message in the text which, at the same time, retains maximal connectedness with various propositions in the text. Like the prototype or schema member of a category, it is a representation of what all or most of the members share. It is in this sense what we can call a generalization" (Giora 1985b: 128).

- It must conform to the *Relevance Requirement*: propositions are related to a discourse-topic proposition.
- It must conform to the *Graded Informativeness Condition*: in relation to the discourse topic, a proposition is deemed to be not less or to be more informative than the previous proposition in relation to the discourse topic[28].
- If a discourse deviates from *a* and/or *b*, such deviation will be explicitly marked by devices such as *by the way* or *after all*.

The discourse topic is thus the baseline for the cognitive well-formedness of discourses, which are structural entities and display a certain unity; they are more than collections of utterances and the spans of text they consist of are more than the sum of their parts. Discourses exhibit a micro and a macro-structure, the former concerning the connection between sentences and propositions, and the latter concerning the characterization of discourses as a whole (Kintsch & van Dijk 1978: 365).

For cognitively-grounded approaches to coherence (Sanders et al. 1992, 1993; Sanders & Noordman 2000; Sanders & Spooren 2001; Sanders & Pander Maat 2006), coherence is a fundamental *property of discourses* consisting in a series of dynamically constructed and cognitively plausible—interpretable—mental representations (Sanders & Spooren 2001: 5) arrived at by relating the different text units based on their linguistic signals (Sanders & Pander Maat 2006: 592-593). Hearers engage in processing with the purpose of retrieving the coherence relations holding between text spans and the organizational structure of the discourse (cf. Saussure 2007), both being essential to understand it (Knott & Sanders 1998). In cognitively-oriented coherence paradigms, thus, the focus lies "on the description of the internal properties of discourse" (Moeschler 1986-87, 1989: 137). In this sense, language users end up with a mental representation of a *discourse*, which is characterized by showing *connectedness* explained as a concept of a cognitive nature in terms of (both referential and relational) coherence (Givón 2005). Language users communicate by means of and represent *texts*, and recovering the

[28] From the perspective of Text Grammar, this rule coincides with the notion of thematic progression as an indicator of discourse cohesion (cf. for instance Casado Velarde 1993).

speaker's intended meaning equals to achieving *a coherent representation of the text*[29] through which an individual communicates:

> (…) there is a producer who has a cognitive representation of what she intends to communicate; this is formulated in a linguistic code, called the text, and this text is decoded by the interpreter who can be said to understand a text once he has made a coherent representation of it. This view fits theories that describe the link between the structure of a text as a linguistic object, its cognitive representation and the processes of text production and understanding. (Sanders & Spooren 2001: 2)

Coherence is a feature of the mental representation derived *from* the text instead of an intrinsic feature of the text itself (idem: 5) and coherence relations model how propositions of a text are integrated into "a larger whole" (Knott & Sanders 1998). Linguistic communication is thus explained by linking mental processes to text structures. The question arises, however, as to whether the search for coherence in the structure of discourses is the actual purpose of human communication or if, instead, discursive structures should be better treated as "an artefact elaborated by the analyst" (Saussure 2007: 153), since discourses are about *meanings* rather than about *structures* (idem). Reconstructing the thoughts of a hearer "is not mediated by any kind of structural object such as text or discourse (…)" (Blakemore 2002: 157). It is not the structure of texts or their coherence signals, but the presumption of optimal relevance of linguistic stimuli and the available mental representations what leads interlocutors to engage in communication (Sperber & Wilson 1995 [1986]; Sperber & Noveck 2004) in their search for contextual effects. To sum up, in verbal interaction, speakers and hearers are driven by the search for *meaning construction*: "(…) the hearer/reader can spontaneously form hypotheses regarding the meaning of a discourse, but he/she does not naturally end-up with hypotheses regarding the structure of the discourse" (Saussure 2007: 153). In sum, the "apparent internal structure [of discourses] is a consequence of other phenomena intrinsic to human communication" (Portolés 2007: 108; see also Wilson 1998; Blakemore 2002)[30].

[29] Sanders & Spooren (2001) highlight the under-specification of the term "text representation".
[30] As concerns discourse markers, coherence-based approaches consider them linguistic devices that allow the connection of text spans and as hints for structures and for rhetorical relations (Mann & Thompson

1.3. *Modeling discourse processing*

Despite posing some challenges as to the ultimate goal of a linguistic exchange, coherence-based models provide a good basis to analyze discourses as formal objects and as the "products" of human thinking and the vehicles of human communication (cf. Pons Bordería 2018; Loureda et al. 2019). Coherence perspectives lie at the source of a number of models of discourse processing and comprehension, among others, the Construction-Integration Model, the Structure-Building Model, the Resonance Model, the Event-Indexing Model, the Causal Network Model, the Constructionist Theory and the Landscape Model (see McNamara & Magliano 2009). They exhibit common features (McNamara & Magliano 2009: 302 ff.):

- They part mostly from the study of **written text** but assume that their proposals can be applied to information of any kind, including that stemming from different modes.
- They understand comprehension as a process that takes place by understanding words and sentences and their relations, a stage preceded by word-decoding and parsing. By contrast, RT does not assume a sequential handling of syntactic, semantic and pragmatic information during utterance comprehension, but assumes that all processes take place in parallel (Sperber & Wilson 1998; Carston 2002b; Recanati 2004; Saussure 2005a, 2005b; Escandell Vidal 2014).
- Word decoding and parsing are taken to be low-level processes. High-level processes comprise information integration and inferencing.
- They assume a **resultative** concept of inference. Inferences are understood as mental processes by which individuals connect information provided in the text, i.e., explicitly stated information (Parodi 2014), "information in the environment" (McNamara & Magliano 2009: 302) and implicit information (previous fragments of a text, world knowledge…).

1988; Taboada 2006). From a functionalist perspective, Schiffrin considers discourse markers as linguistic expressions marking "units of behavior" (1994: 41; see also Blakemore 2002: 153).

A number of linguistic phenomena are currently explained and empirically approached from the viewpoint of these models. In relation to comprehension and processing of discourse relations, one of the most widespread models is Kintsch's *Construction-Integration Model* (CI model, Kintsch 1988, 1998). Kintsch's theory is psychological in nature and thus "concerned with the mental processes involved in acts of [verbal] comprehension" (Kintsch 1998: 3) and builds on previous theories of discourse comprehension (Kintsch & van Dijk 1978; van Dijk & Kintsch 1983). In the CI model, text structure is one of the determinants of how comprehension occurs, and achieving a coherent representation of a text or discourse defines its comprehension: "understanding always occurs in the context of the previous text" (Kintsch 1994: 732).

The CI suggests that complete discourse comprehension is achieved in two stages and is guided by the goals of the reader in his purpose to build a coherent model:

(i) A *construction* stage takes place initially. It is conceived as a bottom-up process during which propositions are rapidly constructed from words and sentences. To that purpose, entertained knowledge is activated independently of whether it is contextually relevant or not. A series of construction rules operate at this stage: rules for the construction of propositions, rules for interconnecting the propositions in a network, rules for the activation of knowledge and rules for constructing inferences (Kintsch 1998: 96-98).

(ii) During the subsequent *integration* stage, the propositions and networks of propositions constructed by context-free activations occurred during the first stage are now inserted in a context. It is a process of spreading activation at whose end contextually irrelevant propositions are suppressed and only those concepts and ideas connected to many others remain activated (Kintsch 1994)[31].

[31] Language users undergo these two comprehension stages in the process of text representation, which is assumed to encompass three levels:

(i) The level of the *surface structure*, which refers to the representation of words and syntax and is assumed to have little or no influence on comprehension (McNamara & Magliano 2009: 309).

(ii) The *textbase level*. The model assumes that texts are represented centrally at the level of propositions, understood as complete ideas consisting of predicates and arguments in the form PREDICATE (ARGUMENT, ARGUMENT). Propositions are taken to be connected only by argument overlap (*conceptual intersections*, see Giora 1985b:127-128), but not by events and actions (contrarily, the

The construction of propositions gives rise to the *microstructure* or local structure of the mental representation of a text. Its *macrostructure* concerns how the text is organized globally and corresponds to a hierarchy of propositions that reflects its *gist* (Kintsch 1994, 1998; McNamara & Magliano 2009: 312)[32]. Importantly, constructing the macrostructure involves three types of inferential processes aimed at *reducing* the amount of information that remains active in the situation model of the text: deletion, generalization and construction of propositions (van Dijk & Kintsch 1983; Kintsch 1994). This operationalization of inferential processes within the CI model to select information relevant to a reader strongly reminds of the types of contextual or cognitive effects established by RT: derivation, modification of the degree of strength or elimination of a previously held assumption (Sperber & Wilson 1995 [1986]; Blakemore 2002; see above and § 2.2.1.1). However, whereas in the CI model these processes have the status of *rules*, for RT they are *per se* effects. From a CI perspective, when knowledge from long-term memory is retrieved and combined with information from the text to form a mental model, also irrelevant pieces of knowledge are activated initially too during construction, but rapidly deactivated at the integration stage (Kintsch 1994: 732-733). This view is at odds with the presupposition of optimal relevance of ostensive stimuli:

> If the identification of this relation [a coherence relation] is not necessary for the recovery of adequate contextual effect, then the effort required for its identification would be gratuitous, and would be ruled out by the second clause of the definition of optimal relevance (…). In other words, *in a relevance theoretic framework a coherence relation should never be computed unless its identification contributes to adequate contextual effects.* (Blakemore 2001: 106, emphasis is mine)

The claims just made highlight a further divergence between coherence and relevance approaches as to the role of context in a communicative act. Relevance Theory (and in general pragmatic approaches, "utterance approaches", cf. Saussure 2007) takes as a starting point the radical context-dependency of utterance-meaning recovery, where only

Event-Indexing model [Zwaan & Radvansky 1998] assumes that discourse constituents are related by means of events and actions, and not by argument overlap [McNamara & Magliano 2009: 323; Magliano, Zwaan et al. 1999]). It contains, thus, semantic information extracted from the text.

(iii) Finally, the *situation model* comprises connections between ideas within the text and ideas from the text and prior knowledge. It therefore depicts the reader's interpretation of the text.

[32] As McNamara and Magliano (2009: 311) point out, the micro and the macrostructure of a text representation coincide "if the text ideas are ordered serially", which, however, is seldom the case.

the very initial decoding stage aimed at deriving the logical form of an utterance, devoid of any truth-conditional, situation specific value, can be claimed to be context-free ("context-immune", cf. Carston 2004: 649-650; Recanati 2004). As soon as propositions are to be constructed, contextual information comes into play. By contrast, in discourse approaches, interpretation—understood as mentally reconstructing and representing the global structure of the text—is comparatively more largely constrained by pieces of text: "readers respond to certain cues in the text that tell them which portions of the text are likely to be important (…)" (Kintsch 1994: 733). This claim can hardly be reconciled with the idea that the *ultima ratio* of communication is to recover the speaker's mental representation conveyed in an utterance rather than recreating coherent discourses.

The fact that constraints beyond text-related factors come into play very early in utterance processing can be illustrated by resorting to the notion of *factual assumption*. Factual assumptions are mental representations, true descriptions of the world that a language user acquires when he is exposed to new ostensive stimuli (Sperber & Wilson 1995[1986]: 74). Four sources contribute to acquiring factual assumptions: "perception, linguistic decoding, assumptions and assumption schemas stored in memory, and deduction." (idem: 81). Within cognitive psychology, *assumption schemata* play an important role to explain how context is accessed in terms of the relation between humans and their environment (Yus Ramos 2003: 191-192). They are basically schemata, scripts and plans (Minsky 1975; Schank & Abelson 1977) guiding hearers towards the re-construction of a communicated assumption from the moment they start processing:

> Schema theories, in contrast [to the CI model], assume that the schemata function as a control structure that ensures the context-sensitive operation of the construction rules in the first place. Thus, they do not need a subsequent integration process. However, the construction process itself becomes much more complex because context sensitivity is required. (Kintsch 1994: 732).

Schemata are rich-feature constructs composed by the knowledge about the stereotypical structures and the particular context of situations, objects or actions that provide background information to the reader. Thus, they act as guides and constraints in the construction of factual assumptions, which are then organized in sets, combined with long-term memory-stored assumptions and subject to inferential processes to generate contextual effects. Schemata help interpret new situations and carry out inferences to fill possible gaps in discourse. Specifically, they constrain the information that could potentially be invoked in a particular communicative exchange to situation-specific information (Bezuidenhout 2017: 105). Resorting to extra-linguistic factors beyond texts and structures is thus essential to recover meanings with which the human mind can further operate.

Just as the human mind resorts to encyclopaedic knowledge like assumptions schemata to build mental representations that serve as inputs for inferential processes, natural languages dispose of mechanisms that function as algorithms and help a hearer carry out computations in his aim to recover an assumption communicated by a speaker. Such mechanisms are embodied as a feature of some linguistic items: procedural meaning. They will be dealt with in the next two chapters.

1.4. *Conclusion and hypotheses$_1$*

So far, the notion of verbal communication managed in this work has been outlined and allows for a first formulation of hypotheses:

Study 1
Phenomenon under study
Processing marked causal versus counter-argumentative relations (+ *por tanto* vs. + *sin embargo*)
Background
• *Por tanto* and *sin embargo* are associated to different contextual effects (contextual implications vs deletion of a contextual assumption).
Hypothesis$_1$
• Causality and counter-argumentation will be processed differently.

Table 2. Study 1: Conclusion and hypotheses$_1$

Study 2
Phenomenon under study
Processing of explicit versus implicit causal relations (+ *por tanto* vs. – *por tanto*)
Background
• Communication is an ostensive-inferential process: utterances are conveyed by a speaker and processed by a hearer under the assumption that they are optimally relevant. • The human mind is an efficient information-processing device, geared towards recovering the maximum of information (= contextual effects) to the least possible effort. • In explicit causal relations (+ *por tanto*) more information is provided than in implicit causal relations (- *por tanto*).
Hypothesis$_1$
• Implicit causal relations will be globally less effortful than explicit causal relations.

Table 3. Study 2: Conclusion and hypotheses$_1$

Study 3 and Study 4
Phenomena under study
Study 3: • Processing plausible versus implausible causal relations (+ *por tanto* + plausible vs. + *por tanto* vs. – plausible) **Study 4:** • Processing plausible versus implausible counter-argumentative relations (+*sin embargo* + plausible vs. + *sin embargo* – plausible)
Background
• Contextual access will be disrupted in implausible causal utterances, but readers will try to recover an assumption in their search for relevance.
Hypothesis$_1$
• Implausible utterances will lead to more effortful processing than plausible utterances.

Table 4. Study 3 and Study 4: Conclusion and hypotheses$_1$

At this stage no specific hypotheses can be made about potentially different outcomes for the participant groups of the study. The hypotheses just set out shall be refined further after chapter 3. Final hypotheses will be provided at the end of chapter 4.

2. Procedural instructions and conceptual representations: discourse markers as guides for utterance interpretation

The previous chapter offered an outline of how the meaning of utterances is recovered by combining decoding and inferencing: as a cognitive process, communication is about a hearer exposed to an ostensive stimulus from which he tries to reconstruct a mental representation as close as possible to the representation that the speaker wanted to make manifest to him when he uttered his message. The focus of this study being linguistic communication and, specifically, the contribution of connectives to the interpretation of utterances, the interaction between mental representations and the linguistic material that gives rise to such representations should be more closely looked at.

2.1. *Concepts and instructions*

Blakemore's seminal work *Semantic Constraints on Relevance* in 1987 set the basis for relevance-theoretical approaches to linguistic communication to consider that utterances consist of linguistic expressions that designate concepts or states that can be mentally represented, and expressions aimed at guiding interlocutors as how to manipulate concepts and that, importantly, cannot be brought to consciousness (Wilson & Sperber 1993; Wilson 2011). For instance, in (3):

(3) *Andrea y Juan ofrecen clases excelentes. Por tanto, tienen muchos alumnos.*
'Andrea and Juan offer excellent lectures. Therefore, they have a lot of students.,

verbs like *offer* and *have*, adjectives like *excellent* or substantives like *lectures* and *students* are associated with concepts with a denotation, which map onto mental representations in the language of thought. By contrast, the causal-consecutive connective *por tanto* ('therefore') deploys a series of instructions as to the computations that concepts have to undergo for a hearer to arrive to a communicated assumption. The first group of words correspond to linguistic material with *conceptual meaning*, while the second group of words have *procedural meaning* (Blakemore 1987, 2000, 2002; Portolés 2001[1998]; Sasamoto & Wilson 2016).

The rationale behind the existence of elements that activate concepts and expressions that activate instructions is cognitively grounded and can be anchored in the effort-effect oriented view of communication by RT. The distinction, thus, reflects some of the pillars of the relevantistic paradigm:

1. Utterances are linguistically underdetermined: if communicated assumptions are arrived at not only by encoding, but also by means of inference, it seems logical to expect that languages have expressions—procedural instructions—that help interlocutors guide each other during a communicative exchange in their purpose to convey and recover a communicated assumption.
2. When interpreting utterances, individuals are driven by a search for optimal relevance, thus trying to achieve maximal (contextual) effects to a minimum of (cognitive) effort: if procedural meaning constrains the interpretive process of utterance processing by pointing at the most relevant context in a given communicative situation, it can be expected to have an effort-reducing while effect-maximizing impact for an individual confronted with an ostensive stimulus.

While procedural meaning is about computations and maps onto mental processes (as opposed to the mental representations that undergo them), it is linguistically encoded and hence should be ascribed to the *semantics* of a language (Blakemore 1987, 1989; Leonetti & Escandell Vidal 2004; Curcó 2011; Escandell Vidal et al. 2011; Wilson 2011) and not to pragmatics (Bezuidenhout 2004). Processing any linguistic item with procedural meaning requires *decoding* on the part of the language user in order for its computational effects, which are the ones actually affecting (primary or secondary) pragmatic processes, to unfold. In (3) above, thus, *por tanto* instructs the reader to process its host utterance (*tienen muchos alumnos*) as a consequence of what has been previously stated, but the hearer's adequate execution of the instruction encoded in *por tanto* does not lie on pragmatic processes, as does the presupposition of optimal relevance that the uttered material carries; rather, the ability of an individual to execute the instruction of the connective starts by grasping its actual semantics, by capturing its specific contents, which "must be learned through exposure to a specific language" (Curcó 2011: 49) and is thus part of the declarative knowledge of a user (his linguistic competence), and not of his pragmatic abilities. Hence, as linguistic devices, connectives, which encode instructions that operate on the inferential stages of utterance interpretation, map onto an individual's linguistic competence and not on his language performance system. Procedural meanings are, thus, "natural language triggers as arbitrary as any other langue encoding" (idem: 46) and, as such, they belong to the semantics of natural languages.

When a language user decodes a procedural expression and grasps its processing instruction, its effects on inferences are deployed and operate on different phases of the interpretive process of utterances[33]:

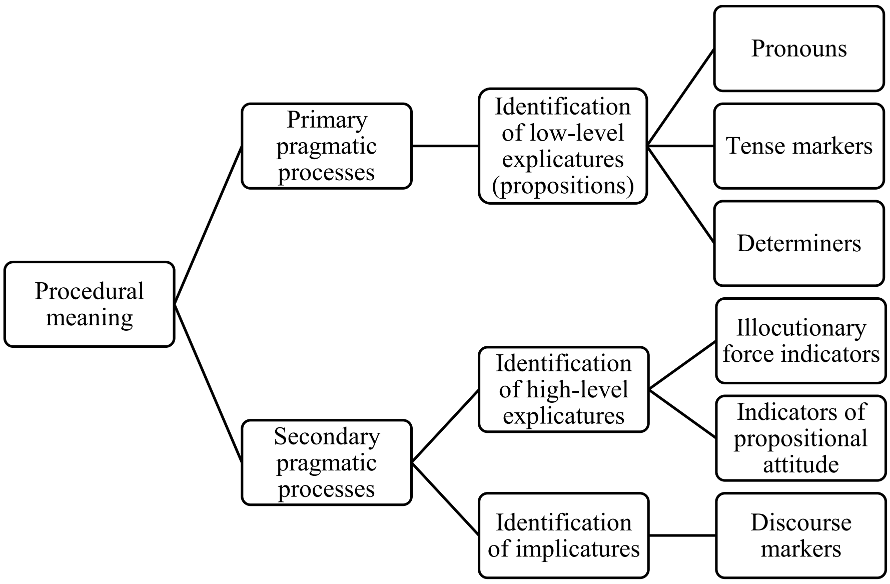

Figure 1. Levels of operation of procedural meaning devices (adapted from Leonetti & Escandell Vidal 2004; Escandell Vidal 2014, 2017; cf. also Recanati 1995, 2004; Nicolle 2015)

The fact that procedural meaning can interact with conceptual expressions and affect various levels of meaning raises the question as to whether those levels are associated with different elements of linguistic structure (Leonetti & Escandell Vidal 2004: 1728-

[33] Other than procedural meaning devices, there are linguistic expressions that also encode instructions. These, however, operate on semantic processes and are directed to indicate structural dependencies (Escandell Vidal 2014:136-137).

1729). Studies carried out specially during the last two decades have shown that the notion of procedural meaning may not be restricted to the realm where it originated as a research object, that is, to the field of discourse markers as studied by Blakemore (1987). Instead, as depicted in Figure 1[34], the notion of procedural meaning has also laid the foundations for a comprehensive account of the semantics of a number of other components of linguistic meaning:

> The notion of procedural meaning thus turned out to be more complex than had been assumed in earlier views. This added complexity has, however, some advantages: the number of phenomena that can be encompassed under this label is now larger than before and, at the same time, the generalisations that are obtained are more significant and contribute both to a better understanding of linguistic facts and to a more economic development of the theory (Escandell Vidal et al. 2011: XXI)

2.1.1. Co-occurrence of procedural and conceptual meaning in a linguistic expression

The depicted increasing complexity of procedural meaning as a construct and the profusion of studies on the topic have also risen awareness about the possibility that procedural and conceptual meaning concur within a single linguistic expression (for proposals on this line, Wilson & Sperber 1993; Nicolle 1997, 1998; Wilson 2011, 2016; Moeschler 2016, among others).

Early studies (Rouchota 1990)[35] and more recent works on procedural meaning (Moeschler 2016[36]) remark this possibility. Further proposals as to residual traits of conceptual meaning in connectives as carriers of procedural instructions come also from diachronic research (Traugott & Dasher 1993; Nicolle 1998, 2015; Portolés 2001 [1998]; Murillo 2010: 267-270; Borreguero 2018, among many others). Research on the paths of

[34] For a comprehensive overview on recent developments on procedural meaning beyond discourse markers, see Escandell Vidal et al. 2011 and Sasamoto & Wilson 2016.

[35] The adversative conjunction *but* is, for instance, considered by Blakemore (1989) and Rouchota (1990) as encoding both instructions and concepts either in its contrast use (Blakemore) or in all of its uses, both contrast and denial of expectation (Rouchota). The underlying claim is that *but* contributes to the truth-conditional meaning of utterances because *and* is part of its meaning. See, however, Blakemore 1987: 125-144 for a previous use-independent interpretation of *but* in purely non-truth-conditional terms.

[36] In a study on French *et* ('and') and *parce que* ('because'), Moeschler (2016) considers that the encyclopaedic entry used to represent conceptual-meaning words is replaced by a relational entry in the case of connectives, which "makes it possible to assign conceptual meaning to concepts that have no denotation" (p. 127).

directionality in semantic change agrees in that conceptual items can develop procedural meaning over time and point out that in such development concepts and procedures co-exist: “if a contentful [lexeme] L acquires procedural meaning, it will usually do so via a polysemy that is both contentful and procedural” (Traugott & Dasher 1993: 40). Or, as Nicolle (2015: 141) notes:

> (…) a newly grammaticalized construction with procedural semantics may at first be a mixed conceptual-procedural expression. Procedural semantic content will always be recovered since it constrains the inferential processing, which an addressee would perform in any case, thereby reducing processing effort, whereas conceptual semantic concept will only be recovered if the addressee fails to derive adequate cognitive effects from the procedural information alone (…)

As for procedural meanings acting at levels others than implicatures, for instance personal pronouns have been treated as instances of truth-conditional procedural meanings (Wilson & Sperber 1993), i.e., as items encoding instructions but contributing to recover the propositional content of utterances. A personal pronoun like English *she*, for instance, would encode a computational meaning instructing the hearer to look for a highly accessible referent and a conceptual content restricting the kind of referent stored in his memory that he has been instructed to look for, namely, a female (Escandell Vidal 2017: 86-87).

Particularly challenging in this respect is the question as to whether the construction of *ad hoc* concepts, that is, pragmatic adjustment (the narrowing or loosening of the semantics of a linguistic expression, see Carston 2002a) carried out by hearers on conceptual words during utterance interpretation is a reflection of the confluence of conceptual and procedural meanings in lexical words, in the sense that a certain lexical item acts as a *trigger* or instruction for activating only certain knowledge stored in the encyclopaedic entry of the concept, which strongly resembles the triggering role ascribed to procedures. On the one hand, this approach goes along with RT’s view of the underspecification of language—words are “merely ‘pointers to’ the speakers meaning” (Wilson 2011: 15)—and with its distancing “from the ‘literal first’ hypothesis, according to which the encoded (‘literal’) meaning is the first to be tested and is abandoned only if it fails to satisfy the expectations of relevance” (idem). On the other hand, RT already provides heuristic mechanisms as to which a hearer will in any case seek to recover the meaning$_{NN}$ of a concept that leads to an optimal interpretation (Curcó 2011; Carston 2016; Escandell Vidal 2017). In this sense, an attribution of procedural meaning to lexical words does not seem to be of any added value to the dynamics of utterance interpretation:

> Schematic meanings do not seem to play any role in comprehension; they are forced to become more and more attenuated in response to new uses/senses of the word. So it may be that we need to move to an apparently even more extreme position according to which lexical 'meaning' consists in nothing more than a pointer, a connection or gateway to a space of conceptual information from which the addressee is to access or construct the relevant (intended) concept. (Carston 2016: 165[37]).

The above does not mean, however, that a procedural and conceptual meaning cannot concur in a single item. Rather, it permits us to explain the interaction between conceptual and procedural semantics as an asymmetrical one, asymmetry being one of the most salient features of procedural meaning (Leonetti & Escandell Vidal 2004; Escandell Vidal & Leonetti 2011; Escandell Vidal 2017) and leading to reject the existence of really hybrid words (Escandell Vidal 2017) or "truly 'mixed conceptual-procedural' expressions in natural languages" (Saussure 2011: 58).

In the next section, the features of procedural meaning in general are outlined and subsequently applied to discourse markers and, specifically, to connectives as semantic constraints on inferences. To that purpose, the functional class 'discourse marker' will be approached in procedural terms and special attention will be paid to their contribution to bring about contextual effects.

2.1.2. Features of procedural meaning

General principles of the heuristics of communication can explain the co-existence of conceptual and procedural meaning in a single expression while a rather restrictive notion of procedural semantics is maintained, thus improving the predictive and generalization power of the concept (Escandell Vidal 2017). If devices with procedural meaning encode computations as how to manipulate linguistic expressions that give access to conceptual

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[37] Carston does not opt for this position in her paper, but seeks to open a discussion on the issue of words potentially being carriers of procedural meaning.

representations, concepts and procedures are both part of the semantics of a language. They are not, however, at the same level:

> (...) the conceptual information is always hierarchically dependent. Conceptual attributes can specify input and output conditions for the algorithm to operate, but **they always fall under the scope of the core operator**, not the other way around. In addition, conceptual attributes occurring as parameters in an algorithm appear in the computational layer, not in the conceptual layer (…) (Escandell Vidal 2017: 87, our emphasis)

2.1.2.1. *Asymmetry*

The above makes manifest the *asymmetrical character* of concepts and procedures: the latter always act upon the former, instructions always prevail and must be necessarily executed[38]. Procedures can be thus thought of as algorithms accessible by the cognitive processing systems and operating on conceptual representations "by placing specific constraints on various pragmatic processes (…)" (Escandell Vidal 2017: 83). Hence, when co-existing in one expression[39], conceptual content merely feeds the algorithm as "a parameter specifying a function" (idem: 87). As a result, it is not the semantic system which processes them, as in the case of lexical categories, but the systems in charge of processing computations. In other words, while lexical items susceptible to be analyzed in purely conceptual terms can be accessed by consciousness and represented mentally, the meaning of procedural items is "bracketed" (Curcó 2011: 43) in the sense that their rules are executed but need not be figured out by an individual[40]. Thus, apparent representational contents in an expression that carries procedures are "embedded under the dependence of the procedure itself" (Saussure 2011: 58).

[38] In relation to the procedural meaning of verb tenses, Moeschler (2005, 2016; cf. also Grisot & Moeschler 2014) expands the hierarchy between information sources that come into play during utterance interpretation and separates conceptual from contextual information ("information derived from contextual assumptions, Moeschler 2016: 129). As a result, contextual information > procedural information > conceptual information.

[39] The asymmetric relation of conceptual and procedural meaning is also sustained in a certain manner within the realm of diachronic analysis. For instance, for those admitting the co-existence of conceptual and procedural information along the grammaticalization path of a given construction, "[p]rocedural semantic content will always be recovered (…), whereas conceptual semantic content will only be recovered if the addressee fails to derive adequate cognitive effects from the procedural information alone." (Nicolle 1997: 141; see also § 2.1.1.).

[40] As Curcó points out (2011: 43), some metaknowledge of procedural representations may be entertained by language users. However, it cannot be equated to the kind of knowledge activated in their minds when confronted with conceptual expressions.

2.1.2.2. *Non-accessibility to consciousness*

The asymmetry of procedural meaning as a trigger for mental operations in respect to conceptual content as an "activator" of mental representations is also related to how the meaning of procedural devices and conceptual expressions is represented in the mind. Linguistic material of a conceptual nature consists of three kinds of sets of information that make up the meaning it is associated with in our minds (see Wilson & Sperber 1993):

(i) A *lexical entry* corresponding to the phonological and morphological features of a concept.
(ii) A *logical entry* corresponding to the (deductive) interferential rules and the definition of the word that encodes the concept.
(iii) An *encyclopaedic entry* containing all the information associated to a given concept coming from multiple sources that characterizes such concept.

By contrast, procedural-meaning devices are considered to lack an encyclopaedic entry[41]: they do not have "a repository of general knowledge (in the form of conceptual representations) about the object/property/activity in the world it [the concept] denotes" (Carston 2016: 155). Procedural-meaning expressions are, thus, non-accessible to introspection[42]. In an utterance like (4):

(4) *Andrea y Juan ofrecen clases excelentes. Por tanto, tienen muchos alumnos.*
'Andrea and Juan offer excellent lectures. Therefore/As a result, they have a lot of students.',

the word *alumno* ('student') would give access to a complete set of information:

[41] Other kinds of concepts can lack other kinds of entries. For instance, proper names cannot be associated with a lexical entry (see Pons Bordería 2004: 39-41 for an illustration hereof).
[42] The non-accessibility to consciousness of procedural-meaning expressions has been adduced as one of the reasons why they are particularly difficult to translate (Portolés 2002) and to be acquired by L2 speakers, whose production and comprehension of procedural devices has often been found to be non-nativelike despite being highly proficient in a foreign language (see chapter 4 and discussion and references therein).

Address: ALUMNO (‘student’)
- lexical entry: N, countable, singular
- logical entry: Person. // Person who studies/is engaged in some kind of course/…
- encyclopaedic entry: scripts and frames related to the word. Previous experiences as students. Types of students depending on the situation.;

while the consecutive connective *por tanto* has an empty encyclopaedic entry:

Address: POR TANTO (‘therefore’)
- lexical entry: adverbial phrase
- logical entry: p $\rightarrow$ q
- encyclopaedic entry: Ø

2.1.2.3. *Rigidity*

The absence of encyclopaedic data in the semantic information of procedural devices like discourse markers makes them non-accessible to consciousness and, at the same time, renders their instructions obligatorily executable for language users. As sets of instructions, the semantics of procedural devices are thought of as guiding utterance interpretation by constraining the access to possible contextual implications, by helping the language user select the pieces of encyclopaedic knowledge needed to recover the assumption intended by a speaker and by activating “more salient routes in the discourse comprehension process” (Moeschler 2016: 122). This asymmetrical interplay of procedural and conceptual meaning, i.e., the prevalence of the former, inherently rigid, over the latter, which, by contrast, is malleable and flexible, becomes even more manifest in cases of clashes between both kinds of meanings. In (5), the mismatch between the actual instruction to be executed in virtue of the meaning of the connective and the contextual assumptions supposedly entertained by the hearer would always be solved in favor of the instructional meaning of *por tanto*:

(5) #[43] *Andrea y Juan ofrecen clases aburridas. Por tanto, tienen muchos alumnos.*
‘Andrea and Juan offer boring lectures. Therefore/As a result, they have a lot of students.’,

If the consecutive meaning of *por tanto* is grasped by the addressee of (5) above, the first and the second discourse segments should be put in relation as being *argumentatively co-*

[43] Implausible, i.e., pragmatically odd utterances are marked along this work with the sign #.

oriented (Anscombre & Ducrot 1983; see also § 2.2.3.1 below), i.e., as being respectively the *premise* and the *conclusion* of the utterance. However, in the context of university lectures, the encyclopaedic knowledge associated with *boring* may activate scripts and frames that suggest a scarcely visited lecture rather than a crowded classroom, as communicated in (3). Despite the encyclopaedic knowledge entertained by the reader, the presence of *por tanto* forces a consecutive reading of the utterance and, thus, triggers his search for a context that permits him to accommodate the stated propositions (for example, that boring lectures require a less active involvement by students, so a lot of them prefer to take them instead of more enjoyable but more challenging lessons). The rigidity of procedural meaning also renders it very hard to explaining the misuse of a connective by adducing semantic or pragmatic reasons (Portolés 1995: 240, also for the example)[44]:

(6) *Cleopatra was Egyptian,* but *dolphins are not mustelids.*

The semantics of *but* inevitably triggers the search for a context in which the first and the second discourse member of the utterance can be inserted and be combined in a mental operation envisaged to eliminate some kind of previously held assumption (Blakemore 1987). In summary, both in (5) and (6), processing the discourse segments according to the instructions of the connective cannot be avoided by the reader. This evidences again the rigidity of procedures as to conceptual information and their asymmetrical relation.

The rigidity and asymmetry of procedural meaning as to concepts play a prominent role in the discussion of the hypotheses entertained in this work, particularly in relation to the studies dealing with clashes between conceptual and procedural meaning (see chapters 8 and 9).

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[44] A purely pragmatic reason could be grounded exclusively on the amount of effort needed to find a context to process the utterance. By extension, this explanation relies on the principle of relevance, by which the hearer presupposes that the speaker is providing him with the most relevant utterance to recover the intended message. As Moeschler (1989: 69) puts it:

> In order to be able to interpret an utterance with the structure P but Q, a hearer must have access to a context that allows him to access the conclusions R and non-R intended by the speaker. Violation of this principle by the speaker hinders the interpretative process of the hearer and entitles him to ask *Why do you say that?*, which stands for a lack of relevance in the speaker's utterance.

2.2. *Discourse markers as semantic constraints on inferences*

2.2.1. The semantics of discourse markers

Adopting a viewpoint of communication as an ostensive-inferential process results in attributing both the speaker *and* the hearer coordinated roles during linguistic communication. Guided by his search for relevance, a hearer will seek to choose a context to process the uttered linguistic material so that he obtains the highest contextual effects at the least processing effort. Speakers, in turn, may exploit the form of their utterances to constrain the hearer's choice of context while the latter tries to recover the communicated assumption. However, since linguistic material is merely a blueprint of what has been actually conveyed, inference is crucial for the success of communication. As a result, it is expected that languages have linguistic expressions used by speakers precisely to instruct readers on how to carry out the inferences needed to achieve a relevant interpretation of their utterances. As put forward in the previous section, it is *procedural-meaning* expressions that perform this function by imposing "constraints on the context in which the utterances containing them must be interpreted" (Blakemore 1987: 75). Among them are some whose particular function lies at ensuring correct context selection by the hearer at minimal processing effort. Those are discourse markers:[45]

[45] "Discourse marker" is but one of a number of terms used by the scientific community. The expression "discourse marker" was introduced by Schiffrin (1985) and is widely employed nowadays (Fraser 1990, 2009 as a subclass of pragmatic markers; Jucker & Ziv 1998; Martín Zorraquino & Portolés 1999; Schourup 1999; Portolés 2001[1998]; Taboada 2006; Cuenca 2007; Loureda & Acín 2010; Loureda & Aschenberg 2011, among many others); further terms used to describe the same or similar linguistic expressions are—to name but some major works that employ them—*discourse connectives* (Blakemore 1987; 1989; 2002; Sanders et al. 1992; Rouchota 1996), *pragmatic markers* (Fraser 1996, 2009; Aijmer & Simon-Vandenbergen 2006), *discourse particles* (Schourup 1985[1982]; Hansen 1996; 1998b; Fischer 2006; Briz et al. 2000-2018, among others) or *cue phrases* (Knott & Dale 1994; Knott & Sanders 1998; Taboada 2009). In the present work, the term "discourse marker" will be employed for several reasons. Firstly, we are dealing with linguistic expressions that operate ultimately upon discourses (as opposed to texts or sentences); secondly, some commonly used terms like "connectives" or "particles" are used in our conceptual framework to designate subclasses of discourse markers; finally, terminological issues will not be dealt with in depth in this study and have already been pointed out elsewhere (cf., for instance, Schourup 1999: 228-229; Fischer 2006; Pons Bordería 2008: 1413). As to the meaning of the terms listed above, it should be also noted that "even if two authors use the same term (…), their underlying assumptions do not necessarily coincide." (Pons Bordería 2008: 1413). By defining "discourse marker" at this stage we intend to delimit the conceptual framework with which we will operate throughout this work. A detailed review

> (…) invariable linguistic expressions that do not have a syntactic function in a clause predicate and that exhibit a coincident function within discourse: guiding, according to their morphosyntactic, semantic and pragmatic features, the inferential processes in communication (Portolés 2001 [1998]: 25-26; cf. also Martín Zorraquino & Portolés 1999: §63.1.2).

Discourse markers project their procedural meaning upon the role of both speaker and hearer in a communicative exchange. On the one hand, they optimize the relevance of an utterance by a speaker; on the other hand, they ensure that a hearer chooses the correct context to interpret it at a minimum cost in processing (Blakemore 1987: 123).

Thus, according to the parameters defined, the term 'discourse marker' should be reserved for linguistic expressions operating on secondary pragmatic processes, that is, guiding a hearer towards working out of high-level explicatures or implicatures of utterances, but not contributing to their propositional content.

This view of discourse markers and of their role in communication contrasts with text linguistics and coherence approaches (Halliday and Hasan 1976, Beaugrande/Dressler 1980; Mann & Thompson 1988; Sanders et al. 1992, 1993; Taboada & Mann 2006; Rysová & Rysová 2018, among others), according to which discourse markers or discourse connectives are linguistic expressions that can also enrich the logical form of utterances by providing, for example, temporal or spatial coordinates. In (7)

(7) *He had a shower. Then he took off to the airport.*

the connecting force of *then* is indisputable. However, *then* cannot be taken to constrain the inferential interpretation of the utterance, since it does not instruct the hearer as to how both discourse segments have to be processed in order for them to yield contextual effects. As a result, while the use of *then* generates a *connectedness* between the segments and narrows down the search for the adequate temporal value (Blakemore 2002: 177-178), it affects the propositional content of the utterance and, as a result, its logical form. Such discursive functions correspond to Blakemore's *type I coherence* "that arises when information made available by the interpretation of one segment of discourse is used in establishing the propositional content of the next" (1987: 112). By contrast, the effect of

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of the development of the term—also in Spanish, French and German—can be found in Blühdorn, Foolen & Loureda (2016: 11-16).

discourse markers is identified as *type II coherence*: the information derived from one discourse segment is used to derive the contextual effects of the next. In sum, discourse markers are expressions "used to indicate how the relevance of one discourse segment is dependent on another" (Blakemore 1987: 125), where *dependent* relates to the fact that two connected discourse segments generate contextual effects:

> either in virtue of the fact that the interpretation of the first may include propositions used in establishing the relevance of the second, or in virtue of the fact that a proposition conveyed by one is affected by the interpretation of the other. In either case we might say that the relevance of one is somehow *dependent* on the interpretation of the other. (Blakemore 1987: 122, original emphasis)

2.2.1.1. *Discourse markers and contextual effects*

The procedural semantics of discourse markers as operationalized by Relevance Theory in its beginnings lies at the basis of the categorization of discourse markers according to their role as constraints on the inferential processes of communication. Specifically, RT originally characterized discourse markers according to how they constrain the contextual effects of utterances, i.e., to how they contribute to improve a hearer's representation of the world (see particularly Sperber & Wilson 1995 [1986] and Blakemore 1987, 1989, 1992: 138-142). Accordingly, the use of discourse markers can be linked or even be thought of as encoding three kinds of contextual or cognitive effects[46]:

a) the **strengthening** of an assumption already entertained by the hearer. For instance, in an utterance whose discourse segments are linked by means of *moreover* or its approximate Spanish equivalent *además*, the premise introduced by the connective generates a mental representation—in form of the conclusion of an argument—that reinforces an assumption—with the status of a conclusion as well—derived from the preceding segment. Hence, in Anna's intervention in (8), the first discourse segment (S1) could already lead to a conclusion of the sort "You are going to like him", which is strengthened by the use of a second argument introduced by *moreover*:

[46] Fraser (2009: 300-301) classifies DMs in three functional classes: contrastive, elaborative and inferential markers, and points out that his categorization corresponds in general terms to the taxonomy of contextual effects put forward in the frame of RT (p. 301, footnote 6).

(8) [Anna is talking to Sarah about her boyfriend, who Sarah hasn't met yet]
ANNA: *He is a very intelligent man. Moreover, he is very funny.*

In this manner, Anna explicitly (conventionally) instructs Sarah to combine the propositions derived from both segments (S1 + S2) and to process them as two premises that act together within the same argumentative operation and lead towards the same conclusion ("You are going to like him").

b) the **contradiction and elimination** of an assumption stored in the hearer's mind. That is the case of, for instance, counter-argumentative connectives such as English *nevertheless* or *however*, or the roughly equivalent *sin embargo* in Spanish. They are used to connect two segments of discourse:

(9) ANNA: *He is a very intelligent man. However, he doesn't really carry conversations forward.*

This time, in the same communicative context of the previous example, S1 in Anna's utterance would lead Sarah to inferentially concluding that she will like Anna's boyfriend. That conclusion is nevertheless eliminated by means of the proposition stated in S2 introduced by *however*. Importantly, when contradictions arise during information processing, the weakest of the competing assumption is the one which is abandoned (Sperber and Wilson 1995[1986]). Thus, if later on Sarah engages in a pleasant conversation with Anna's boyfriend, she might abandon the conclusion initially obtained previously from Anna's utterance in (9)[47].

[47] According to Sperber and Wilson, assumptions gained by perception are usually very strong, whereas those derived from other's utterances depend on our trust on the speaker. Sperber & Wilson (1995[1986]:121) identify three types of situations in which assumptions do not lead to contextual effects and, thus, would be irrelevant 1) when new information is processed but does not root onto any other information in the context; 2) when the new information is already in the context but does not lead to improve it (it duplicates old information); 3) when some new piece of information contradicts another but is not strong enough for the old information to be abandoned.

c) the **combination of old and new information** to derive an implicated conclusion, as discourse markers like Spanish *por tanto* or English *therefore* do:

(10) *Sebastian can ski for seven hours. Therefore*, *he is in good shape.* (adapted and translated from Montolío 1998: 110)

Here, the conclusion stated in S2 (that Sebastian is in good shape) is derived by inferentially combining the new assumptions recovered from S1 with other particular contextual assumptions entertained and thus provided by the hearer himself (for instance, world knowledge). In other words, by instructing the reader to process S2 as a conclusion, *therefore* constrains the relevance of S1 by marking that it has to be processed as a premise for deducing the assumption in S2 (which, again, holds the status of a contextual implication).

2.2.1.2. *Discourse markers as activators of inferential routes*

A categorization of discourse markers according to the contextual effects they generate, however, was soon considered too limited by scholars working within the framework of relevance theory mainly due to two reasons:

- Firstly, describing the differences in the semantics and the use of discourse markers which are functionally near, that is, discourse markers leading *to the same contextual effects*, yet not interchangeable (Portolés 2001 [1998]; Blakemore 2002: 94 ff.; Murillo 2010, among others), is not feasible.
- Secondly, some discourse markers do not lead to contextual effects, but activate specific contextual assumptions that license a relevant interpretation of the utterance in which they occur, while constraining others. For instance, both *nevertheless* and *however* are discourse connectives leading to an elimination of an assumption. They are, however, not interchangeable in all contexts. In (11), slightly adapted from Blakemore (2002: 127):

(11) [A mother's response to her hungry child's request for food]
There's a pizza in the fridge, however, / *?nevertheless, leave some for tomorrow*.,

the context only licenses the use of *however*. The use of *nevertheless* requires a context in which its host segment ("leave some [pizza] for tomorrow") is an answer to an (explicit or implicit) question of the speaker (Blakemore 2002). This is not the case in (11).

Along the same line, as to discourse markers that do not activate contextual effects like *well*, Blakemore (2002) exposes how in an utterance like

(12) *Do you remember Tom? Well, he's just bought a motorbike.*,

the discourse marker *well* does not constrain processing by producing a specific contextual effect, but rather serves as a guarantee of the relevance of the utterance.

These conceptual developments resulted in a widening of the notion of procedural meaning originally managed by RT. According to the refined proposal, "procedural information cannot be limited to information about cognitive effects" (Blakemore 2002: 128). In this sense, discourse markers can a) activate inferential routes linked to a specific contextual effect; b) activate contextual assumptions for achieving an intended interpretation from a given utterance; c) do both (Blakemore 2002: 128 ff.).

Blakemore's expansion of her original notion of the procedural meaning of discourse markers laid the foundations for subsequent elaborations that provide more fine-grained explanations of the effects of discourse markers for utterance interpretation:

> [Discourse markers] guide an interpreter during utterance processing by making conspicuous the inner structure of utterances and their relation to previous and subsequent utterances, to the context of the interaction and to background knowledge and desires, so that the speaker's communicative intention can be accessed. (Blühdorn et al. 2016: 23-24)

2.2.2. Discourse markers as monosemous expressions

The description and categorization of discourse markers in terms of the contextual effects they bring about underscores the monosemic approach of RT to their semantics: "a unitary 'core' meaning, usually of a highly abstract and schematic nature" is isolated "from which all uses of a given item can be derived."[48] (Hansen 1998a: 239). In effect, connectives are

[48] As conversational implicatures according to Grice or as contextual meanings according to RT.

defined by RT in procedural terms, which apply "both to a basic instruction common to all their uses and to more specific instructions which can deploy in their different uses." (Reboul & Moeschler 1998: 93). While the basic instruction of a discourse marker necessarily unfolds when the discourse marker is processed, potential usage-specific instructions are facultative[49] (cf. Luscher 1994 and Reboul & Moeschler 1998 for an illustration of the semantics of some discourse markers from this viewpoint).

A monosemic approach has been also adopted within coherence-based and cognitive approaches to discourse. Van Dijk (1979: 449) takes a core connective meaning as the starting point. This core meaning materializes in either "semantic uses" or "pragmatic uses" when pragmatic elaboration takes place. For her part, Sweetser (1990) distinguishes three types of causal relations conveyed by discourse markers. The core causal meaning of the connective takes on a more specific sense depending on the domains in which the connective occurs: the content, the epistemic or the speech-act domain. According to this taxonomy, *because* marks a content relation in (13a), an epistemic relation in (13b), and a relation in the speech-act domain in (13c):

(13) a) *He moved because he loved her.*
b) *He loved her, because he moved.*
c) *Hurry up, because we are going to miss the train!*

Compared to the strict maximalism of homosemy approaches, semantic minimalism does not lead to a large multiplication of the senses of a certain discourse marker in the lexicon. Semantic minismalism would be thus in line with Grice's *Modified Occam's Razor*: senses must not be multiplied beyond necessity (Grice 1989; cf. also Recanati 1994; Portolés 2004: 325-327). It also ties in better with a pragmatic view of communication, since sense effects materialize in the context in virtue of pragmatic principles. The

[49] Such hierarchical organization of the instructions encoded in a procedural device strongly reminds of the controversy about the fact put forward in some theoretical works that procedural and conceptual meanings may concur in a procedural-meaning expression (Fraser 2009; Wilson 2011, 2016, among others). Against this view it is argued that any trace of conceptual meaning potentially identifiable in an expression with procedural-meaning is subordinated to the computational meaning and encapsulated or bracketed, thus never getting to actually deploy as it would deploy in a conceptual-meaning expression (Curcó 2011; Escandell Vidal & Leonetti 2011; Saussure 2011; Escandell Vidal 2017).

following example of the Spanish discourse-structuring marker *por un lado… por otro (lado)…* ('on one hand… on the other hand') illustrates the monosemic approach.

Por un lado… por otro lado… presents the linked discourse segments "as a series organized in two parts of the same comment on a topic" (*DPDE*, *s.v. por un lado… por otro (lado)*):

(14) *I am going to take a few days off.* Por un lado, *I have been working a lot.* Por el otro lado*, I haven't been out of town for over six months.*

Nonetheless, in certain contexts, the discourse marker expresses contrast, as in (15):

(15) *Should I take a holiday?* Por un lado*, I have been working a lot.* Por el otro lado, *I shouldn't spend any extra money now.*

Its contrastive meaning should however be considered as an *effect sense* of its nuclear discourse-structuring meaning, since it unfolds according to its linguistic environment.

Minimalist views have been critized for its limited explanatory power, with monosemy approaches being rendered insufficient to obtain fine-grained descriptions of the semantics[50] of discourse markers within the same paradigm and sharing a number of semantic features. This is broadly solved by developments of the notion of procedural meaning where an additional context-constraining function is attributed to discourse markers (Blakemore 2002: 94-98, 117; see also § 2.2.1.2).

An alternative proposal within monosemy comes from the hand of analytical eclecticism to procedural-meaning devices and has been put forward most notably in Romance linguistics (Portolés 1998 [2001]; Portolés 2004; Domínguez García 2005; Murillo 2010). Analytical eclecticism calls for a combination of the theoretical claims of Argumentation Theory (Ducrot 1980; Anscombre & Ducrot 1983; Ducrot 1993) of a semantic nature, with cognitively grounded postulates of Relevance Theory. By doing so, eclectic proposals aim at developing a more powerful explanatory scheme for the meaning and discursive behavior of discourse markers. Two tenets lie at its basis. Firstly, the fact that, due to the inherently eclectic nature of discourse markers (they can stem

[50] Following Coseriu, Casado Velarde (1993: 12 and 36-38) speaks of "textual functions".

from a variety of grammatical classes, belong to different grammatical categories and do not form a grammatical but a functional category) their semantics is best addressed by combining claims from different theories. Secondly, that language-specific considerations should not be left aside to determine the semantics of discourse markers. Doing otherwise would mean putting the processing instructions of discourse markers on a par with the processing instructions performed by the mind. However, “the discourse markers available in different languages are not equivalent, as would be expected, were they perfect correlates of general mental processes undergone by our species” (Portolés 2004: 331).

2.2.3. *Discourse markers as argumentative devices: an excursus on Argumentation Theory*

At the basis of the postulates of Anscombre and Ducrot’s Argumentation Theory (AT) lie particularly two observations:

a) Some meanings cannot be covered by traditional truth-conditional approaches—among them, the argumentative potential of utterances. For that reason, approaching utterance meaning requires a pragmatic view.
b) Non-truth conditional meaning is, however, encoded and, therefore, a part of semantics (cf. Iten 1999).

2.2.3.1. *The* pragmatique integrée

AT, thus, seeks to determine how linguistic material is used to convey an argumentative orientation[51] to an utterance and how such material conditions utterance comprehension; in other words, it integrates pragmatics *into* semantics and gives rise to a *pragmatique intégrée*, a non-truth conditional or instructional semantics (Iten 1999: 43 ff.; Reboul & Moeschler 1998: 30-31; Portolés 2001[1998]: 75-76).

[51] “The conclusion is the utterance—whether explicit or implicit—for which the argument is used. The argumentative orientation is the direction assigned to the sentence” (Moeschler & Reboul 1994: 315).

Like Relevance Theory, Argumentation Theory (AT) also resorts to the notion of *instructions*, which has undergone substantial changes as AT developed. In its beginnings, AT used the term "instructions" to explain the *sense of utterance tokens* (*sens des énoncés*), that is, of linguistic material with historical charachteristics, and, thus, situated in a space and a time (Anscombre & Ducrot 1983: 84; Moeschler & Reboul 1994: 22). The sense of an utterance is an observable fact (Iten 1999: 44) and opposes to *sentence signification* (*signification de la phrase*), where "sentence" refers to the deep structure of an utterance token. AT conceived of deep structures originally as bundles of instructions compelling a hearer to search for certain information in a discursive situation in his purpose to recover the sense intended by the utterer (Ducrot et al. 1980)[52]. In other words, "to know the signification of a deep structure (…) is to know what to do to interpret it". This view evolved with the publication of Anscombre and Ducrot's *L'argumentation dans la lange* in 1983 towards a view of deep structures in terms of contents (*contenus*) instead of instructions. From this new perspective, the signification of deep structure is disentagled by determining its asserted contents—i.e., factual and truth-conditional contents—and its presupposed contents—some of which are, importantly, argumentative. Argumentation is understood at this stage of AT not in traditional rethorical terms, but as an *act of arguing*[53], where linguistic structures condition the potential continuation of discourses, and, thus, the dynamics of discourses:

> An uttererer (*locuteur*) performs an act of arguing by presenting an utterance E_1 (or a bundle of utterances) as aiming at *making someone admit* another utterance (or a bundle of other utterances) E_2. Our thesis is that, in languages, there are constraints that condition such presentation. An utterance E_1 can be presented as an argument licensing an utterance E_2 not only if E_1 provides reasons to admit E_2. It is also required that the linguistic structure of E_1 satisfies certain conditions for it to be eligible to constitute an argument for E_2 in a given discourse (Anscombre & Ducrot 1983: 8).

At this stage also the concepts of *argumentative orientation* and *argumentative strength* undergo revision within the framework. Previously, both concepts had been defined in

[52] For clarity, we will stick to the oppositions *sentence* or *deep structure* vs. *utterance* and *meaning* vs. *sense* along the next paragraphs, as managed by AT.
[53] See Anscombre & Ducrot (1983: 163ff.) and Iten (1999: 55) for the distinction between *argumentation* and *act of arguing*.

terms of the conclusions that arguments lead to. In their revised version, Anscombre and Ducrot define argumentative orientation and argumentative strength by referring additionally to the *properties* attributable to the objects at issue. In this sense, two utterances display the same argumentative orientation if they attribute the same property to the same object, as in (16):

(16) *John and Mary have a big family. They need a big flat.*,

where *p* and *q* both share the property of "bigness"; or they can be argumentatively anti-oriented if they do not share the property under question, as in (17), where *p* refers to "smallness" and *q* refers to "bigness"[54]:

(17) *John and Mary have a small family, but they need a big flat.*

Similarly, two utterances are argumentatively stronger or weaker in relation to each other depending on the relative degree of the property that both utterances exhibit and, thus, share, as in (18a) versus (18b):

(18) a) *John and Mary have a big family. They need a big flat.*,
b) *John and Mary have a huge family. They need a big flat.*

While both utterances share their argumentative orientation—the premises taken as arguments (the first discourse segments) potentially co-orient in both cases towards the same conclusion made explicit in the second segment—, example (18b) is argumentatively stronger within the scale of "bigness". Hence, for AT (18b) would support more strongly the conclusion that a big flat is needed.

2.2.3.2. *Constraints on conclusions: the* opérateurs argumentatifs

At this stage, the question arises as to how certain arguments license certain conclusions instead of others. In principle, an utterance like (19):

[54] In an analysis purely performed in terms of conclusions, the logical form of (19) would be $p \rightarrow q$; while (20) would be defined as $p \rightarrow r$ & $q \rightarrow \neg r$.

(19) *It is 20 degrees warm.*

may—at least at the sentence-level—condition the dynamics of a discourse in a way that both “the temperature is high” or “the temperature is low” could be drawn as conclusions. Anscombre and Ducrot observe that languages have certain linguistic expressions that modify the argumentative potentialities of the utterances in which they occur, thus licensing only certain conclusions. In other words, languages have argumentative operators (*opérateurs argumentatifs*, Anscombre & Ducrot 1983; Ducrot 1983) that function as constraints on argumentative conclusions:

(20) *It is barely 20 degrees warm. Let’s stay at home.*
(21) *It is nearly 20 degrees warm. Let’s go for a walk.*

While the operator *barely* in (20) seems to orient discourse dynamics towards the conclusion “Let’s stay at home”, the operator *nearly* in (21) would rather lead towards a conclusion such as “Let’s go for a walk”.

The concept of argumentative operator, however, does not yet provide AT with an instrumentarium to explain why—even in presence of operators—some conclusions are favored in a given discourse while others are blocked. Additionally, the approach just depicted for an argument-constraining function of operators rapidly encounters a number of counter-examples, since given certain contexts conclusions can be evoked opposite to those which the theory would predict. If Ann says (22) to Daniel, who dislikes warm temperatures, a conclusion like “Let us go for a walk” becomes acceptable. Similarly, if Ann and Daniel were on a ski trip, by uttering (23) Ann would be rather trying to convince Daniel to stay in:

(22) *It is barely 20 degrees warm. Let’s go for a walk.*
(23) *It is nearly 20 degrees warm. Let’s stay in the hotel.*

2.2.3.3. *From arguments to conclusion: the* topos

These interrogants act as a trigger for the development in AT of the concept of *topos* (Anscombre & Ducrot 1986; Anscombre 1989; Ducrot 1989; Anscombre 1995, among others). As a result, "argumentative relations abandon their binary nature: the move from the utterance-argument to the utterance-conclusion is done now by evoking a general principle called 'topos'" (García Negroni 2005: 7):

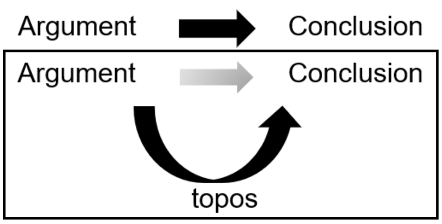

Figure 2. Topos-based move from arguments to conclusions

Topoi[55] are "the general principles admitted within a linguistic community that serve as the basis for an act of arguing" (Moeschler & Reboul 1994: 317). They are mental constructs that warrant the transition from an argument to a conclusion. *Topoi* are general[56] because their validity in discourse is constant, i.e., non-dependent on a specific discourse situation; *topoi* are also gradable: they relate two scalar properties. In (24):

(24) *Anna has a lot of work. She can't sleep at night.*,

the *topos* governing the argumentative content of the utterance can be formulated as "working a lot leads to sleep problems", where the gradualness of the properties "work" and "sleep problems" can be operationalized in the topical form <+work, +sleep problems>. At the same time, the *topos* convened by the topical form underlying (24)

[55] The concept of *topos* has arosen particular controversy outside and within theory proponents. Anscombre and Ducrot themselves see the concept as partly extralinguistic, which breaks their strictly semantic or, more exactly, "pragmatic-within-semantics" view of language.

[56] Ducrot (1989) considers *topoi* as universal constructs, hence this property. From their universal nature follows that *topoi* are seldom made explicit (Moeschler & Reboul 1994: 317). If a speaker infers that their interlocutor is not in possession of a given *topos*, he can make it linguistically explicit. The explicated *topos* then becomes the *argumentative basis* of an intervention. In this manner, the speaker can be sure that the *topos* is shared with the interlocutor, who will now be able to derive the conclusions intended by him (Fuentes Rodríguez & Alcaide Lara 2007: 38).

automatically conveys its opposite as well (García Negroni 2005: 8; Portolés 2007: 239): “the less someone works, the less sleep problems he has”, which would corrrespond to the topical form <-work, -sleep problems>. Given a certain discourse context or community, and since *topoi* do not rely upon logical relations (García Negroni 2005: 8), two further possibilities can arise: <+work, -sleep problems> and <-work, +sleep problems>. These can be the case in (25) and (26):

(25) *Anna has a lot of work. She sleeps through the night*.[57]
<+work, -sleep problems>

(26) *Anna barely has any work. She cant’s sleep at night.*
<-work, +sleep problems>

For AT, *topoi*—or *topical fields*, introduced in a later stadium to refer to bundles of *topoi*—are triggered by the linguistic expressions of utterances, by their words[58]. Linguistic predicates are considered “bundles of topoi” (Iten 1999: 61). Contrarily to previous stages of the theory, linguistic predicates are not described in terms of instructions nor considered to convey asserted contents anymore. AT is progressively dropping a view of semantics in truth-conditional and non-truth conditional terms to adopt a stance of radical argumentativism (Anscombre & Ducrot 1989; Ducrot 1993), based exclusively in non-truth conditional meaning: language does not describe states of affairs but refers to (bundles of) *topoi*, which constrain discourse dynamics, thus favoring certain argumentative concatenations in discourse to the detriment of others[59].

Argumentative operators and connectives are determinant for the incorporation and the development of the notion of *topos* to the analytical framework of AT. In a sort

[57] In principle, a number of other (different) *topoi* could in turn underlie this utterance: a) <+exhaustion, -sleep problems>: Anna comes home exhausted from so much work and *therefore* sleeps through; and b) Anna finally has a demanding job and can thus sleep very well: <+self-fulfillment, -sleep problems>.

[58] However, while languages are determinant for the structure of *topoi*, they do not determine their content (Anscombre 1989).

[59] On the contrary, Relevance Theory preserves the distinction between truth-conditional and non-truth-conditional semantics. Grounded on their cognitive stance, RT considers languages as conveyors of mental representations of states of affairs, and it is mental representations—and not linguistic expressions themselves—which can be assigned a truth-conditional value. From this follows the most salient difference between the approaches of RT and AT in its radical-argumentativism stage: AT fully abandons the notion of truth-conditionality: “[linguistic semantics] shall only aim at destroying the incessantly re-emerging illusion that discourse conveys information about things.” (Ducrot 1993: 98).

of feedback loop, in turn, the concept of *topos* leads to changes in the definition of argumentative operators and connectives in argumentative-theoretical terms. While AT had defined them so far as constraints on the argumentative potential of phrases, the turn towards radical argumentativism and the subsequent prominence acquired by the notion of *topos* imply that connectives and operators must now be looked at as constraints *on the interpretive routes* that relate arguments and conclusions (Reboul & Moeschler 1998; García Negroni 2005). Argumentative operators restrict the *topoi* underlying a specific relation between an argument and conclusion in a given discourse situation, licensing certain interpretations and blocking others:

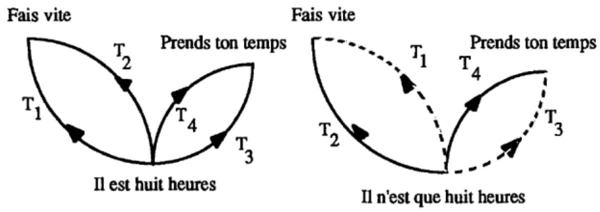

Figure 3. Argumentative operators as constraints on interpretive routes (Anscombre 1989: 25)

In the right diagram, introducing the operator *ne que* ('just', 'only', 'not even', i.e., 'It is *just* eight') limits the potential interpretive routes in discourse and leads the hearer towards a more constrained argumentative conclusion.

2.2.3.4. *Argumentation Theory and the semantics of discourse markers*

The description of argumentative operators and connectives as constraints on inferential routes reminds of the notion of procedural meaning in the framework of Relevance Theory, specifically of the notion of procedural meaning as attributed to discourse markers[60] and can be associated too to the relevance-based tenet of the underspecification of languages.

Both AT and RT argue in favor of a monosemic approach to the semantics of connectives. AT considers connectives and argumentative operators—the *mots de discours* (Ducrot et al. 1980)—as constraints for selecting an interpretive route associated

[60] Most of so-called "argumentative operators" in AT would not be described—at least not exclusively—in instructional and non-truth conditional terms by RT. Adverbs like *nearly* or *barely* would in fact be analyzed relevance-theoretically as conveying conceptual and, thus, truth-conditional information.

with a *topos* that inform a hearer about the semantic relation holding between the utterance segments that they connect or upon which they project their meaning[61]. This is precisely the core meaning that any monosemous description of linguistic semantics consists of. Linguistic expressions, in this sense, have an "instructional semantics". Their signification is made up of instructions intended for a hearer to look for certain information in a given discourse situation and to combine pieces of information in a given fashion to recover the sense intended by the utterer (Ducrot 1980: 12). In effect, the signification of linguistic expressions is but a mere indication for language users as to how to fill gaps to retrieve the sense of an utterance and as to the range of possibilities of how to fill them (Ducrot 1980: 18). For instance, the signification of the counter-argumentative connective *but* is associated with variables that must be *contextually* enriched by the hearer. In virtue of its instructional semantics, *but* links two discourse segments *X* and *Y* that point towards two semantic entities *P* and *Q*:

(27) *The weather is nice, but Anna is coming today.*

Once the semantic contents *P* and *Q* are derived from *X* and *Y*, an argumentative conclusion *r* must be inferred from *P*, while, in virtue of the constraints imposed by *but*, a conclusion *non-r* must be inferred from *Q*. Importantly, a value must be attributed to *r* and *non-r* that is in line with the value attributed in the previous steps to *P* and *Q*[62]. This must be performed under consideration of the discourse situation, since "interpreting an utterance means applying the instruction or instructions that permit the interpreter to achieve the sentence meaning that renders accessible the utterance sense" (Reboul & Moeschler 1998: 81) and is, thus, context dependent:

[61] "Connectives connect semantically and pragmatically a discourse member with a previous one, or with an easily accessible contextual assumption" (Portolés 2001: 139); argumentative operators, in turn, "condition the discursive potentialities of the discourse member in which they occur or which they affect, but *without* relating it with a previous member" (idem: 143, emphasis is mine).

[62] This is a case of indirect argumentation (Moeschler 1989; Portolés 1995). *But* (like *pero*, its Spanish equivalent) can be used both for indirect and direct argumentation. As illustrated in the example, in indirect argumentation, *pero* does not introduce a segment directly communicating a conclusion opposed to that inferred from the first segment. Instead, the contradictory conclusion must be inferred from the second discourse segment, considering its relation to the first (Portolés 1995: 244).

(28) *The weather is nice, but Anna is coming today.*

$$\begin{array}{ccc} P & \rightarrow & Q \\ \downarrow & & \downarrow \\ r & & \textit{non-r} \\ \text{I am going out} & & \text{I am not going out [I will stay home and wait for Anna]} \end{array}$$

In addition, the instructional meaning of *but* instructs the hearer to keep the second argument as decisive for the continuation of discourse, and this instruction is immanent for the connective. This can be illustrated with further examples of different uses of *but*:

(29) *That is not coffee, but tea.*
(30) *He's got brown eyes, but he is quite tall.*

In a nutshell, Argumentation Theory, similarly to RT, proposes a monosemous approach to connectives, in which a nuclear meaning is isolated and different discourse situation-dependent usages or effect senses (*effets de sens*) result from contextual enrichment processes, in line with the principle of *Grice's Razor* (Grice 1989: 47-49).

The explanatory power of AT for the semantics of discourse markers, the "words of discourse", becomes nuanced, however, as notions arise within the theory that transcend purely linguistic considerations and appeal progressively more to extralinguistic factors involved in verbal communication, chiefly to world knowledge. The concepts of "topoi" and "bundles of topoi" as originally proposed are abandoned as a result (García Negroni 2005: 21)[63]. In effect, phenomena concerning verbal communication manifest in language, but originate in the mental states of the participants of a communicative exchange. In communication understood as an ostensive-inferential process, not only the code and the inferential processes triggered by it should be managed as variables potentially affecting the outcome of a verbal interaction. Human beings' ability to represent their interlocutors' mental states—their metarrepresentational

[63] This leads to formulating alternative theoretical proposals for linguistic argumentation, most notably the Theory of Stereotypes (*Théorie des Stéréotypes*, Anscombre 2001) and the Theory of Semantic Blocks (*Théorie des Blocs Semantics*, Carel 1992; Carel & Ducrot 2005), which can be considered "a radicalization of the principles that always guided AT" (García Negroni 2005: 21).

abilities—and their intention to communicate must also feed cognitive explanations of verbal communication. It is as to this aspects where AT and RT prominently diverge.

The conceptual apparatus of AT as a semantic theory is specially powerful to perform fine-grained semasiological analyses of the meaning of a given discourse marker, since some of its notions—most notably *strength* and *argumentative orientation*[64]—enable detailed descriptions of the instructions of a discourse marker (see Portolés 1995, 2001[1998], 2004; Murillo 2010); it also allows the researcher to identify the specific instructional semantics of different discourse markers belonging to the same paradigm. Hence, combining theoretical and methodological claims from AT and RT to approach the study of discourse markers can give rise to powerful claims that shed light on the functioning of linguistic phenomena only partially described so far. Eventually, pursuing the path of theoretical and methodological eclecticism may lead to the incorporation of analytical tools developed in other frameworks. For the purpose of the present study, however, RT has the conceptual apparatus needed to approach the phenomena under study comprehensively. It provides the tools to define the connectives key to this work (*por tanto* and *sin embargo*) as carriers of procedural instructions,in terms of the effect they bring about upon readers' mind-stored representations; to model the interaction of connectives with contextual assumptions and communicative competence; and to give account of the interplay of cognition and languages.

2.3. *Beyond procedural meaning: morphological and syntactic features of discourse markers*

Despite constituting an eclectic class, apart from their procedural meaning, discourse markers share a series of formal features. Morphological, syntactic, grammatical and

[64] Portolés (1998) adds the concept of *argumentative sufficiency* to characterize discourse elements not pointing towards a certain conclusion, but introducing an argument as sufficient or insufficient to reach such conclusion.

orthotypographic features help narrow down the notion of DMs and distinguish them from other linguistic expressions.[65]

A description of DMs in morphological terms requires an *a priori* clarification: DMs do not stem from or pertain to a sole word class. Instead, they form a functional class. As such, DMs share their discursive role as guides and constraints of inferential processes (Martín Zorraquino & Portolés 1999; Portolés 2001[1998]; Fraser 2009). DMs function extra-sententially[66] and do not modify the propositional content of utterances (idem).

DMs stem from nouns (*hombre* [lit. 'man']), noun phrases (*en cambio* 'by contrast', *sin embargo* 'however', *al fin y al cabo* 'after all'), adjectives (*bueno* 'well' [lit. 'good']), adverbs (*well*), verbs (*mira* 'look', *oye* 'listen'), combinations of adverbs and prepositions (*therefore*) or of two adverbs (*however*), prepositions (*hasta* 'even'), prepositional phrases (*on the contrary*, *on the other hand*, *in other words*…), etc[67]. Along their grammaticalization process, DMs have progressively abandoned their conceptual meaning to take up a procedural meaning. This is related to their position within utterances. While conceptual-meaning words are usually integrated within the utterance and—even when presented as parentheticals—modify the propositional content of utterances, DMs act at an extra-sentential, non-propositional level. These features have

[65] Comprehensive descriptions on the formal properties of DMs are provided in Martín Zorraquino 1998, 2010; Martín Zorraquino & Portolés 1999; Portolés 2001[1998]; Fischer 2006 or Llamas Saíz 2010. Some historiographic considerations of the treatment of discourse markers (discourse particles) as a class within the Spanish grammatical tradition can be read in Martín Zorraquino 1998: 19-26; Martín Zorraquino & Portolés 1999: 4055-4056; Pons 2001: 220-221; or Llamas Saíz 2010: 183-185. The online dictionary *Diccionario de Partículas Discursivas del Español* (DPDE, www.dpde.es) directed by Antonio Briz, Salvador Pons and José Portolés, defines, exemplifies and describes Spanish DMs, with some entries also available in other languages (most notably French, Italian and Portuguese). Borreguero Zuloaga and Loureda (2013) and Portolés (2014) deal with the treatment of DMs in the *Nueva Gramática de la Lengua Española* (2009).

[66] Focus operators (*even*, *too*, *only*…) would be an exception to this feature, since they are syntactically integrated in the utterance (*Even John came to the party*). Borreguero Zuloaga and Loureda (2013: 199-200) remind that in such cases the four main criteria used to categorize an expression as a discourse marker—two semantic criteria, procedural meaning and non-truth conditionality; and two morphosyntactic criteria, invariability and extra-sentential use (Martín Zorraquino & Portolés 1999; Portolés 2014)—are arranged hierarchically. The two semantic criteria as well as invariability are taken as fundamental, while the syntactic criterion (exerting a sentential function) is not. "Thus, the sentential function exerted by a procedural-meaning expression is subordinated to its role as an inference-guiding device." (Borreguero Zuloaga & Loureda 2013: 199-200).

[67] For Fraser (2009: 303), DMs stem primarily from adverbials, conjunctions and prepositional phrases; he does not count expressions drawn from verbs (*look*, *hear*…) to the class of DMs.

formal reflections: a) DMs are usually dislocated from the sentence or the discourse segment in which they appear, either by intonational or—very often—orthographical means; and b) in general—except for conjunctions, which always appear in segment-initial position—they exhibit a great positional versatility[68]. In this sense, they contrast with the same formal elements with conceptual meaning:

(31) *I don't feel* well. *I think I'll go back to bed.*
(32) Well*, if you feel bad, go back to bed. / If you feel bad,* well*, go back to bed.*

Sometimes, position shifts of a DM bring about functional changes in the DM, most notably in the case of reformulation or conversational markers, while in other occasions position shifting is rather related to discourse-traditional or stylistic factors, as is the case of most connectives that exhibit positional versatility, for instance *sin embargo*[69], *therefore*, *however* (Briz & Pons Bordería 2010: 283).

While DMs do not constitute a grammatical class, they usually belong to invariable grammatical categories, as considered in traditional grammars, primarily interjections (*mira*, *anda*, *hombre…*), conjunctions (*and*, *but*) and adverbials (*therefore*, *además* 'moreover', *besides*, *por tanto*, *sin embargo*) (Llamas Saíz 2010: 186 and footnote 6; see also Portolés 2014).

As in (31) and (32), frequently the same expression co-exists in the language system with a discourse-marking and a non-discourse-marking function. In the latter use, as long as the word class allows for it, morphological inflection is possible. For instance, the Spanish causal-consecutive connective *por tanto* co-exists in a non-discourse marking use with *por* + *tanto/a/os/as* ('for' + 'much' 'many'), where the second component can vary in gender and number. In (33), the first utterance displays a non-marking (or non-procedural) use of the preposition *por* and the quantifier *tanto*. *Por* never varies, but *tanto*

[68] See Martín Zorraquino and Portolés (1999: 4062) for a detailed description of the syntactic distribution of DMs; see Briz and Pons Bordería (2010) for a study of the interrelation of discourse segmentation units, DM position and DM functions; see Nadal et al. (2016) and Nadal (2019) for experimental evidence on the influence of position shifts of the counter-argumentative connective *sin embargo* upon processing patterns.
[69] Nadal (2019) approaches experimentally the correlations between position shift and processing pattern with the Spanish counter-argumentative connective *sin embargo*; also from an experimental approach, Loureda and López Serena (2013) observe different processing patterns of utterances with pre- and post-focal *incluso* ('even') and attribute them to the fact that post-focal *incluso* adds a reformulation function to its focus-marking functions.

must be inflected to match the form of the subsequent nouns (*momentos*, masculine plural; *ocasiones*, feminine plural):

(33) *Brindó por tant**os** buen**os** momentos / por tant**as** buen**as** ocasiones que habían pasado juntos.*
‘He made a toast *to the so many* [PL., MASC.] good [PL., MASC.] moments [PL., MASC.] / *to the so many* [PL., FEM.] good [PL., FEM.] occasions [PL., FEM.] they had shared.’

By contrast, inflection is not possible when *por* + *tanto* act in discourse as an adverbial locution with a connective function[70]:

(34) *Han pasado muchos buenos momentos juntos.* Por tanto*, querrá hacer un brindis.*
‘They have shared a lot of good moments. *Por tanto*, he is going to feel like making a toast.’

A similar case is the Spanish interjection *hombre* ‘man’ functioning as a conversational DM, which in its non-marking usages admits a plural form:

(35) *Esos hombres se fueron sin avisar*
‘Those *men* left without a warning.’,

while this is not possible in its uses as a DM, where “it appeals politely to the interlocutor, either a man *or a woman*, to show alliance, agreement or complicity (…)” (*DPDE*, *s.v. hombre*[1], emphasis is mine):

(36) *Hombre, no me parece tan caro.*
‘*Hombre*, I don’t find it that expensive.’

Some DMs (very frequently stemming from verbs) constrain inferential processes but can still be subject to some variability, for instance the imperative form of the Spanish verb *mirar* ‘to look’ in its conversational uses:

[70] See § 3.1 for a detailed exposition of formal, diachronic and semantic considerations of *por tanto*.

(37) *Mira* [IMP., 2ND PERS. SING.] /*Mirad* [IMP., 2ND PERS. PL.], *estoy muy cansado de repetir siempre lo mismo.*
'Look, I am very tired of repeating the same all the time.'

In other cases, morphological inflection is used as a determining criterion to classify an expression as a discourse marker[71]—in whose case the expression is invariant—or rather as a formal linguistic resource that functions transphrastically to a certain degree but maintains its conceptual meaning partly or fully:

(38) *Han pasado muchos buenos momentos juntos. Por tanto, querrá hacer un brindis.*
'They have shared a lot of good moments. *Therefore*, he is going to feel like making a toast.'

versus

(39) *Han pasado muchos buenos momentos juntos. Por esa razón querrá hacer un brindis.*
'They have shared a lot of good moments. *For that reason,* he is going to feel like making a toast.'

In the second segment, *for that reason* can be used in plural both in Spanish and English:

(40) *They have shared a lot of good moments and have been roommates for over a decade. For those reasons, he is going to feel like making a toast.*,

and admits modifiers and objects: *for those and many other reasons*, *only for those reasons*, *for the reasons I just mentioned*; which is not possible for discourse markers: **therefore and for many other reasons*, **only therefore* (Martín Zorraquino & Portolés 1999: 4060; Llamas Saíz 2010: 190; Recio et al. 2018).

Other syntactic features of DMs comprise the fact that they cannot be subject to negation (*He was tired*. **Not therefore he was in a bad mood.*), neither—with the exception of adverbs—be linked by conjunctions (*He was tired. *But and moreover he was in a good mood*), nor be focalized by means of cleft constructions (**It was therefore*

[71] Fraser (2009: 301 ff.), by contrast, considers this property "incidental" or "non-definitional".

that he was in a bad mood) (Llamas Saíz 2010: 191-192); only exceptionally—more prominently, DMs which function as interjections or the conjunction *and*, for instance—are they syntactically autonomous and can constitute a speech turn (*I was out last night and I am feeling so bad! -*Therefore./*However.*) (idem: 192; Martín Zorraquino & Portolés 1999: 4068-4069); they have scope over lexical and syntagmatic categories of a very diverse nature: nouns or noun phrases, adjectives, verb phrases, prepositional phrases, complete sentences (cf. Martín Zorraquino & Portolés 1999: 4069-4070), or even several discourse segments, either prior or subsequent to the DM (Fraser 2009: 304-305); DMs cannot stand for the discourse member or the constituents under their scope when they are elided: *He stays at home when he's in a bad mood. But not for that reason. /*But not therefore* (Portolés 2001 [1998]: 64; Llamas Saíz 2010: 193); finally, DMs cannot be the object of a question: *He stayed home because he was tired. Why did he stay home?/*He was tired. Therefore, he stayed home. *Why did he stay home?* (Portolés 2001[1998]: 65).

2.4. *Categorizations of discourse markers*

The procedural semantics of discourse markers and their heterogeneous nature have led to a number of theoretical approaches to their analysis, but also to abundant classifications—at times substantially different from each other—. Prominent reasons for that are diverging classification criteria and the nature of the questions addressed.

Some classifications rely on the discursive functions of discourse markers, according to which DMs are employed to perform speech acts (Casado Velarde 1993, 1998; see also Portolés 2001[1998]: 135-137). A specific discourse marker can thus be ascribed to a number of different categories: paraphrasing, emphasizing, exemplifying…, which results in a polysemic approach to their semantics. Other taxonomies part from a core meaning of a specific DM which materializes in discourse in different ways giving rise to a number of *contextual senses* (Hansen 1998a; Martín Zorraquino & Portolés 1999;

Portolés 2001[1998])[72]. These views argue for a unitary meaning of specific DMs in the sense of *Grice's Razor* and usually describe DMs in terms of their processing instructions[73]. The different levels of discourse at which such instructions deploy give rise to the categories according to which DMs are grouped: a) information-structuring devices; b) connectives; c) reformulation markers; d) discourse operators; and e) interactive markers (Portolés 2001[1998]). Within Spanish linguistics, similar categorization criteria are applied in Briz (1998), Martín Zorraquino & Portolés (1999), Briz, Pons & Portolés (2008: Introduction) or Loureda & Acín (2010: 24). López Serena & Borreguero Zuloaga (2010) provide a categorization in terms of the levels of discourse in which the instructional semantics of DMs deploy and correlate them with the written and spoken conceptional variation of discourse.

Cognitively-oriented approaches to coherence (Sanders et al. 1992, 1993; cf. also Knott & Sanders 1998; Spooren & Sanders 2008) propose a taxonomy of coherence relations based on four salient dichotomic cognitive primitives: basic operation (causality or addition); source of coherence (semantic or pragmatic); order of the discourse segments (basic [$p \rightarrow q$ or p & q] or non-basic [$q \rightarrow p$]; and polarity (positive or negative). Discourse markers are subsequently defined by the categorical features they exhibit.

Considering communication as a cognitive process where inferences are decisive to interpret verbal stimuli allows us to suggest a classification of linguistic expressions as to their contribution to either semantic or pragmatic processes in utterance production and interpretation. This does not equal to say, however, that DMs form a single category (Blakemore 2002: 185). Instead, to define discourse markers, RT underscores the role of inference in utterance understanding and links the semantics of a specific connective to the cognitive effects that it triggers and/or to the way how it constrains the access to the context (Blakemore 1987, 2002; Recanati 2004; Escandell Vidal 2014, 2017).

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[72] Similarly, Sanders et al. (1992, 1993) argue as follows: "If each relation is thought of as a separate cognitive primitive, we must assume that in order to interpret a stretch of discourse, readers use their instant knowledge of all these relations (30? 100? 1000?) to determine its structure. It is far more attractive (…) to assume that readers understand a piece of discourse because a notion like EVIDENCE is composite. It consists of more elementary notions, such as causality, and readers make use of their knowledge of this limited set of basic notions to derive the appropriate coherence relation." (Knott & Sanders 1998: 140).

[73] Note, however, that Portolés (1998 [2001]) and Martín Zorraquino & Portolés (1999) incorporate the level of discourse into their analysis and definitions of DMs as well as some postulates of Argumentation Theory such as the notions of argumentative orientation or argumentative force.

3. Causality and counter-argumentation in discourse: *por tanto* and *sin embargo*

Within discourse markers, *por tanto* ('therefore') and *sin embargo* ('however') pertain to the category of linguistic expressions triggering inferential processes necessary to relate semantically and pragmatically the mental representations drawn from two discourse segments (Blakemore 1987, 2002; Martín Zorraquino & Portolés 1999: 4080). The new mental representations retrieved are linked to the cognitive effect they generate in the mind of the interlocutor, which, if communication succeeds, will correspond to a change in his state of mind. More specifically, it will match the change of state of mind intended by the speaker when he uttered his message.

3.1. Por tanto ('therefore')

3.1.1. The semantics of por tanto

Por tanto links semantically and pragmatically two discourse segments, an antecedent and a *consequens*:

(41) *Ana y Paula tienen mucho dinero. Por tanto, compran muchas joyas.*
Ana and Paula are very wealthy. *Por tanto*, they buy lots of jewelry pieces.

As a connective, *por tanto* triggers inferential processes that affect both discourse segments, so the mental representation that arises from processing the connected utterance is derived from both segments as a whole (Pons 1998; Portolés 2001[1998]). Specifically, *por tanto* introduces a proposition that constrains the relevance of the preceding segment, and crucially does so "by indicating that it is relevant as a premise for the deduction of the proposition [it] introduces" (Blakemore 1987: 84). In terms of cognitive effects, *por tanto* helps combine old (mentally stored) and new information to derive a mental representation with the form of an implicated conclusion.

According to this, a hearer exposed to utterance (41) above will process the first discourse segment guided by the search for relevance, albeit not knowing yet that the segment he is processing is the premise of the conclusion stated in the S2. The presence of the consecutive connective *por tanto* ensures that the relation established between both segments is indeed one of premise-conclusion: its procedural meaning instructs the speaker to treat the fact that Ana and Paula are very wealthy as the premise to deduce that they buy a lot of jewelry pieces. The notion of *deduction* is of importance here. *Por tanto* belongs to the set of connectives that introduce a consequence derived by means of reasoning (Martín Zorraquino & Portolés 1999: 4100-4101; *DPDE, s.v. por (lo) tanto*). This differentiates *por tanto* from other consecutive connectives introducing a consequence arisen from states of facts communicated in the first segment (e.g., Spanish *en consecuencia* 'as a consequence': *El desempleo ha aumentado en las zonas rurales. En consecuencia, se han adoptado medidas destinadas especialmente a esas regiones*. 'Unemployment has gone up in rural areas. *En consecuencia*, new measures have been taken aimed specifically at those areas.', cf. Martín Zorraquino & Portolés 1999: 4100 ff.). The fact that reasoning is involved in the derivation of the consequence expressed by the second discourse segment in an utterance linked by *por tanto* allows the order of the segments to be inverted (idem: 4101)[74]:

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[74] Herrero Ingelmo (2012: 19-20) reminds of the traditional distinction between reality-related causal relations (*de re*) and logical causal relations (*de dicto*), which differ in the degree of informativity of the consecutive proposition. Causal relations *de re* are less informative than causal relations *de dicto*, where "the logical consequence is given in the speaker's mind" (idem: 19). The distinction stems from Bello (1981[1872]) and was taken up again in the Spanish grammatical tradition by Lapesa (1978) and Marcos Marín (1979). Based on Bello, they propose further dichotomic classifications and distinguish between causes of what is uttered (*causales de la acción enunciada/del enunciado*) and causes for uttering the causal sentence at issue (*causales del acto enunciativo/de la enunciación*). The first type refers to the actual cause of an effect; the second type refers to the reason why a certain statement is uttered. Fuentes Rodríguez (1987: 148), partly relying on Marcos Marín's taxonomy, distinguishes three types of consecutive relations, also differing in their informativity degree: reality-related causal relations (A is a necessary condition for B. It has a very low informativity degree and is used almost exclusively in scientific argumentation); logical causality (B is a necessary consequence of A. These types of relations have a higher informative degree than the first type); and a third type of causal relations with the higher informative degree, where A is a sufficient condition for B and B is a possible consequence of A. These taxonomies can in principle be mapped onto Sweetser's (1990) distinction between content and epistemic relations, and ties in with classifications of causal discourse relations in terms of subjectivity (see e.g., Sanders & Spooren 2015; Sanders & Evers-Vermeul 2019).

(42) *Tienen un hotel muy bonito. Por tanto, tienen muchos clientes.*
‘They run a very nice hotel. *Por tanto*, they have many guests’
Cause → reasoned consequence

(43) *Tienen muchos clientes. Por tanto, tienen un hotel muy bonito.*
‘They have many guests. *Por tanto*, they run a very nice hotel’
Consequence (evidence) → reasoned claim

This is not possible when a consecutive connective like *en consecuencia* (‘as a consequence’) is used, which introduces a discourse segment as an effect or an objective outcome of the content of the preceding segment (*DPDE*, *s.v.* ‘en consecuencia’):

(44) *Tienen un hotel muy bonito. En consecuencia, tienen muchos clientes.*
‘They run a very nice hotel. *En consecuencia*, they have many guests’
Cause → direct consequence (effect)

(45) # *Tienen muchos clientes. En consecuencia, tienen un hotel muy bonito.*
‘They have many guests. En consecuencia, they run a very nice hotel’
Cause → direct consequence (effect)

In the experimental utterances that serve as stimuli in the present study, the discourse segments always hold a cause-related consequence relation.

3.1.2. Diachrony and formal features of por tanto

From a diachronic perspective, *por tanto* is more strongly grammaticalized connective that other connecting expressions of the causal-consecutive paradigm[75] (Herrero Ruiz de Loizaga 2003; cf. Recio et al. 2018 for an experimental study on processing patterns of causal relations marked with Spanish *por tanto* and the less grammaticalized connecting cues *por eso* and *por ello*, ‘that is why’; further experimental evidence is provided by Cuello Ramón (in preparation)).

[75] The lexical meaning of *tanto* cannot be traced in *por tanto*; by contrast, in *en consecuencia* or *por ende* it is possible to find some traces of the lexical meaning of the substantive (Pons Bordería 1998).

Por tanto is a medieval connective, first documented in the 13th century[76] (1240-1250) in the Castilian epic *Poem of Fernán González* and increases its vitality from the 15th century onwards. At present, *por (lo) tanto* is one of the most frequent Spanish grammaticalized causal connectives (García Izquierdo 1997; Herrero Ingelmo 2012: 159 ff.):

	until 1500	16th	17th	18th	19th	20th (CORDE)	20th (CREA)	20th (CORPES)	Total
por (lo) tanto	0	13	3	33	1,672	2,771	7,426	17,327	29,235
en consecuencia	0	47	102	256	557	1,268	6,379	6,079	14,888
por consiguiente	349	1,413	543	949	2,678	1,841	2,003	2,391	12,167

Table 5. Absolute frequencies for *por (lo) tanto*, *en consecuencia* and *por consiguiente* (Herrero Ingelmo (2012: 160), extended with data from the CORPES)

Formally, *por tanto* consists of the causal preposition *por*[77] and the pronoun *tanto*, whereby *tanto*'s meaning of identity anaphora conferred the sequence an anaphoric nature (Eberenz 2000). In the 15th century, *por tanto* already exhibits discursive uses. In the 16th century "*tanto* maintains its demonstrative value and its anaphoric capacity in many cases" (Herrero Ruiz de Loizaga 2003: 363). In the 17th century occurrences of a grammaticalized *por tanto* increase exponentially (see table 5) and the variant *por lo tanto* is consolidated. The sequence *por lo tanto* serves as evidence that *tanto* has been detached of its anaphoric and pronominal value, otherwise it would not be possible to explain the anteposition of the neuter pronoun *lo* (Herrero Ruiz de Loizaga 2003: 371)[78].

Concerning its suprasegmental features, *por tanto* has its own melodic contour, which detaches it prosodically from its host member. As a reflection thereof, in written discourse, *por tanto* is generally preceded by a comma, a semicolon or a period, and followed by a comma (or by a period or a semicolon if it is placed at the end of the segment). Such syntactic detachment allows for its great mobility: *por tanto* can occur in

[76] In a corpus analysis of consecutive connectives in romanced bibles, Garrido Sepúlveda (2017: 48) does not register any occurrence of *por tanto* in his corpus and only three cases in a subsequent extended search.
[77] Other phrases formed by *por* + an anaphoric expression (*por ello*, *por eso*) are already registered in the first Castilian texts (Borreguero Zuloaga 2018).
[78] As Herrero Ruiz de Loizaga (2003: 371) observes "one would not say **por lo eso*, **por lo ello*."

initial, medial or, less frequently, in final position within its host segment[79] (*DPDE*, *s.v. por (lo) tanto*; Fuentes Rodríguez 2009: 260):

(46) a) *Tienen un hotel muy bonito.* ***Por tanto,*** *tienen muchos clientes.*
b) *Tienen un hotel muy bonito. Tienen,* ***por tanto,*** *muchos clientes.*
c) *Tienen un hotel muy bonito. Tienen muchos clientes****, por tanto***.
'They run a very nice hotel. (*Por tanto*,) they have (, *por tanto*,) many guests (, *por tanto*).'

Further formal traits of *por tanto* correspond to those already dealt with for connectives and discourse markers in general (see § 2.3). As most connectives, *por tanto* does not admit modifiers (**por precisamente tanto* 'not precisely therefore'), cannot be the object of negation (**no por tanto* 'not therefore') and cannot be focused by means of cleft constructions (**Es por tanto que*… 'It is therefore that…') (see also Recio et al. 2018: 386-388).

3.1.3. *The semantic contribution of* por tanto *to utterance interpretation: an excursus to the processing of implicit and explicit causal relations*

One of the aims of the present study is exploring how the presence and absence of a procedural guide influence information processing, specifically the processing of two causally related discourse segments. Discourse relations signaled by a discourse marker will be referred to further on as "explicit relations" (47a); asyndetic discourse relations will be referred to as "implicit relations[80]" (47b):

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[79] For experimental evidence on the impact of position shifts of *por tanto* on processing see Narváez García (forthcoming).

[80] The expression *implicit causality* is also used in psycholinguistics to describe "the causal interpretation (…) that can be derived or projected from the meaning of some verbs" (Zunino 2017b: 295). In this study, by contrast, it will be used to refer to causal discourse relations which are not explicitly marked by a procedural guide, i.e., by a causal connective. The question arises, however, as to whether there is indeed a practical difference between both. For example, utterances like "Maria cut the fabric"—where the semantics of the verb does not carry a presupposition of causality—and "John praised her daughter" lead the reader to automatically search for a cause (either in a strict sense—*John praised her daughter* because *she had done such a good job at school*—or in a derived sense, if objectives and aims are understood as underspecifications of causes—*Maria cut the fabric* in order to *make a purse out of it*); but it is arguable whether the causal interpretation arises out of the lexical content of the verbs themselves (cf. Koornneef & Sanders 2013; for Spanish, Gozalo 2004 and Arroyo Hernández 2017), or from the tendency of the human

(47) a) *Tienen un hotel muy bonito. Por tanto, tienen muchos clientes.*
'They run a very nice hotel. Por tanto, they have many guests.'
b) *Tienen un hotel muy bonito. Ø Tienen muchos clientes.*
'They run a very nice hotel. Ø they have many guests.'

The phenomenon of implicitness and explicitness of discourse relations has been addressed theoretically and empirically. Within in theoretical linguistics, the topic has been approached from a grammatical viewpoint, particularly from syntax. Within empirical approaches, the use and the effects on processing and comprehension of explicitness versus implicitness in discourse relations has been on the focus of a number of observational studies (Carbonell Olivares 2005; Taboada 2006; Mann & Taboada 2007; Asr & Demberg 2012; Das & Taboada 2013; Hoek & Zufferey 2015 on parallel corpora, among others) and experimental studies (Haberlandt 1982; Caron et al. 1988; Millis & Just 1994; Golding et al. 1995; Murray 1995, 1997; Degand et al. 1999; Sanders & Noordman 2000; Zunino et al. 2012b; Zunino 2014; van Silfhout 2015; Loureda et al. 2016a; Nadal et al. 2016; Nadal 2019; Nadal & Recio 2019; Narváez García (forthcoming)). Researchers working in the field of second language acquisition and learning have also devoted efforts to whether the presence of a discourse-marking device affects how information is processed and comprehended by non-native speakers (see chapter 4 and references therein).

3.1.3.1. *Grammatical views on implicitness and explicitness of causal relations*

The implicitness of discourse relations has been a traditional concern for linguistics. In general, grammatical approaches acknowledge the plausibility of *asyndetic* discourse relations: "It is evident that with a mere juxtaposition we constantly mean *the same relations* that can be expressed with conjunctions and relative pronouns…" (Gili Gaya 1993[1943]: 262-263, our emphasis). Thus, juxtaposition is taken as an instance of either coordination or subordination in which no semantic marking is provided.[81] For Spanish,

mind to seek for causal explanations of events, in which case the second term of the causal relation (John's reason to praise her daughter; Mary's aim in cutting the fabric) would just not be explicitly mentioned.

[81] For experimental evidence on the order of acquisition see Evers-Vermeul (2005) and Evers-Vermeul & Sanders (2009, 2011).

a similar view is shared in grammar reference works. In the *Descriptive Grammar of the Spanish Language* (*GDLE* 1999) it is noted that identifying a given discourse relation in certain cases of juxtaposition is possible also in absence of a connective because “such notions are of a communicative nature” (López García 1999, §54.7: 3543). More recently, the *New Grammar of the Spanish Language* (*NGRAE* 2009) argues in the same direction about the contribution of juxtaposition to “the cohesion of discourse”:

> It is generally accepted that the discourse cohesion arisen from juxtaposing sentences is a complex process of a pragmatic nature to whose elucidation the distinctions put forward by syntax can only marginally contribute. (*NGRAE* 46.11o: 3519)

These considerations apply to a number of discourse relations: causal, additive, temporal, copulative, adversative or conditional relations (cf. Gili Gaya 1993[1943]; *GDLE*; *NGRAE*). In the case of causal relations specifically, the absence of a connective does not lead to the disappearing of the underlying semantic relation from the utterance (Álvarez 1999, §58.7.1: 3793): “it is the connective which presupposes a juxtaposition or clause combination, *and not the other way around*” (idem: §58.6.1: 3791, our emphasis).

3.1.3.2. *Pragmatic approaches to the implicitness and explicitness of causal relations*

From a cognitive view of communication, it is the mutually manifest cognitive environment of the interlocutors what leads a speaker to use a specific connective to express a causal relation or to convey such relation implicitly. Both juxtaposition and semantic explicitness are fully-fledged procedures available to speakers to convey causal relations (Nieuwenhuijsen 2013: 137). In this sense, implicit and explicit causality should not be compared in terms of complexity, at least not in natural discourse. By producing an implicit causal relation, a speaker does not aim at reducing the complexity of his discourse. Instead, he seeks to achieve optimal relevance in terms of what is said and how it is said in order to generate the largest contextual effects in his interlocutor. This would lead to nuancing claims that the semantic and pragmatic relation between two discourse segments becomes “clear, perspicuous and unambiguous” (Montolío 2001: 20) when a connective is used[82]. By choosing to convey a causal relation juxtaposing two discourse segments, the speaker may be being as relevant as when he opts for explication.

In implicit relations, the content or events expressed by two juxtaposed discourse segments must necessarily be eligible to be part of a complex one: "[t]his is the key to connection: a given relation arises because there is a way to combine both events according to the linguistic cues provided" (Garrido Medina 2007: 312). In other words, the *content* of the discourse segments determines:

a) whether the relation is conveyed implicitly or explicitly. This explains why some discourse relations and communicative situations are better candidates for implicitness than others (Hoek and Zufferey 2015);
b) the selection of a given connective (Degand 1998; Pander Maat & Degand 2001; Pit 2003).

"Content" refers to linguistic and paralinguistic processing cues other than connectives and to the context of an utterance. Linguistic processing cues are referential expressions, mood or tense indicators,[83] punctuation marks (Charaudeau 1992; Figueras 2000), etc. Paralinguistic cues include that inform about an underlying discourse relation include supra-segmental traits (Neuber 2002; Wharton 2003, 2009; Hidalgo Navarro & Cabedo Nebot 2012) or paralanguage (see e.g., Wharton 2003; but see Escandell Vidal 2017: 88-91 for a more restrictive notion of procedural meaning). Finally, the context encompasses "that subset of mentally represented assumptions which interacts with newly impinging information (whether received via perception or communication) to give rise to contextual effects" (Carston 2002a: 376).[84] Since "[e]very ostensive stimulus conveys a

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[82] At least in natural discourse in a first language, but see data discussion in study 2 (chapter 7) for the effects of explicating the consecutive connective *por tanto* on L2 processing. See also the references in Chapter 4, § 4.4.2).

[83] As sketched out in this chapter, this is in line with recent developments of the notion of procedural meaning, initially applied exclusively to connectives (Blakemore 1987, 2002; Blass 1990, among others) and now extended to further linguistic expressions, see e. g., Escandell Vidal & Leonetti 2011; Carston 2016; Moeschler 2016.

[84] These claims have led some scholars to challenge the existence of implicit relations and to argue that all relations are indeed signaled (Taboada 2009; Arroyo Hernández 2017). However, "signaling" is understood here as making use of morphological syntactic, semantic and pragmatic mechanisms to guide the reader

presumption of its own optimal relevance" (Sperber & Wilson 1995[1986]: 158), when confronted with an implicit causal relation, a hearer would aim to interpret the stimulus as the optimal one selected by the speaker to convey his assumption. From the other side of the coin, the speaker selects the optimal stimulus under consideration his interlocutor's abilities and preferences (idem), where "abilities" refers to those required to access the pertinent context to obtain cognitive efforts from the linguistic material.

3.1.3.3. *Empirical approaches to implicit and explicit causal discourse relations*

The potentialities of discourse to express many kinds of discourse relations implicitly does not mean, however, that speakers do not show preferences for implicitness in certain relations. This is the case of causality, which seems to enjoy a special cognitive status: "[b]oth common sense and data tell us that the processing of causal relations in text must be an important part of the comprehension process." (Myers 1990: 373). Indeed, causally related information has been proved a) to be recalled better than non-causally related information (Trabasso & van den Broek 1985; Sanders & Noordman 2000; Sanders 2005); and b) to be read faster than other discourse relations, thus holding an indirect relationship with processing effort: the "more causal" an utterance is, the lower its processing effort will be (Haberlandt & Bingham 1978; Keenan et al. 1984; O'Brien & Myers 1985; Myers et al. 1987; Myers 1990; Sanders & Noordman 2000; Sanders 2005).

As regards implicitness, precisely because of their particular cognitive status, causal relations have been found to be particularly good candidates for being conveyed without resorting to a discourse marker (Asr & Demberg 2012; Hoek & Zufferey 2015); in addition, implicit causality seems to be less effort-demanding than explicit causality (Murray 1995; Loureda et al. 2016a; Moncada 2018; Nadal & Recio 2019), as far as sufficient contextual assumptions can be provided by the reader that allow him to connect two implicitly connected segments causally. In effect, experimental evidence supports the claim that entertained assumptions (world knowledge) play a decisive role in how discourse is processed. More specifically, there seems to be an inverse relationship between mind-stored assumptions and the benefit of explicit discourse marking for

towards retrieving a specific discourse relation. Since our focus is on discourse markers, we will maintain the distinction "explicit" versus "implicit" for utterances containing or not a discourse marker respectively.

processing (McNamara et al. 1996; Noordman & Vonk 1998; Zunino et al. 2012a, 2012b, 2016; Zunino 2014; but see Moncada 2018): the more knowledge can be provided by the reader, the less he has to rely on procedural information guiding him as to how to combine conceptual information.[85]

Two cognitive principles have been formulated that help explain the particular behavior of causal relations. It is according to these principles, together to the ostensive-inferential, relevance-governed nature of communication that our hypotheses regarding the processing of implicit and explicit causal relations are set out (cf. § 3.3).

The Principle of Continuity (Segal et al. 1991; Murray 1995, 1997)

During discourse processing consecutively presented events tend to be interpreted linearly by default (most prominently in narrative discourse, but see Sanders & Noordman 2000 and Zunino 2014 for findings on other discourse types). Readers have an expectation of temporal continuity when confronted with ostensive stimuli (Murray 1997). In the following utterances:

(48) *They run a very nice hotel. They have many guests.*
(49) *They run a very nice hotel.* Por tanto*, they have many guests.,*

the depicted events are continuous and hence, according to the principle of continuity, they would comply with readers' expectations. "Continuity" also refers to the fact that the events of an utterance are expected by-default to maintain the same frame of reference, that is, the same topic (Segal et al. 1991). As a result of the mind's tendency towards discursive continuity, as confirmed by evidence (Murray 1997, also 1995), connectives encoding instructions that alert the reader of a break of continuity (e.g., a counter-argumentative connective) would have a stronger facilitating role for processing than

[85] In *An Enquiry Concerning Human Understanding* (1748) David Hume already points out the relationship between previous knowledge ("experience") and causal processing:

> I shall venture to affirm, as a general proposition, which admits of no exception, that the knowledge of this [cause-effect] relation is not, in any instance, attained by reasonings a priori; but arises entirely from experience, when we find that any particular objects are constantly conjoined with each other. Let an object be presented to a man of ever so strong natural reason and abilities; if that object be entirely new to him, he will not be able, by the most accurate examination of its sensible qualities, to discover any of its causes or effects. (p. 12)

connectives that confirm or strengthen expectations of continuity, which would have "less of an impact on on-line processing" (Murray 1997: 229). If these findings are extrapolated to the implicit/explicit debate of causal relations, utterances connected by *por tanto* should not lead to faster processing of causal utterances compared to its absence: the cause of the discourse relation is conveyed in the first segment and its consequence in the second, thus forming a continuous relation.

The Causality-by-default Hypothesis (Sanders 2005)

During discourse processing, readers tend to interpret two consecutive segments as causally related[86] (as opposed to temporally or additively related). As Sanders observes, "because readers tend to build the most informative representation, they start out assuming the relation between two consecutive sentences is a causal relation (given certain characteristics of two discourse segments)" (Sanders 2005: 9). This hypothesis originates as an explanation of the so-called *paradox of causal complexity* (Sanders 2005), according to which causality is processed faster than additive relations despite being cognitively more complex, as supported in findings that additive connectives are acquired in childhood before causal connectives (Evers-Vermeul 2005; Evers-Vermeul & Sanders 2009, 2011).

3.1.3.4. *Relevance-guided processing as an integrative principle for causal processing*

According to the causality-by-default hypothesis, the higher *informative load* of causal relations seems to be the trigger for the human mind to seek for a causal representation when confronted with discourse events. This preference results in processing ease. The principle of continuity, in turn, invokes expectation (of linearity) reasons to explain processing ease and processing preferences.

The notion of *relevance*, however, seems to suffice to explain why causality seems to be at the basis of human processing and why the absence of causal connectives does not seem to hinder causal processing or even leads to foster smoother, faster reading. In the absence of a causal connective, when confronted with two consecutive discourse

[86] Sanders notes that the tendency towards causal processing is not limited to language processing, but is a general cognitive principle also underlying processing of visually perceived stimuli (Sanders 2005: 8).

segments, readers may prefer a causal reading in virtue of the trade-off between processing efforts and contextual effects that underlies linguistic communication. If accommodation of new information (the utterance) to the context favors a causal reading, the human mind will not stop processing until a causal link is established between the depicted events. Similarly, if the context calls for additive processing, under normal circumstances, processing will stop once additivity has been recovered. Causality, then, is not processed by-default, but because given a specific context it is the most relevant interpretation of the utterance. That is, it is the interpretation leading to the greatest contextual effects for the invested processing effort. This also serves to explain the paradox of causal complexity (Sanders 2005, see above). Complexity is a relative notion: in cognitive terms, something is more complex than something else if it requires more effort for the same benefit. Thus, establishing causality would be easier than linking two segments additively if it brings about a larger profit (the contextual effects intended by the speaker) at the same processing cost. Doing otherwise would result in failure to retrieve the assumption intended by the speaker.

In the (plausible) utterances of our study signaled by *por tanto*, the discourse segments are the cause and the consequence of the discourse relation. Hence, processing is constrained by two interpretive guides: the lexical content of each of the two successive segments giving rise to mental representations that can be causally linked; and the procedural meaning of *por tanto*, which explicitly instructs a reader to process its host segment as a consequence of the previous segment. The resulting relation takes the logical form $p \rightarrow q$:

(50) [*La mayor capacidad de comprensión está en relación directa con la mayor amplitud de dicho campo [visual]*]$_{\text{cause}}$. [***Por tanto****, la comprensión también tiene que ver con la velocidad lectora (…).*]$_{\text{consequence}}$

(CORPES XXI - Equipo Peonza: El rumor de la lectura. Madrid: Anaya, 2001)

'[Better comprehension abilities are directly related to a wider amplitude of the [visual] field]$_{\text{cause}}$. [***Por tanto***, comprehension has also to do with reading speed.]'$_{\text{consequence}}$

By contrast, the absence of a causal-consecutive connective compels the reader to interpret the discourse relation by just resorting to the lexical content of the juxtaposed segments. In other words, utterances with the form "Segment 1 (S1) + *por tanto* +

Segment 2 (S2)" provide the reader with two processing cues, while in utterances with the form "Segment 1 (S1) + Segment 2 (S2)" readers have one, namely the mental representations retrieved from the contents of the segments. In virtue of relevance-oriented processing, the presence of *por tanto* in utterances like these could be taken by readers as an "empty" semantic mark (cf. Nadal & Recio 2019). As a result, while both utterances would be equal in terms of informativity, the explicit relation would be imposing a stronger processing effort to the reader and, thus, be less relevant.

3.2. Sin embargo ('however')

3.2.1. The semantics of sin embargo

Sin embargo connects semantically and pragmatically two discourse segments and triggers inferential processes that give rise to a mental representation arising from processing the content of both segments according to the instructions that it encodes. Specifically, *sin embargo* eliminates or suspends an assumption stored in the interlocutor's mind:

(51) *Tienen un hotel muy feo. Sin embargo, tienen muchos clientes.*
'They run a very ugly hotel. Sin embargo, they have many guests.'

From the first discourse segment (S1), in virtue of his world knowledge, among them entertained scripts and frames, a hearer would activate accessible mental representations such as 'they do not have a lot of clients', 'they will soon be broke'. By uttering *sin embargo*, however, the speaker compels him to suspend that line of inferencing and to accept the content of the second discourse segment (S2) as an unexpected state of affairs. In this sense, the definition of the English adversative connective *however* as given in the framework of relevance theory (Blakemore 2002) is partially valid for Spanish *sin embargo*. Both connectives are linked to a cognitive effect and constrain the access to the context, however in different ways.

Like *however*, *sin embargo* also encodes constraints on cognitive effects: the contradiction and elimination of an accessible assumption, namely the one derived from S1; but *sin embargo* specifically constraints the context in which the contradiction/elimination effect is activated by instructing the hearer to inferentially access an assumption from S1 that corresponds exactly to the opposite of the proposition stated in S2. As a result, *sin embargo* triggers additional inferencing so that a world-knowledge based relation between the propositions of S1 and S2 is activated. In (52)

(52) [*Tienen un hotel muy feo*]$_p$. Sin embargo, [*tienen muchos clientes*.]$_q$

$$\begin{tikzcd} p \arrow[drr] & & q \arrow[d, "w"] \\ & & \neg q \end{tikzcd}$$

$\neg q$ is the inferentially derived representation from the content of p (S1), namely that the hotel does not receive many guests, and w expresses the contradiction that arises between q (S2) and the inferred assumption. Note that what is exclusive or contradictory in this kind of adversative relations is the assumption activated from S1 and the propositional content of S2. *Sin embargo* contradicts the expectation retrieved in form of a mental representation from S1 and activates the mind-stored assumption that people usually do not visit ugly hotels. This explains why *sin embargo* can only be used as a so-called direct argumentative connective (Portolés 1995: 245-246 and 251), contrarily to *pero* 'but', and, as a matter of fact, to English *however*.

By contrast, in indirect argumentation both discourse members activate mutually exclusive assumptions. In other words, only inferred contents are opposed:

(53) [*El hotel es muy feo*]$_p$, *pero* [*tiene un jardín enorme*.]$_q$
'The hotel is very ugly, but it has a huge garden.'

$p \rightarrow r$

$q \rightarrow \neg r$

An interpretation leading to cognitive effects is only possible if access to the context to interpret the utterance is provided that licenses the conclusions intended by the speaker.

Otherwise, “the interpretive process is blocked, and the hearer is entitled to ask ‘Why are you saying that?’, which proves the lack of relevance of the utterance” (Moeschler 1989: 69). In (53), thus, *r* would correspond to an assumption like ‘let us *not* organize the company’s Christmas party there’ and ¬ *r* to an assumption like ‘let us *organize* the company’s Christmas party there’. Note that due to the rigid semantics of *sin embargo*, its use in an utterance like (54) results in pragmatic oddity:

(54) #[*El hotel es muy feo*]$_p$. sin embargo, [*tiene un jardín enorme*.]$_q$

The use of *sin embargo* automatically triggers the search for world knowledge that relates the premise in S1 and the conclusion in S2, which is not possible or not easily accessible here: without further contextual restrictions, no commonly shared assumption holds that ugly hotels do not usually have big garden[87].

When several assumptions are contradicted in a communicative act, the weakest one is abandoned. The question of whether the remaining assumption is the one communicated in the adversative utterance or the one that the hearer entertains, depends on perception and on the trust in the utterer (Sperber & Wilson 1995[1986]:121). Assuming the hearer’s trust in the speaker, his utterance will be taken as informative and lead to contextual effects as depicted. Importantly, while in processing an adversative relation the proposition that could have been inferred from the S1 is suppressed to eliminate the contradiction, the implicative proposition—the relation between *p* and *q*—is not suppressed. Rather, it “is recognized as still valid outside of the circumstances of the utterance and being able to be applied again later on.” (Moeschler 1989: 53). This makes manifest the twofold nature of connectives and connected utterances: the cognitive operation is more of an interplay of both discourse segments mutually acting as inference-constraining. In a nutshell, the S1 affects inferences arising from the S2, in contrast to

[87] For German, Breindl notes that the use of direct-argumentation markers in indirect argumentation would lead to “a senseless result that could be repaired at most by means of an additional assumption” (2004: 236), which highlights again the malleability of conceptual meaning under the rigid effect of procedural instructions. The interplay of instructional rigidity and conceptual malleability results in the triggering of the search for a relevant context to accommodate the relation between the discourse segments as imposed by *trotzdem*, namely as one relating S1 and S2 directly (and not indirectly).

what is the case, for instance, with reformulation markers, where the speaker can go back to the reformulated segment and just assign it a new interpretation (Portolés 1993: 152)[88].

3.2.2. Diachrony and formal features of sin embargo

Sin embargo is an adverbial phrase formally consisting of the preposition *sin* ('without') and the substantive *embargo* ('obstacle', 'handicap'). Counter-argumentative connectives emerge later than connectives ascribed to other categories (Garachana 1998: 199). Specifically, *sin embargo* is documented already in the origins of Castilian Spanish with an adverbial meaning, and hence clause-integrated. From the 15th century onwards it occurs with a concessive value. In such cases, *sin embargo* is usually followed by either ('of') or que ('that'), further proof that it at that stage it is still fully integrated in the sentence. At least from the 17th onwards, *sin embargo* already functions as an extra-sentential connective with an adversative value (idem: 200).

In terms of frequency, *sin embargo* is one of the most vital adversative connectives in Spanish:

	(CORDE)						20th (CREA)	20th (CORPES)	Total
	until 1500	16th	17th	18th	19th	20th			
sin embargo	163	523	737	1,746	8,621	9,720	28,128	110,256	151,146
no obstante	143	679	1,163	158	2,101	2,564	4,920	132,061	139,361

Table 6. Absolute frequencies of *sin embargo* and *no obstante* ('nonetheless', literally in its origins 'not obstructing', 'not impeding').

Like *por tanto*, *sin embargo* also exhibits a high positional mobility and can occur in utterance initial, medial or, though very rarely, in final position (Briz & Pons 2010; *DPDE*, *s.v. sin embargo*; see Nadal 2019 for experimental evidence of position effects on processing of counter-argumentative utterances marked by *sin embargo*). Different positions are, however, usually associated with specific discourse traditions or register,

[88] For experimental evidence on the impact of Spanish reformulation markers on processing see Salameh Jiménez (2019).

thus affecting formal rather than functional features of the utterance (Briz & Pons 2010: 283):

(55) a) *Tienen un hotel muy feo.* ***Sin embargo,*** *tienen muchos clientes.*
b) *Tienen un hotel muy feo. Tienen,* ***sin embargo,*** *muchos clientes.*
c) *Tienen un hotel muy feo. Tienen muchos clientes****, sin embargo****.*
'They run a very ugly hotel. (However,) they have (, however,) many guests (however).'

Further formal features affecting the syntactic behavior of *sin embargo* are similar to those discussed above for *por tanto* and for fully grammaticalized discourse markers in general. *Sin embargo* cannot be negated (**no sin embargo* 'not sin embargo'), it does not admit any kind of modifiers (**especialmente/precisamente sin embargo* 'specially/precisely sin embargo'), and cannot be focused with a cleft construction (**Es sin embargo que*… 'It is sin embargo that'…). Like *por tanto*, *sin embargo* also forms an own intonation group (Fuentes Rodríguez 2009: 319) and is, therefore, detached from the rest of its host segment. In written discourse, *sin embargo* is also generally preceded by a comma, a semicolon or a period, and followed by a comma (or by a period or a semicolon if placed at the end of its host segment (*DPDE*, *s.v. sin embargo*).

3.3. *Conclusion and hypotheses$_2$*

Along chapters 2 and 3, we have set out the features of procedural meaning (§ 2.1.2), of discourse markers as procedural-meaning devices (§ 2.2.1), and, specifically, of the connectives *por tanto* and *sin embargo* (§ 3.1 and 3.2), the core of this study. At this point, the general hypotheses formulated at the end of chapter 1 can be refined:

Study 1
Phenomenon under study
Processing marked causal versus counter-argumentative relations (+ *por tanto* vs. + *sin embargo*)
Background
• *Por tanto* instructs the reader to process its host segment as a consequence of the assumption derived from the preceding segment. New information is combined with mentally-stored assumptions and gives rise to the assumption communicated by the speaker. • *Sin embargo* instructs the reader to process its host segment as a counter-consequence the assumption derived from the previous segment. As a result, inferred contents must be suspended or eliminated. • In causality new and old assumptions do not collide; by contrast, in counter-argumentation, contextually provided assumptions must be revised. Additionally, causality enjoys a special cognitive status and the human mind is oriented towards causal processing ("search after meaning", Graesser et al. 1994). As a result, in causality, the discourse operation at issue would be closed up with processing of the second discourse segment; by contrast, in counter-argumentation, the reader would still have to search for the actual cause of the communicated assumption after processing the whole utterance.
Hypothesis$_2$
• Causality will be less effortful to process than counter-argumentation for all participant groups. Additionally, a higher need for re-analysis is expected for all participants in counter-argumentative utterances.

Table 7. Study 1: Conclusion and hypotheses$_2$

Study 2
Phenomenon under study
Processing of explicit versus implicit causal relations (+ *por tanto* vs. – *por tanto*)
Background
• Communication is an ostensive-inferential process. As a result, speakers make use of procedural guides that constrain their interlocutors' inferential processes. As a connective, *por tanto* is an inferential-constraining (procedural-meaning) device. When provided, as in explicit causal relations, it instructs the reader to process its

host segment as a consequence of the assumption derived from the previous segment, which is conferred the status of a premise. As a result, new information is combined with mentally-stored assumptions to give rise to the communicated assumption. • As far as the context and the reader's mind-stored assumptions allow him to do so, two consecutive discourse segments will be processed as causally related, even in absence of a procedural mark instructing a reader to do so, as occurs in the causal implicit relations that are the subject matter of study 2. • The human mind is geared to the maximization of relevance and stimuli (utterances) are relevant if they are worth the audience's processing effort and are the most compatible with the audience's preferences and abilities (Sperber & Wilson 1995). Relevance is thus a trade-off between effort and benefit. In this sense, additional information (e.g., the explication of a discourse marker) will only be relevant if the cognitive effects arrived at by processing it are also larger than in the absence of such information.
Hypothesis$_2$
• Implicit causal utterances will be processed less effortfully than explicitly linked utterances for all participant groups. Two sub-hypotheses are posited for this outcome pointing in the same direction, albeit underlying different reasons: 1) The explication of a causal procedural-meaning device will lead to more effortful processing due to the fact that it will be processed as "void" by the readers, who are able to recover the causal relation by merely resorting to the assumptions derived from the segments combined with their mind-stored assumptions. 2) The explication of a causal procedural-meaning device will lead to more effortful processing due to the fact that readers may search for further contextual effects given the additional material (*por tanto*).

Table 8. Study 2: Conclusion and hypotheses$_2$

Study 3
Phenomenon under study
Processing plausible versus implausible causal relations (+ *por tanto* + plausible vs. + *por tanto* – plausible)
Background
Contextual access, specifically the access to mind-stored assumptions that allow readers to establish a causal link between discourse segments, will be disrupted in implausible causal utterances. However, geared by their search for relevance and in virtue of the accommodation processes triggered by the rigid semantics of the

connective *por tanto*, readers will try to recover an assumption both in plausible and in implausible utterances.
Hypothesis₂
Implausible utterances will lead to more effortful processing than plausible utterances for all groups. Also, higher re-analysis is expected for the implausible condition, due to the need to create an *ad hoc* context to accommodate the assumptions derived from each of the segments during the construction of an initial assumption. In addition, due to the linear nature of causal-consecutive relations ($p \rightarrow q$), stronger re-analysis is expected particularly for the connective (as the accommodation triggering device) and the second discourse segment.

Table 9. Study 3: Conclusion and hypotheses$_2$

Study 4
Phenomenon under study
Processing plausible versus implausible counter-argumentative relations (+ *sin embargo* + plausible vs. + *sin embargo* – plausible)
Background
Contextual access, specifically the access to mind-stored assumptions that allow readers to establish a counter-argumentative link between discourse segments, will be disrupted in implausible counter-argumentative utterances. However, geared by their search for relevance and in virtue of the accommodation processes triggered by the rigid semantics of the connective *sin embargo*, readers will try to recover an assumption both in plausible and in implausible utterances.
Hypothesis$_2$
Implausible utterances will lead to more effortful processing than plausible utterances for all groups. Also, higher re-analysis is expected for the implausible condition, due to the need to create an *ad hoc* context to accommodate the assumptions derived from each of the segments during the construction of an initial assumption. In addition, due to the non-linear nature of counter-argumentative relations, stronger re-analysis is expected particularly for the connective (triggering device) and the first discourse segment.

Table 10. Study 4: Conclusion and hypotheses$_2$

More specific hypotheses, additionally taking into account the participant groups of the study, will be provided at the end of chapter 4.

4. L2 discourse processing

Understanding utterances requires a complex interplay of bottom-up and top-down processes: word meanings must be retrieved, syntactic structures must be processed and that semantic and structural information must be combined with extra-linguistic information: encyclopaedic knowledge, frames and scripts, communicative situation (cf. Roberts 2013: 190; Escandell Vidal 2015: 127). This also applies to learning a foreign language, which means "learning to categorize and interpret situations and social relations the same way as native speakers categorize and interpret them" (*Plan Curricular del Instituto Cervantes*[89], *PCIC*, § 6). Doing so implies being able to decode linguistic input and to carry out inferential processes. Thus, during discourse interpretation, both linguistic and pragmatic competencies come into play.

Together with linguistic and sociolinguistic competence, in the realm of language teaching and learning, *pragmatic competence*[90] is one of three components of communicative language competence (*Common European Framework of Reference for Languages*, *CEFR*). Pragmatic competence concerns

> the ability of making a communicative use of languages where not only the relations between linguistics signs and their referents are considered, but also pragmatic relations, that is, the relations holding between the language system, on the one hand, and interlocutors and the communicative context, on the other. (*Diccionario términos de E/LE*, *s.v. competencia pragmática*)

The sub-components of pragmatic competence are *discursive competence*, *functional competence* and *design competence*. Discursive competence concerns knowledge of the principles by which messages are "organised, structured and arranged" (*CEFR* § 5.2.3.);

[89] The *PCIC* ('Curricular Plan of the Instituto Cervantes') provides teachers, researchers and curricular planners for Spanish as a foreign language with materials and inventories for their teaching, learning and evaluation praxis. It has as a basis the claims and reference levels set out by the *Common European Framework of Reference for Languages* (*CEFR*). While the *CEFR* is applicable to any language, the PCIC develops its contents for Spanish as a foreign language.

[90] Pragmatic competence was first put forward as a sub-competence of communicative competence in its own right by Bachmann (1990). Previously the concept had been managed indirectly, but not explicitly articulated, in models of communicative competence put forward by Hymes' (1972) and Canale and Swain's (1980) or Canale (1983).

functional competence is concerned with those principles necessary to know how messages are "used to perform communicative functions" (idem); finally, design competence refers to how messages are "sequenced according to interactional and transactional schemata" (idem):

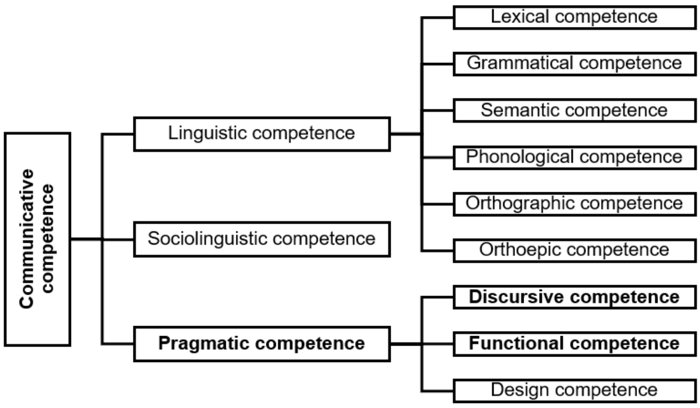


Figure 4. CEFR § 5.2. - Components of communicative language competence and their sub-components

To process argumentative utterances like the ones in this study, L1 and L2 participants must bring to bear their discursive and functional competencies, besides putting to use their linguistic lexical, semantic and grammatical/syntactic competencies (cf. *CEFR* § 5.2.3.1 and § 5.2.3.2):

Task	Discourse competence	Functional competence
• Processing explicit plausible causal relations • Processing implausible causal relations • Processing plausible counter-argumentative relations • Processing implausible counter-argumentative	• Controlling discourse management in terms of coherence and cohesion. • Linking discourse segments in accordance with the semantics of the connectives.	• Managing argumentation as a micro- and as a macro-function
• Processing implicit causal relations	• Controlling discourse management in terms of coherence and cohesion. • Arranging discourse segments according to a coherent order (cause → effect) in absence of a procedural guide.	

Table 11. Abilities/components of discourse and functional competence required for utterance interpretation in the phenomena under study

4.1. *Task difficulty and consequences for processing*

When an individual reads a written utterance, he is executing a *task*. In the field of L2 research, task performance is a function of learners' competences and task constraints (CEFR § 7.2.). Learner competences and characteristics, and task-related constraints as potential determinants of task-performance in an L2 comprise several sub-factors (CEFR § 7.2.2). The following apply to our research:

1) Learner competences and characteristics[91]
   a) Cognitive factors
      i) Task familiarity
         (1) Type of task and operations involved
         (2) Necessary background knowledge (assumed by the speaker or writer)
      ii) Ability to cope with processing demands
         (1) Handle the number of steps or 'cognitive operations' involved, and their concrete or abstract nature
         (2) Attend to the processing demands of the task (amount of 'on-line thinking') and to relating different steps of the task to one another (…)

2) Task conditions and constraints
   a) Reception tasks
      i) Text characteristics
         (1) Discourse structure
      ii) Type of response required
         (1) Level of inferencing required

4.1.1. Learner characteristics: cognitive factors

Task familiarity and the ability to cope with task demands may influence the outcome of a given task and is considered a potential determinant of task difficulty.

[91] Learner competences and characteristics also comprise linguistic and affective factors, which are left aside here. Linguistic complexity is comparable between utterances (cf. § 5.3.2.1 and § 5.3.2.2); affective factors are not the subject matter of the study and were therefore not controlled for.

4.1.1.1. *Familiarity with the type of task and operations involved*

This study consists of online reading tasks in Spanish at the participants' own pace (see chapter 5). Reading in Spanish is thus less familiar for the two non-native groups and increases task complexity for them compared to the L1 readers. Both L2 groups are therefore expected to show, systematically and condition-independent, more effortful processing than the control group.

As concerns the operations involved in the different tasks, causality is expected to be more effortful than counter-argumentation. This pattern is expected throughout results for all participant groups, albeit more conspicuously for less proficient learners. Causal relations comply with the cognitive principle of continuity (Murray 1995, 1997), while counter-argumentation brings about a rupture of expectations that compels the reader to revise an initial assumption retrieved inferentially.

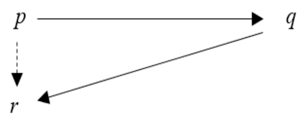
4.1.1.2. *Familiarity with the necessary background knowledge (assumed by the speaker or writer) to solve the task*

Not all utterances of our study evoke familiar background knowledge by the readers (see chapters 7 and 8). Irrespective of the group, implausible utterances both causal and counter-argumentative communicate assumptions that clash with entertained mental assumptions. It is thus expected that implausibility increases processing complexity for all groups, albeit to a larger extent for the non-native groups. Within them, B1 readers are expected to exhibit the strongest plausibility effects in terms of higher processing effort, since accommodation processes required to recover a communicated assumption in implausible utterances are highly resource-demanding (see the following subsection).

4.1.1.3. *Ability to handle the number of steps or 'cognitive operations' involved, and their concrete or abstract nature*[92] *and to attend to the processing demands of the task (amount of 'on-line thinking') and to relating different steps of the task to one another*

The cognitive operations needed to recover a communicated assumption are not the same in all conditions. In causal utterances marked by *por tanto* readers must derive implicated premises and identify the second discourse segment as an explicitly stated conclusion that matches the mental representation activated during processing of the first segment:

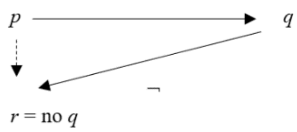
(56) *They run a very nice hotel.* Por tanto, *they have many guests*



[They have many guests]

Conversely, processing two counter-argumentative segments connected by *sin embargo* requires the reader to *revise* the mental representation inferentially recovered from the first discourse segment:

(57) *They run a very nice hotel.* Sin embargo, *they don't have many guests*



NO (They don't have many guests)

In counter-argumentation, the premise underlying the move from *p* to *q* (based on background knowledge and with the form of a general law, a *topos*) is not removed from the reader's cognitive environment and remains valid in his mind. Thus, processing counter-argumentation does not just involve "managing a contradiction (by preserving one proposition and suppressing another), but a more complex cognitive management of

92 The fact that the number of cognitive steps can differ between the interpretation of different utterances does not mean that the interpretation process as put forward by RT (Sperber & Wilson 1986[1995], Wilson & Sperber 2004) does not apply here.

relational or implicative propositions" (Moeschler 1989: 53). In addition, while in both discourse relations the conclusion (*q*) can be accessed, full accessibility *to the arguments* licensing the conclusion is exclusive to the causal relations. When the reason for *q* (= non *r*) is not given, in virtue of the *principle of argument explicitation* (*principe d'explicitation de l'argument*, Moeschler 1989) counter-argumentation entitles the reader to ask for such reason, thus giving account of the "interpretative incompleteness of the speaker's utterance" (idem: 68). Thus, in (58):

(58) *They run a very nice hotel.* Por tanto, *they have many guests*

the reason for the many guests is the hotel's beauty. By contrast, in (59):

(59) *They run a very nice hotel.* → *They* ***don't*** *have many guests*

the conclusion is that the hotel is never really crowded, but the final argument licensing it remains uncovered. The utterance can still be processed as relevant, but processing is most probably not concluded when the consequence as stated in the second discourse segment is read. In relation to learners' abilities to cope with cognitive task demands, counter-argumentation is expected to be cognitively more demanding than causality.

As concerns implicit and explicit causality (study 2), the former presupposes the reader's ability to *inferentially* relate the utterance segments as a cause followed by a consequence. By contrast, the explication of a connective conventionalizes the argumentative relation to be established between the segments, thus reducing the inferential need to interpret the utterance. Since connectives are constraints to contextual access, a higher cognitive complexity is expected for implicit causality. This should be particularly so for B1 speakers, who might rely more on linguistic input—on the connective as a conventionalizing mark—than the other two groups than on their inferential abilities in the L2.

Implausible utterances are also more complex than plausible utterances (studies 3 and 4) from the viewpoint of the cognitive steps involved in their processing. Handling a mismatch between contextual assumptions and procedural meanings as in the implausible utterances of the study implies creating an *ad hoc* assumption, which is not necessary in absence of such mismatches. In the latter case, the implicated premises are activated by the linguistic input and retrieved from background knowledge. By contrast, a contradiction between the instructions encoded in *por tanto* or *sin embargo* and the pragmatic relation holding between the discourse segments requires readers to suppress the implicated premises that they entertained. This is not exactly the sort of suppression dealt with in plausible counter-argumentation, which affects the conclusion inferred from the first segment. The sort of suppression that a clash between instructions and contextual assumptions requires affects the relational proposition underlying the move from a premise to an argument. In other words, it requires removing the *implicated premises* which, in this case, correspond to mind-stored assumptions. In addition, the rigid nature of the connectives compels readers to construct a new *ad hoc* assumption (*p* therefore/however *q*). As a result, the number of cognitive steps involved in processing implausible utterances is higher than in plausible discourse relations.

4.1.2. Task constraints and conditions

Learner competencies and task constraints and conditions are two sides of a coin. Competencies are formulated from the perspective of the learner's background and his ability to handle; constraints focus on the challenges imposed by tasks themselves.

4.1.2.1. *Discourse structure*

There seems to be a direct correlation between increasing task complexity and the structuring of the discursive information presented to an addressee: explicit information rather than implicit information and textual coherence contributes "to reducing information processing complexity" (CEFR § 7.3.2.2). Implicit causality should thus be cognitively more complex than explicit causality, at least for L2 readers; likewise, implausible utterances should be more effort-demanding than plausible utterances.

4.1.2.2. *Level of inferencing required*

Inferencing is crucial in implicit causal utterances. The absence of a procedural guide leaves it up to the reader to activate a proper context to establish the connection between two juxtaposed segments. In explicit causality, by contrast, the presence of *por tanto* as a contextual constraint may re-distribute and eventually constrain inferential efforts.

For its part, implausible utterances (studies 3 and 4) require a higher level of inferencing in the terms explained in § 4.1.1.3. The suppression of entertained implicated premises that would license the move from arguments to conclusions, and the construction of new *ad hoc* assumptions contradicting such mind-stored assumptions to replace them increases the level of inferencing, and, as a result, the complexity of implausible utterances compared to plausible ones.

In summary, considering the pragmatic abilities of the participant groups as well as task-related factors, the phenomena under study can be tentatively arranged in a scale of expected cognitive complexity as follows:

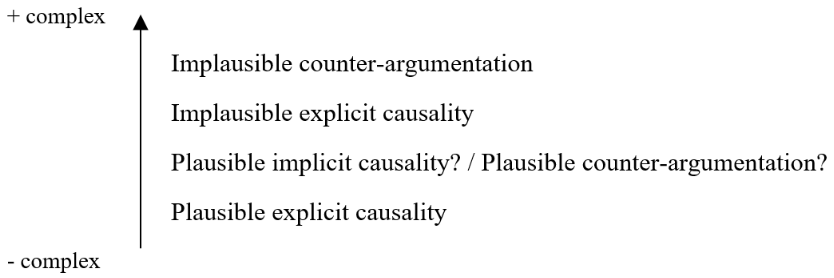


Figure 5. Suggested theory-driven scale of complexity of the phenomena under study

This scale of complexity is based on readers' competence and on task constraints, and applies for both experimental groups (B1 and C1). In general, as proficiency increases, participants should be more able to cope with higher tasks demands. In this sense, more effortful processing is expected by the less proficient group (B1) in all four studies. In turn, the control group (L1) is expected to outperform the two L2 groups and to exhibit less effortful processing task-wide: utterance interpreting is always effortful, but such effort increases when it involves decoding and inferring in an L2, whose knowledge is "partial and imperfect" (Amenós & Ahern 2014: 26).

4.2. *Pragmatics in L2 research*

Pragmatics has influenced the theoretical and methodological bases of applied linguistics in a decisive manner (Gutiérrez Ordóñez 2004: 535). Beyond the realm of second/foreign languages, in general, a common distinction has been made between cognitive and social pragmatics (Escandell Vidal 2018: 19). Cognitive pragmatics deals with the mental mechanisms that make it possible for speakers to communicate successfully, investigating the processes underlying the bridging of the gap between "encoded meanings of words and sentences and the full-blown speaker's meaning" (Zufferey 2015: 16); social pragmatics considers that language use "involves *cognitive* processes, taking place in a *social* world with a variety of *cultural* constraints" (Verschueren 2009: 1; see also Verschueren 1999)[93], and thus aspires to analyze how social communication practices affect, create or develop interpersonal relations between interlocutors and, in general, social relations. Both approaches to pragmatics, however, "are intrinsically interwoven and cannot be understood without each other" (Escandell Vidal 2018: 19 and references therein), and as a result, both of them have been addressed by L2-research (Zufferey 2015). Cognitive and socio-cultural approaches to L2 pragmatics, furthermore, also share their basic aims: comparing non-native with native performance in the production or in comprehension or pragmatic phenomena, and analyzing potential *pragmatic transfer*, that is, "the influence exerted by learners' pragmatic knowledge of languages and cultures other than L2 on their comprehension, production and learning of L2 pragmatic information" (Kasper 1992: 207). L2 learners' developing pragmatic competence has been termed "interlanguage pragmatics" (ILP)[94] (idem).

Studies focusing on the socio-cultural component of pragmatics take L2 speakers as *intercultural speakers*, that is, as "linguistically and interculturally competent" users of languages (Taguchi 2017: 157). As such, they possess a (more or less developed)

[93] Besides highlighting the importance of social and cultural factors for studying linguistic behavior compared to cognitive approaches (but see Sperber & Wilson 1997 for a response of criticisms of RT not involving such aspects in linguistic analysis), Verschueren (1999, 2009) considers pragmatics as a *perspective* of the study of language (rather than as a component of a linguistic theory)

[94] Bardovi-Hartlig (1999, 2013) suggests distinguishing between ILP and acquisitional pragmatics. ILP refers to L2-pragmatic performance, while acquisitional studies approach the development of pragmatics in non-native speakers.

intercultural communicative competence allowing them "to perform 'effectively' and 'appropriately' when interacting with others who are linguistically and culturally different from oneself" (Fantini 2006: 12, apud Fantini 2012: 271). Major subject matters of these studies have been politeness (cf. Félix-Brasdefer 2013a and references therein) and speech acts (Wierbizcka 1985; Kasper and Rose 1999 for an overview; *Cross-Cultural Speech Act Realisation Project* [CCSARP], Blum-Kulka et al. 1989; Bardovi-Harlig 2010, 2013; see also Félix-Brasdefer 2013b and references therein). Taken together, studies confirm that even highly proficient non-native speakers experience difficulties with the comprehension and production of speech acts due to the strong culture-specific anchoring underlying their linguistic realization (Zufferey 2015: 184-185). Sociopragmatics has also studied L2 conversational management, notably turn-taking (cf. Pekarek Doehler & Pochon Berger 2015 for a review of results), under the tenet that each culture has its own interactional rules and, as a result, conversational discursive patterns may differ between cultures and hence must be taught (Albelda Marco & Fernández Colomer 2006: 3).

Research on socio-culturally oriented trends in pragmatics often draws on spoken or written learner corpora with an aim to analyzing the communicative behavior of large population samples and extract statistical generalizations from data (Escandell Vidal 2018: 19). Thus, commonly, research procedures consist on the selection of participants, the collection of their spoken or textual productions and the systematization and treatment of the compiled corpus (Borreguero Zuloaga & Gómez-Jordana 2015: 24).

L2 studies adopting a cognitive or inferential view of pragmatics address how and to what extent the gap between what is said and what is communicated affects success and failure of communication in an L2. A basic tenet thereof is that misunderstandings between speakers of different languages and/or cultures often do not arise because of encoding mistakes, but produced precisely when non-native speakers "are not engaged in a linguistic decoding task but are about to discover what the informative intention of the speaker is (…)" (Moeschler 2007: 69). As in socio-pragmatic approaches to L2 acquisition, investigating the implicit or inferential part of communication also helps give account of a learner's *interlanguage pragmatics* (Kasper 1992) and the development pace of inferential aspects of pragmatic competence.

Cognitively-oriented studies of any component of linguistic behavior set their focus on “the processes put to use by L2 learners when they produce or comprehend utterances in their target language, and how the underlying representations are best modelled” (Schimke & Hopp 2018: 2). As concerns pragmatics specifically, L2-research has been devoted to studying non-native speakers’ abilities to process figurative language and to retrieve explicatures and implicatures from linguistic input (Zufferey 2015: 177 ff.). Figurative language being out of the scope of the present study, we offer in what follows key research findings on the recovery of explicatures and implicatures in second languages.

Inferential processes are deeply entrenched with cultural aspects of the target language (and, hence, of its speakers), further proof that studies about inferential pragmatics and socio-pragmatics cannot be considered separately. Besides decoding, inferencing is essential to recognize the speaker’s intention and recover a communicated assumption (see chapters 1 and 2). This implies interpreting contextual clues—the set of assumptions available to them in that particular situation to access implicated premises that lead to implicated conclusions or contextual effects (Sperber & Wilson 1995[1986]; Carston 2002a, 2002b). Contextual clues include world knowledge, which is known to be culture-dependent (Moeschler 2007: 83) so it is logical to expect that situations of intercultural communication are more prone to result in false attributions of beliefs which, in turn, would lead to erroneous derivation of a communicated assumption. In other words, mastering language is not on a par with sharing the same cultural assumptions. The risk of falsely attributing beliefs and knowledge to another speaker could even be higher as proficiency in the L2 increases, thus leading to cases of intercultural misunderstandings (Moeschler 2007: 85).

A notable body of L2-research on inferential pragmatics has dealt with the online cognitive mechanisms underlying the recovery of implicatures and explicatures and has resorted to experimentation to that purpose. Experiments can provide insight into mental processes that come into play during communication (Sperber & Noveck 2004; Sandra 2009; Noveck 2018).

Disambiguation, reference resolution and further pragmatic enrichment processes as mechanisms to carry out the sub-task of the comprehension process leading to the recovery of explicatures (Wilson & Sperber 2004: 615) have been approached in L2 research. Among them, a major object of inquiry for experimental studies has been referential coherence, in particular the cues that contribute to anaphora resolution. Investigating the effects on L2 online processing of these linguistic mechanisms is in so far particularly illuminating because their cognitive handling is influenced "by a number of potentially interacting constraints, including morphological, syntactic, semantic, and discourse level constraints." (Felser & Cunnings 2012: 599, see also Sorace & Filiaci 2006). These studies have as major questions whether L1 and L2 resolution of the cues that contribute to anaphoric or cataphoric coherence[95] (Givón 2005: 134) differ and whether potential L1 transfer effects deploy during L2-processing (cf. Roberts et al. 2008: 337-339 for a review)[96]. For instance, Felser and Cunnings (2012) found that during processing L2 speakers rely more heavily on discourse-level constraints (e.g., topichood or world knowledge) rather than on structural cues to resolve anaphoric expressions, specifically reflexives (*himself*, *herself*), irrespective of whether the L1 and L2 are structurally similar. This finding is in line with Clahsen and Felser's *Shallow Structure Hypothesis* for L2-processing (Clahsen & Felser 2006, see §4.5.1 below), according to which L2 structural processing "is compromised in L2 processing" (Felser & Cunnings 2012: 600). Stronger recourse to discursive information by non-natives has been confirmed in further studies on online pronoun resolution (cf. Felser 2018 for an overview), thus giving account of "general learner effects" (Roberts et al. 2008). Similarly, integrating information from different sources, as required for successful anaphora resolution, is equally more problematic for speakers of an L2, even at very high L2-proficiency levels (idem). Importantly, L1 transfer effects found in online pronoun resolution in ambiguous cases seem to be due to pragmatic transfer. As Roberts et al. put it, syntactic ambiguities are "caused by syntax and must be resolved by pragmatics, at it is at the level of pragmatics that the L1 appears to exert its influence" (idem: 353). In sum, while most studies confirm differences in L1 and L2 performance, no final answer

[95] "(…) [A]naphoric referents are those for which the speaker assumes that the hearer already has a pre-existing accessible mental representation. The grammar of anaphoric reference cues the hearer about how to ground the current referent onto its co-referent node in the pre-existing mental representation." (Givón 2005: 134).

[96] Reference is made exclusively to adult L2 learners. For recent evidence on children's processing, see Klages & Gerwien (2018).

can be yet given as to L1 transfer effects. Indeed, at least in research at the sentence-discourse interface, inconsistencies in the results seem to be due to methodological differences and to the specific phenomena under study (Hopp 2009; Zufferey 2015: 188; Zufferey et al. 2015).

Studies addressing the inferential comprehension process are still unrepresented in L2-research (Taguchi 2012: 30). In general, evidence points towards more costly comprehension of implicatures when these do not have shared assumptions (i.e., when these are culture-specific) as the basis for inferencing. When, on the contrary, conventions are shared by the L1 and L2 pragmatic system, positive pragmatic transfer seems to occur (Taguchi 2007, 2012)[97]; and posit also a higher difficulty of conversational compared to conventional implicatures. L2 learners' comprehension is suggested to follow "a progression from the stage where meaning is conveyed through strong cues (i.e. signals of conventionality) to the stage where a message does not involve any obvious signals and thus require a series of inferential clues to arrive at meaning" (Taguchi 2012: 244). In sum, findings from quantitative and qualitative methods seem to suggest that culture-specific conventions lie at the basis of intercultural pragmatic failure. They are also a further sign that exploring the retrieval and comprehension of inferred meanings from a cognitive perspective does not stand at odds with socio-pragmatic approaches. On the contrary, a comprehensive view of inferential phenomena requires anchoring cognitive-oriented proposals with intercultural aspects involved in non-native communication. This is the case in Moeschler's (2007) theoretical and empirical analysis of misunderstanding in intercultural communication, which the author ascribes to "the empirical domain of *intercultural pragmatics*" (idem: 86, italics as in the original). Moeschler proposes that explicatures are "the core layer for investigating intercultural pragmatics" (idem) and a "minimal requirement for successful intercultural communication" (idem: 83). In other words, intercultural misunderstandings often arise when higher-level explicatures are not retrieved correctly due to false attribution "of beliefs and knowledge to each other that [the interlocutors] in fact do not possess" (idem: 86). According to Moeschler, thus, strong misunderstandings in intercultural communication are not the consequence of a

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[97] For a discussion of positive (pragmatic) transfer as stated in Cummins' Interdependence Hypothesis (Cummins 1984) see below, § 4.4.2.

lack of shared beliefs or knowledge, which stands at odds with the "implicature-first" thesis (cf. Taguchi 2007, 2012). Further misunderstandings are identified by Moeschler too that imply erroneous retrieval of implicated premises and conclusions. The potential this approach to intercultural misunderstandings is enormous for "[d]iplomatic negotiation, trade, academic cooperation, and social encounters (…)" (idem: 87).

A major point of inferential pragmatics lies in the conception of communication as an ostensive-inferential process. From that viewpoint it is logical to expect that speakers make use of inference-guiding devices to alleviate the addressee's effort in arriving at the intended meaning; in turn, to recover the speaker's meaning, communicatively competent addressees will be expected to be able to seize the processing instructions present in the discourse. This view of communication underlies a distinction between conceptual and procedural-meaning expressions put forward by Relevance Theory (Sperber & Wilson 1995[1986]; Blakemore 1987; 2002; see chapter 2). In particular the fact that procedural meaning is rigid (Leonetti & Escandell Vidal 2004; Escandell Vidal & Leonetti 2011) and not accessible to consciousness (Wilson & Sperber 1993: 16; Wilson 2011) poses two major questions for L2 research. The first one would be of a paradigmatic nature: Do procedural and conceptual meanings influence processing differently? The second one would be of a syntagmatic nature: How do procedural instructions affect the processing of conceptual meanings?

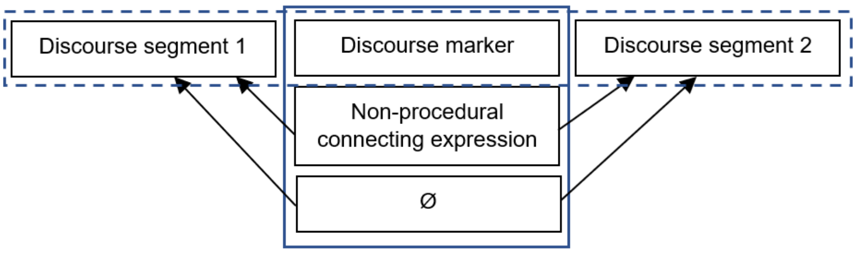

Figure 6. Paradigmatic and syntagmatic relations of procedural and non-procedural expressions in connected discourse

4.3. *Discourse markers in L2 research*

As procedural-meaning devices that act as constraints to inferential processes during communication (Blakemore 1987, 2002; see chapter 2), discourse markers[98] (DM) are specially challenging for non-native speakers (DPDE, *Introduction*; Fuentes Rodríguez 2010; Escandell Vidal et al. 2011; Zufferey 2015; Zufferey et al. 2015; Zufferey & Gygax 2017). At the same time, however, being able to use and understand discourse markers in an L2 is essential to develop a fully-fledged communicative competence. Specifically, "[m]astering the use of discourse markers is fundamental to develop *discourse competence*, that is, to organize discourses, as well as *pragmatic competence*, since discourse markers are a component of interactional strategies." (DPDE, *Introduction*, italics as in the original). Discourse markers, indeed, "contribute for a non-native speaker's discourse not to be perceived as 'harsh' or at least as clearly 'non-idiomatic' (…) (with all negative consequences that that could bring about in social interaction)" (Busse 1992: 39).

Several factors have been identified as potential explanations of the complexity of DM for L2-learners. A major issue is the complex form-function mappings of the semantics of DM across languages (Portolés Lázaro 2002; Zufferey 2015; Zufferey & Gygax 2017). Adequate managing of DM requires accessing to their full functional meaning, i.e., to their processing instructions. Often, however, non-native speakers erroneously transfer bundles of instructional features to a given DM in the L2 from the most accessible equivalent DM in their L1; or, vice versa, they do not grasp instructions encoded by a DM in their L2 because the most accessible equivalent in their L1 does not encode them. In other words, learners attribute functions to a DM that are not the same in the other language, since, across languages, "there is a general correspondence between the markers, but certainly not an exact mapping"[99] (Fraser 1999: 950, see also Portolés Lázaro 2002; Borreguero Zuloaga 2011; Zufferey & Cartoni 2012).

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[98] Procedural meaning is not exclusive to discourse-marking devices. Discourse markers have been, however, the most productive topic of studies dealing with the conceptual/procedural distinction (Escandell Vidal et al. 2011: XXII). The varieties of procedural meaning (discourse markers, mood indicators, modality, intonation, referential expressions) are dealt with in Escandell Vidal et al. (2011).

[99] As a fundamental reason for the lack of perfect equivalents for DMs across languages, Portolés Lázaro (2002: 154) adduces the fact that some DM still exhibit some reminiscent features of the conceptual devices

Studies of discourse markers in non-native discourse are still rather scarce compared to studies dealing with the comprehension, the processing or the production of other components of languages:

> In the literature on second language acquisition (SLA), the field of discourse markers has been largely omitted so far (…), even though pragmatic competence in terms of knowing the cultural values of the second language, for example, is recognized as being essential for successful communication. (Müller 2005: 1)

4.3.1. Corpus-based L2 research on discourse markers

A plethora of works about discourse markers in non-native discourse are corpus-based and hence deal with production. In many of them, learner-corpora are compared with texts produced by native speakers of the language/s at issue. Some corpus studies have addressed L2 use of DM as essential devices to manage communication successfully in—mostly spoken—social interaction, thus focusing on conversational and contact-regulating DM[100] (Kim 2009, Aijmer 2011; for Spanish L1 or L2, works by the A.Ma.Dis group[101]; Borreguero Zuloaga & Thörle 2016; Borreguero 2019; Vande Casteele & Collewaert 2019; Koch & Thörle 2019, among others). Mastery of their use is taken to be a good indicator of the developmental state of learners' discursive, functional and design competence (cf. figure 4) and has also been taken as a sign of fluency in the L2 (Fant 2012). Other corpus-based works focus on non-native production of DM acting at the discourse-level, like connectives and discourse operators (Kielhöfer & Poli 1991; Lamiroy 1994; Granger & Tyson 1996; Müller 2005; Shea 2009; for Spanish, Vande Casteele & Collewaert 2013; Bustos Gisbert & Gómez Asencio 2014; Vázquez Veiga & Donís Pérez 2015); on reformulation markers (Murillo 2012); or information-structuring

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they stem from: "However still has a clear link to the adverb *ever* and with the productive paradigm it gives rise to: *forever*, *whatever* (…). In turn, the meaning of Spanish *no obstante* ['however'] is intimately related to the meaning of the verb *obstar* ['impede'] (…).

[100] Conversational markers are those prototypically used in conversation. They comprise epistemic markers (*of course*, *apparently*…); deontic markers (*fine*, *alright*…); markers of alterity (*look*, *man*, *listen*…); and conversational meta-discursive markers (*well*, *I mean*…) (Martín Zorraquino & Portolés 1999: 4143-4145).

[101] Research Group A.Ma.Dis, Universidad Complutense de Madrid (Spain), www.marcadores-discursivos.es.

operators (Andorno 2000; Benazzo & Paykin 2017; Caloi 2017). Discourse structuring devices (*on the one hand… on the other…*; *firstly…*; *secondly…*) have been dealt with by Bustos Gisbert et al. (2014) in an extensive corpus study. The authors also explore the use of temporal, spatial and argumentative connectives (additive, causal, counter-argumentative) as well as reformulation markers by L2 speakers of Spanish with English, Italian or Portuguese as their L1. According to their analyses, misuses of connectives in the L2 do not affect all sorts of DM equally and also depend on the learners' L1, their proficiency level or the text type. In general, evidence points to a formal reconfiguration of DM by non-native speakers (for instance, **en hecho* instead of *de hecho* 'indeed', 'in fact'); or to functional reassignment leading to a widening of the functions allowed in Spanish for certain connectives (e.g., *entonces* misused as an equivalent of *por eso* 'that is why', *al principio* 'initially', *pues bien* 'well').

As concerns frequency of use, taken together, corpus-based analyses studies generally point to either an overuse or an underuse of discourse markers by learners, even by highly proficient ones, mainly due to L1 transfer of strategies to convey and/or mark the discourse relations at issue. In cases where frequency is native-like, the type of DM used by L2 speakers is often not (cf. Vande Casteele & Collewaert 2013; Bustos Gisbert et al. 2014). Erroneous uses of DM are also reported in corpus-based studies, thus evidencing the complexity attributed to these units arising from their procedural meaning and the lack of perfect functional equivalents between the L1 and the L2. All in all, however, evidence varies across markers and their functions (Zufferey 2015: 185).

Besides corpus-based studies, further empirical investigations have resorted to offline and online experiments to account for possible effects of discourse marking in L2 discourse comprehension and processing. These methodologies address discourses as *activities* rather than products (Coseriu 1955-56; Loureda et al. 2019).

4.3.2. Experimentation in L2 research on discourse markers

Experimental methods employed in SLR have their roots in methods developed and traditionally used in the field of psycholinguistics. Depending on the extent to which a method can access mental and neuronal processes, experimental methods can be classified in offline, online and true online methods (Mertins 2016: 16)[102]:

a) *Offline methods* do not provide direct access to mental processes. They reflect conscious decision-making and tasks are solved with a time delay. Examples of offline methods are untimed questionnaires.
b) *Online methods* provide mediated access to mental processes. As a result, the processes they tap onto are "more automatized and more conscious" (idem). Tasks are solved with a short time delay. Eye-tracking processing studies, self-paced reading or the Visual World Paradigm (Huettig et al. 2011) pertain to this category.
c) *True online methods*, finally, tap onto immediate mental processes. Thus, they give account of "highly automatized and unconscious mental and neuronal processes" (idem) An example of a true online method is electroencephalography (EEG).

In the field of second language acquisition, the decision to resort to offline or online experimental methods is often dependent on whether the researcher is trying to explore learners' implicit or explicit knowledge (Zufferey et al. 2015: 393), because of the tight link between each type of knowledge with more or less conscious and automatic processes. Implicit knowledge of a language is tacit and has been internalized; explicit knowledge, conversely, is conscious and can be seen as a tool for L2-learners to "achieve self-control in linguistically demanding situations" (Ellis 2009a: 13). In L2 research, hence, methods such as offline grammaticality judgments or rule-induction tasks would provide insight into explicit knowledge, while on-line measures as employed in eye-tracking reading experiments give account of learners' intuitive processing of certain linguistic phenomena (Zufferey et al. 2015). Criteria constitutive of implicit and explicit knowledge can be operationalized as follows (Ellis (2009b: 39):

[102] The advantages and disadvantages of each kind of method are also dealt with in Mertins (2016: 16-18).

Criterion	*Implicit knowledge*	*Explicit (analyzed) knowledge*
Degree of awareness	The task requires the learner to respond according to 'feel'	The task encourages the learner to respond using 'rules'
Time available	The task is time-pressured	The task is performed without any time pressure
Focus of attention	The task calls for a primary focus on meaning	The task calls for a primary focus on form
Systematicity	The task results in consistent responses	The task results in variable responses
Certainty	The task results in responses that the learner is certain are correct/incorrect	The task results in responses the correctness/incorrectness of which the learner is uncertain about
Utility of knowledge of metalanguage	The task does not require the learner to use metalinguistic knowledge	The task invites the learner to use metalinguistic knowledge
Learnability	The task favors learners who began learning as children	The task favors learners who have received form-focused instruction

Table 12. Operationalizing the constructs of L2 implicit and explicit knowledge (Ellis 2009b: 39)

Offline methods have a longer tradition than online methods in L2 research (Conklin & Pellicer-Sánchez 2016), but given the distinct processes they tap onto, both methods are sometimes combined (cf. Zufferey et al. 2015; Zufferey & Gygax 2017 for non-native processing of DM). The perception of the adequacy of connectives by L2 speakers has been addressed most frequently by means of acceptability judgment tasks and sentence completion tasks (Zufferey et al. 2015: 392-393), both of which provide insight in conscious mental processes. Comparatively, the use of online and true online experimental methods in L2-research on discourse markers is strikingly underrepresented, as will be shown further down below.

As in corpus-based studies on discourse markers (§ 4.4.1), evidence from offline experiments also seems to point to diverging results depending on the phenomena and the L2 population under study, with the literature on the topic reporting either facilitating effects of discourse markers, interfering effects or no effects (Degand & Sanders 2002: 739). Evidence of L1 transfer can also be or not be the case depending on whether it stems from an online or an offline experiment (Zufferey 2015: 393).

In a series of offline comprehension studies aimed at determining the effect of several features of DM on reading comprehension in the L2, Lahuerta (2002, 2009) showed that for L2 speakers of English (L1 Spanish) explicating discourse relations by means of DM helps learners identify the rhetorical structure of texts and brings about a general advantage for reading comprehension, particularly when readers are not familiarized with the topic of the text. This is in line with results obtained for L1 reading comprehension pointing to a stronger comprehension enhancement of DM of non-expert versus expert readers (Noordman & Vonk 1992; Zunino et al. 2012a, 2012b; Zunino 2014; van Silfhout et al. 2015; and references in Zunino 2017c). Furthermore, infrequent or specially challenging uses of DM seem to hamper reading comprehension, while orthodox uses of DM have a facilitating function (Lahuerta 2003).

Positive effects for comprehension are confirmed in other studies, albeit for participants familiarized with the topics at issue and highly proficient in the L2. In an experiment with native speakers of French and Dutch with Dutch and French as their L2 respectively, Degand and Sanders (2002) checked whether explicit causal linguistic marking by means of causal connectives (French and Dutch equivalents of *so*, *since*, *because*…) or causal signaling phrases (French and Dutch equivalents of for instance *the reason for this is that*… or *a consequence of this is that*…) led to better comprehension of expository texts in their L1, in their L2 or in both languages. The experiment consisted of a battery of expository texts followed by a question-answering task. The authors found that all participants, irrespective of their mother tongue, benefited from the presence of linguistic signaling (both phrases and connectives), and that the positive effect of explicit causality marking as concerns comprehension was similar when participants read in their L1 or in their L2. The authors concluded that the absence of interaction effects of language and performance in the comprehension test might attributable to the very high proficiency in the L2 of both groups of non-native speakers. Specifically, results might reflect a case of positive pragmatic transfer in the sense of Cummins' (1984) Interdependence Hypothesis, according to which linguistic and cognitive skills can be transferred from the L1 to the L2 (Degand & Sanders 2002: 753) once a threshold level has been reached in the L2. In the case of discourse relations, positive transfer would occur from a certain proficiency level on: "As soon as readers master an efficient reading strategy in their mother tongue, including the ability to utilize and infer coherence relations in discourse, they can transfer this skill to another language, *provided they have also developed a sufficiently high L2 competence level*." (idem, emphasis is mine). Finally, the authors raise a major question for second language research, namely how high or low is must be the level of mastery of the L2 so that positive transfer phenomena at the discourse level can occur. In fact, as concerns the instructional meaning of connectives in particular and pragmatic transfer in general, the broader question would be whether there is a correlation between certain pragmatic phenomena and certain proficiency levels. Research results therein would have a major impact on L2 learning and teaching practices and materials design.

In contrast with Degand and Sanders (2002), other authors have found evidence of negative pragmatic transfer in offline tasks dealing with connectives. In a grammaticality judgment test, Zufferey et al. (2015) found evidence for L1 negative transfer in the responses of their participants when they were asked to assess misuses of connectives. When the incorrect uses of a connective correspond to licensed uses of the most direct equivalent in their L2, even highly proficient speakers fail to identify the misuse. Learners thus seem to confer functions to the connective in the L2 that are only possible for their L1 equivalent. The complexity to perform native-like in the experiment is explained tentatively by the authors by resorting to the inaccessibility to consciousness of procedural meaning (see above and chapter 2). Advanced L2 speakers' struggle to integrate the procedural meaning of discourse connectives when these exhibit complex form-function mappings as to the participants' L1 has been also proved experimentally by Zufferey & Gygax (2017). Lack of adequate understanding of a certain connective leads L2 readers to preferring implicit over explicit utterances, even when implicitness leads to incoherency. This could suggest that L2 show a preference for inferential processing of discourse relations holding between two segments when the semantics of the explicated connective is unclear for them. In other words, when procedural meanings cannot be accessed (due to insufficient knowledge), conceptual meanings might be the hotspot for the recovery of a communicated assumption, at least in tasks tapping onto explicit knowledge. As just argued for similar results from other studies, this finds a further explanation in the inaccessibility of connectives (and, in general, of procedural-meaning devices) to consciousness. In contrast with these data, Ivanova and Bello (2019) report native-like performance by advanced non-native speakers of English (L1 Spanish) in a study on the focus operator *even*. When asked about the implicatures introduced by *even*, L2 readers seem to fully grasp the procedural meaning of the connective and identify the utterance's contrastive focus (Rooth 1985) as (informatively) less expected than the elements forming the alternative of the utterance. This further supports the idea that different pragmatic phenomena, for instance different types of procedural instructions (connecting versus information-structuring instructions), lead to different results in terms of pragmatic transfer (Zufferey 2015).

Combining offline with online experimental techniques is most common in the realm of second language research. Online procedures allow researchers to explore performance of non-native speakers in real time compared to native speakers and, thus, to make claim about implicit and automatic processes which are not accessible otherwise. As Roberts (2012: 114) puts it, online techniques can bring researchers closer to finding out whether eventual differences between L1 and L2 processing are due to capacity limitations of the latter, as put forward by some theories on L2 processing (Hopp 2010), or rather to fundamental differences between L1 and L2 processing procedures (Clahsen & Felser 2006) (see § 4.5).

Research available so far on the effect of connectives for online processing has provided inconclusive evidence. Findings about (positive or negative) transfer phenomena from the L1 also differ across online or offline tasks (see above).

Zufferey et al. (2015), for instance, found native-like performance by their L2 participants in an online reading study. L1 and L2 participants were equally sensitive to misuses of connectives. Interestingly, for the L2 group this was so even when the misuses corresponded to licensed uses of the most direct equivalents of those connectives in their L1, thus showing no traces of negative L1 transfer. Zufferey & Gygax (2017) found no evidence of L1 negative transfer in a self-paced reading task aiming at determining whether incoherency coming from the absence of a connective is detected by L2 speakers. The authors report a smaller impact of implicitness (= incoherency) for non-native speakers, albeit apparently due to task-related capacity limitations of working memory

(Hopp 2010). Otherwise, the connectives facilitate processing similarly for L1 and L2 speakers.

Ivanova and Bello's eye-tracking reading study (2019) does not provide evidence for L1 transfer effects either. Instead, the authors found that, while L1 speakers pay more attention to procedural marks (the focus operator *even*) to recover a communicated assumption, non-native speakers are more prone to resort to conceptual-meaning expressions. Again, this could be a further indicator that procedural meanings are specially challenging linguistic expressions for non-native speakers, and that inability to make use of their instructions to a full extent leads L2 speakers to use implicit compensation strategies based on word-knowledge. Note that this would be partially in line with Clahsen & Felser's Shallow Structure Hypothesis (2006a, 2006b, cf. § 4.5.2).

All in all, evidence reported so far from experimental tasks designed to explore implicit and explicit knowledge of discourse markers, specifically connectives, by non-native speakers and eventual differences with L1 speakers leaves a panorama of diverging results depending mainly on a) the experimental paradigm resorted to (online vs. offline, but also different offline/online experimental settings); b) the sort of pragmatic phenomena under study; c) the characteristics of the participants (most prominently L2 proficiency). This is in line with findings for other linguistic phenomena, which are also dependent on these factors (Kaan 2014: 259-260). Experimental studies on discourse markers dealing with L2 processing are still scarce and evidence does not point in a sole direction in a clear-cut way. The findings of studies carried out so far, however, provide the ground for future work in how specific pragmatic phenomena affect second language processing, production and comprehension. Data gathered experimentally are valuable to L2 researchers "because they can be used to further refine SLA theories, including implicit and explicit learning theories" (Godfroid & Winke 2015: 334).

4.4. *Factors influencing L2 discourse processing*

Cognitively-grounded theories of second language processing formulated along the past decades provide valuable insight into the mental processes involved in non-native processing of different types of linguistic and non-linguistic input in an L2 (for a review, see VanPatten 2014; see also Hopp 2007). These theories have also shed light into whether such input affects L2 speakers differently than native speakers. In general, however, in the field of second language acquisition and learning, processing theories focus on cognitive phenomena underlying morphological, lexical and syntactic processing, thus reaching up to the sentence level. L2 discourse processing has been dealt with less extensively, with most research concerning the syntax-discourse interface, most prominently reference resolution (cf. § 4.3) and information structure as a constraint on the syntax of discourses (Hopp 2007: 47-51 for a review and discussion of empirical studies addressing the syntax-discourse level; see also Sorace 2005; Hopp 2018).

Taken together, theories or models of L2-processing focus on L1-transfer phenomena (e.g., the Revised Hierarchical Model, Kroll & Tokowicz 2005; or the Modular On-line Growth and Use of Language, MOGUL, Truscott and Sharwood Smith 2004), or attribute differences in performance by L2 speakers to linguistic or cognitive (resource-related) limitations of the latter (the Late Assignment of Syntax Theory (LAST) by Townsend & Bever (2001); Ferreira's (2003) "good-enough" model; Sorace's (2005, 2011) Interface Hypothesis; or the Capacity model, (McDonald 2006), leading to non-target-like (= non-native-like) performance and less automatized processing.

Since this study is concerned with how different types of meanings (conceptual meaning and procedural meaning) affect L1 versus L2 discourse processing, transfer phenomena will be left aside. Instead, it is posited that L2 processing may be a function of computational capacity, in turn defined by the participants' linguistic competence and the task demands they are confronted with (= the conditions at issue) as set out above (§ 4.2), and governed by participants' ability to attribute their interlocutors the required beliefs to access a relevant mental representation of utterances and achieve contextual effects.

4.4.1. Capacity and working memory limitations in L2 processing

It was suggested (§ 4.2) that cognitive factors as a component of learners' competences are determinant of learners' abilities to deal with different tasks. Capacity models addressing processing in a foreign language take limitations in the cognitive resources of L2 users engaged in a linguistic task as the triggers for differences between L1 and L2 processing.

A number of factors (time pressure, linguistic complexity, etc.) can change qualitatively the mental activity one individual is engaged in and thus constrain the sort of contexts he is able to access in a given situation (Sperber & Wilson 1995: 138). Thus, since utterance interpretation implies taking into consideration "whatever information is most highly activated by the automatic working of the cognitive system at the time" (Wilson 2005: 1141), if the cognitive system is overstrained, the assumptions that a competent speaker expects his (non-native) interlocutor to activate may remain unrecovered or be retrieved only in a sketchy manner. Along this line of argumentation, we argue that L2 processing requires a higher allocation of cognitive resources than processing in the L1. Specifically, it is suggested that the enhanced cognitive effort required in L2 processing affects working memory, defined as "the ability to store and process information simultaneously" (Taguchi 2008: 523). Working memory capacity has indeed been found to correlate directly with performance in complex cognitive tasks involving linguistic processing (Haarmann 2013: 697) and with accuracy or completeness of an interpretation (Christianson et al. 2006). As a result, if working memory capacity is compromised due to cognitive overstrain during L2 processing, more effortful processing but sketchier representations are expected for non-native readers. This pattern is expected to be more pronounced as task complexity increases.

Detailed explanations of a sketchy retrieval of information during utterance interpretation due to increased cognitive load have been provided by and modeled as the Good Enough Processing Theory (Ferreira 2003; Ferreira et al. 2002, henceforth GEPT). The GEPT has found that, in occasions (e.g., when confronted with garden path phenomena), L2 readers make an initial misinterpretation of an utterance which is not completely overwritten during reanalysis. As a result, the initial misanalysis may linger after the reanalysis stage: interpreting new input (as occurs during the stage of reanalysis) is done "without having completely pruned interpretations that are no longer compatible with this input" (Slattery et al. 2013: 115). Although the GEPT aims at explaining non-native parsing, we suggest that its findings can be applied at the discourse level as well.

In this sense, under high cognitive constraints, L2 speakers would hold on to the initially recovered assumption rather than overwrite it with the input processed during the re-reading stage.

As concerns the present work, stronger capacity limitations are posited as pragmatic competence decreases and as task demands increase. Thus, the L1 group is expected to outperform L2 readers all tasks in the sense of less effortful processing of the (theoretically) less complex condition. This should be especially visible in studies 3 and 4, where readers are confronted with pragmatic mismatches that require accommodation and, thus, a considerable amount of re-processing or re-analysis.

Taken together, under the umbrella of limitations in cognitive resources further factors have been found to lie at the basis of the principles governing L2 processing and contribute to modeling potential differences between L1 and L2 processing. Chiefly among them are considerations of *processing shallowness* (§ 4.5.2), *automaticity* (§ 4.5.3) and *epistemic vigilance* (Sperber 1994; Wilson 1999; Sperber et al. 2010, see also § 4.5.4):

Conceptual notions underlying L2 processing	
Capacity limitations (Working Memory)	*Shallowness*
	Automaticity
	Epistemic vigilance

Table 13. Conceptual notions underlying L2 processing

4.4.2. *The Shallow Structure Hypothesis of L2 processing (Clahsen & Felser 2006a, 2006b, 2006c)*

Clahsen and Felser's Shallow Structure Hypothesis (SSH, 2006a, 2006b) belongs to the category of models of L2 processing that conceive of L2 resources as qualitatively different from those brought to bear during L1 processing. Specifically, it addresses the question of whether L2 learners can achieve native-like performance in their L2. According to the SSH, L2 speakers' behavior differs from that of native-speakers in that the former do not achieve full parsing during comprehension. L2 speakers lack sufficient grammatical knowledge to parse linguistic input in a native-like manner, which results in *shallow processing*[103], that is, in the partial computation of syntactic structures and, consequently, in less detailed syntactic representations. Shallow processers are considered to rely more on lexical and pragmatic (e.g., world knowledge) than structural information (Clahsen & Felser 2006b: 17). Importantly, the SSH posits that L2 comprehension is achieved despite deficits in grammatical computations (i.e., despite shallower parsing) as far as non-native users' semantic and pragmatic knowledge compensates for it: "[s]uch shallow processing is often accompanied by reliance (or overreliance) on lexical, semantic, and pragmatic information, which can lead to seemingly trouble-free comprehension in ordinary communication" (Sorace 2011: 89). Deficient parsing, thus, can be compensated for by L2 speakers by relying more heavily on pragmatic information:

> Adult **learners' ability to use** metalinguistic information, **world knowledge, and pragmatic inferencing**, and to match associatively stored meaning and form patterns to the input, will further **help them to become generally successful L2 comprehenders**. (Clahsen & Felser 2006c: 118, emphasis is mine).

The interpretive routes available for interpretation are depicted in figure 7:

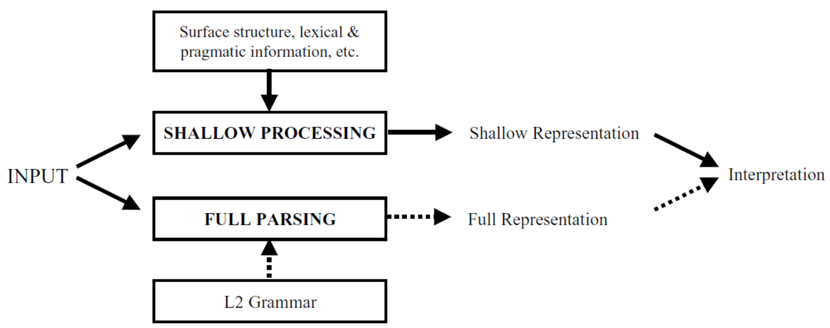

Figure 7. (Clahsen & Felser 2006c: 119). Routes potentially available for interpretation according to the SSH: "the full parsing route is underused in L2 processing due to inadequacies of the L2 grammar." (idem: 118)

[103] According to Clahsen and Felser, "shallow processing does not seem to be unique to L2 learners." (2006a: 33); instead, "it looks as if shallow processing is an option available to the human language comprehension system in principle. What we suggest here is that contrary to native speakers, adult learners are largely restricted to this option in L2 processing, computing representation for language comprehension that lack syntactic detail (…)." (idem: 34).

The over-reliance in pragmatic information posited by the SSH for non-native processing, however, poses the question as to which interpretive routes are exploited when L2 speakers are confronted with pragmatic implausibility, as is the case in studies 3 and 4 of this work. Compared to pragmatically plausible utterances, pragmatic mismatches arising from a conflict between mind-stored assumptions and the rigid semantics of connectives put a strain on processing resources, and do so in the L1 and in the L2, given that they require the performance of accommodation processes (Recanati 2004; Escandell Vidal & Leonetti 2011). However, in the case of L2 readers, such mismatches could hamper the access to pragmatic information, so that both the full-parsing and the shallow-parsing route would be compromised, albeit differently for the L2 groups. While the SSH sees the reason for non-native-like parsing in a deficient underlying L2 grammar, we argue that differences in performance during accommodation processes ca be explained in terms of shallowness but is due to *limitations in processing resources*[104]. More specifically, we propose to broaden the notion of *shallowness* as follows:

a) Shallowness or depth in processing are best treated as a continuum.
b) Shallowness also applies to cases in which also the shallow processing route itself is affected, as in pragmatic mismatches, and thus to the discourse level.

This management of the notion allows arranging the performance of learners at different stadiums of the L2 acquisition process in different points of a continuum of processing depth. L2 learners developing a native-like grammar—a possibility in principle conceded by Clahsen and Felser (2006c: 118, 121)—would thus be closer to the pole of less shallowness/higher depth:

[104] Clahsen and Felser' SSH postulates are based on comparing eye tracking online processing data of children L1 and adult L1 and L2. Children seem to use the same parsing routes during sentence processing than L1 adults, and to differ from them in lexical and morphological processing as a result of "children's relatively limited short-term memory" (Clahsen & Felser 2006c: 108). This suggests cognitive limitations in children similar to those argued here for L2 learners in cases of mismatch-management (§ 4.5.1 above).

Figure 8. Continuum of processing shallowness

In light of the above, when forced to carry out accommodation processes as a result of mismatches of procedural instructions and contextual assumptions, particularly effortful processing (= particularly high reading times/condition effects) due to cognitive overstrain is expected for L2 readers compared to the group of native speakers, who are expected to recover from the mismatch less effortfully due to their available cognitive resources.

4.4.3. Automaticity in L2 processing

Models at whose basis are considerations of automatic versus (more) conscious processing take differences between L1 and L2 processing to lie on the “mental routes for accessing and retrieving grammatical knowledge” (Hopp 2007: 82). These models have led to the formulation of the distinction of a declarative and a procedural memory (Ullmann 2005, 2011), addressed in similar terms as implicit and explicit knowledge (Paradis 2004; Ellis 2009a, 2009b; see also § 4.4.2 above). The Declarative/Procedural model predicts that “both first and second language (L1 and L2) depend on two long-term memory systems in the brain: declarative and procedural memory (…)” (Ullman 2013: 160). Both are available to and used by native and non-native speakers, albeit to a different extent:

> Procedural memory is less available to L2 learners: They have fewer items in their implicit linguistic competence than native speakers; consequently, whereas items which they lack are available to native speakers, they are not available for use by L2 speakers. As stipulated in Paradis (2004), **to the extent that there is a gap in their L2 implicit linguistic competence (the “rule” system), adult learners compensate by relying on their metalinguistic knowledge (…); they therefore depend more than native speakers upon declarative memory**. (Paradis 2009: 20, emphasis is mine)

Implicit and explicit knowledge (Ellis 2009a), thus, differ in a number of aspects:

Implicit knowledge	Explicit knowledge
Tacit, intuitive, internalized	Conscious, a "tool"
Procedural	Declarative (= encyclopaedic)
Available through automatic processing	Generally accessible only through controlled processing
Regulates default L2 production	Is/can be exploited when difficulties in task-performance are experienced by the L2 learner
Full learnability in the L2 is limited	Fully learnable
Procedural rules may be target-like (= L1)	Declarative rules are imprecise and inaccurate

Table 14. Distinctive features of implicit and explicit knowledge (Ellis 2009a: 11-16)

While learning an L2, the switch from declarative to procedural memory is possible and has indeed been found to correlate with proficiency (idem: 162-163). Such switch may be taken as an instance of a path towards *automatization* of originally explicit processes or knowledge. As a result of automatization, less cognitive effort is allocated to the processor during a task. In effect, automaticity is "the *absence of intentional control* in the execution of a cognitive activity" (Kahneman 1973, apud Segalowitz & Hulstijn 2005: 317, emphasis is mine), and it is one of the main features of procedural memory. Automatic handling or processing requires a lower allocation of cognitive resources, so it is effortless, unconscious, rapid and ballistic (Segalowitz & Hulstijn 2005: 372). In contrast, attentional control involves, among others, "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: 371). Automaticity is associated with enhanced cognitive efficiency (Segalowitz 2010) and is best treated as a continuum "rather than an automatic-controlled dichotomy" (DeKeyser 1997: 196).

More automatized processing is associated with implicit knowledge or procedural memory, whereas effortfulness and conscious processing is associated with explicit or declarative knowledge (Paradis 2004; Segalowitz & Hulstijn 2005). The label "procedural" in models and theories of automaticity, importantly, shares some parallelisms with the notion of procedural meaning as managed in relevance theory. Indeed, both notions refer to instructions and, thus, to meanings not accessible to consciousness, and correspond to processes that must be necessarily executed (Wilson & Sperber 1993; Carston 2016; Ullman 2001, 2016). Both notions apply to computations taking place in the brain automatically and at little cognitive cost (Ullmann 2001; Paradis 2004; Paradis 2009). In sum, the same as procedural semantics, the mechanisms of procedural memory cannot be controlled consciously either, but—at least in the L1—are set in motion *automatically* (Paradis 2009: XI).

Alike the GETP and the SSH, explicit/declarative and implicit/procedural knowledge models of L2 processing have focused on lexical and grammatical processing (see e.g., DeKeyser 1997; Ullman 2001; Kotz 2009). Here, we suggest that the notions of automaticity and consciousness during L1 versus L2 processing can also provide satisfactory explanations for cognitive phenomena at the discourse level as the ones at issue in this work. Indeed, the automatized, procedural system has been claimed to be specialized in learning to predict rule outputs or subsequent contents in a sequence (Ullman 2016: 956), and this can be transferred beyond syntactic computations to the processing of discursive sequences. Hence, for study 1 (processing causal versus counter-argumentative relations), highly automatized (= rapid and effortless) processing of discourse relations conform to the rules of discourse is posited for the L1 group; by contrast, as proficiency decreases, readers are expected to rely more on declarative memory and, as a result, to allocate more time (= more cognitive effort) in processing counter-argumentative relations. As for study 2, automaticity is expected to lead to similar processing of marked and unmarked (= implicit) utterances and more conscious processing is expected to lead to condition effects.

As concerns studies 3 and 4, pragmatic implausibility is expected to affect all readers, since they are confronted with burdens that could lead to engage explicit/declarative knowledge more extensively than in processing of plausible discourses. At the same time, however, different implausibility-solving strategies are expected to correlate with proficiency given that automatic processing is deemed to be unstoppable and ballistic: "once a process has been triggered (…) it cannot be stopped in midstream and will run – *automatically* – to completion" (Segalowitz 2013: 55). This is expectably the case for L1 participants. By contrast, the L2 groups might approach mismatch-solving much more consciously thus performing more effortfully (= investing more time in the task) than L1 readers but not necessarily achieving task completion. Behind this, however, are not only task-related factors but also the degree to which the interlocutors manage the beliefs entertained as to the incoming information and the speaker as its source. This is dealt with in the next subsection.

4.4.4. Epistemic vigilance as a further component of pragmatic processing

Misunderstandings in an L2 often arise because of difficulties in recovering inferential information (Padilla Cruz 2013). This does not mean, however, that inferential cognitive mechanisms are culture or language dependent. Instead, cognitive mechanisms devoted to perform interpretive processes have been suggested to be universal, with L2 non-native-like performance and L2 misunderstandings resulting from a) differences in cultural background (Zufferey 2015: 176); and b) the fact that L2 speakers "attribute beliefs and knowledge to [their interlocutors] that they in fact do not possess" (Moeschler 2007: 86; cf. Padilla Cruz 2013). Indeed, "learners' capacities or abilities as hearers may not be as accurate or sophisticated as those of natives (…)" (Padilla Cruz 2013: 118). Linguistic limitations or differing world knowledge from that entertained by native speakers of the language at issue aside, it is claimed that the degree of *epistemic vigilance* at which an individual operates during L2 processing may differ from that brought to bear in L1 processing (Padilla Cruz 2013).

Epistemic vigilance is the human cognitive ability to attribute information a certain degree of reliability, that is, to assess the quality of incoming information and the trustworthiness of the speaker (Sperber 1994; Sperber et al. 2010). Epistemic vigilance can thus be directed at the *source* of the information and at the *content* of communication (idem). As a result, in the search for relevance, processing stops when the incoming information and the source of the information (the speaker) are considered relevant and trustworthy enough respectively. When an incoming piece of linguistically communicated information contradicts entertained beliefs, two options stay open for the addressee: rejecting the information or starting some coherence-checking. Rejecting information is the simplest alternative, but would imply not accessing potentially valuable information to correct or update earlier beliefs (Mercier & Sperber 2010: 60). Coherence-checking, by contrast, would trigger a process of assessment of the source's (the speaker's) trustworthiness and of the content of the piece of information at issue. It implies more effort-demanding, albeit cost-effective interpretive routes.

The alternative chosen by the hearer—rejection or coherence-checking—is influenced by the assumptions he holds about his interlocutors' competence and benevolence (Sperber 1994), which affect expectations of relevance of the communicated information. As a result, a hearer can adopt either of the three following attitudes towards incoming information (Sperber 1994; Wilson 1999; Sperber et al. 2010; Mazzarella 2016):

- *Naïvely optimistic addressees* would stop processing when the first relevant enough interpretation is recovered, driven by their assumption that their interlocutor is both benevolent and competent. Naively optimistic processing would lead to *accidental relevance* or to *accidental irrelevance* of the incoming input (Wilson 1999: 138), since a naively optimistic hearer "would restrict himself to the linguistically encoded meaning, would be unable to find an acceptable interpretation, and communication would fail." (idem: 422);
- *Cautiously optimistic addressees* would stop processing at the first interpretation that they consider the speaker might have thought would *be* relevant enough for them because they assume the speaker to be benevolent but not competent (i.e., lacking some knowledge or holding false beliefs);
- *Sophisticated interpreters*, finally, would stop processing at the first interpretation that they consider the speaker might have thought would *seem* relevant enough to them. In this case, the hearer takes his interlocutor not be competent nor be behaving benevolently, for instance because he has some deceptive intentions.

When engaged in L2 processing, individuals have been argued to behave often as naïve optimists due to their limited interpretive abilities in the foreign language (Padilla Cruz

2013: 120-121). An attitude of naïve optimism would lead non-native readers to experience difficulties at recovering explicit contents from utterances, but also their explicatures and/or implicit contents (idem: 121; Foster-Cohen 2015: 3). Among the reasons for not recovering an implicitly communicated assumption are a) failure to restrict the context adequately; and b) failure to read the interlocutor's mind to access the proper context for interpretation (Wilson & Sperber 2004; Padilla Cruz 2013). This is precisely what we argue could happen when L2 readers are confronted with pragmatic mismatches arising from clashes between entertained beliefs (mind-stored assumptions) and rigid procedural instructions in studies 3 and 4. Their attitude of naïve optimism would lead them to stop processing without having activated the context actually envisaged by the speaker. As a result, we suggest that they would either recover a sketchy representation of the speaker's intended assumption, thus incurring in *accidental relevance*, or lead to rejecting the communicated content, i.e., to *accidental irrelevance* (Wilson 1999: 138). Were this so, very shallow processing as reflected in low processing costs is expected for non-native compared to native speakers.

4.5. *Conclusion and hypotheses*[3]

Along this chapter, factors influencing discourse processing in a second language have been set out, empirical evidence from corpus analysis and experimental research have been provided and the notions of processing shallowness, automaticity and epistemic vigilance have been proposed as complementary to capacity models to provide comprehensive explanations of why and how L2 performance may differ from performance in an L1 as concerns the phenomena under study.

At this point, thus, the hypotheses provided at the end of chapter 1 and refined at the end of chapter 3 can be further refined and give rise to the following final hypotheses:

Study 1
Phenomenon under study
Processing marked causal versus counter-argumentative relations (+ *por tanto* vs. + *sin embargo*)
Background
• *Por tanto* instructs the reader to process its host segment as a consequence of the assumption derived from the preceding segment. New information is combined with mentally-stored assumptions and gives rise to the assumption communicated by the speaker. • *Sin embargo* instructs the reader to process its host segment as a counter-consequence the assumption derived from the previous segment. As a result, inferred contents must be suspended or eliminated. • In causality, thus, new and old assumptions do not collide; by contrast, in counter-argumentation, contextually provided assumptions must be revised. Additionally, causality enjoys a special cognitive status and the human mind is oriented towards causal processing (“search after meaning”, Graesser et al. 1994). As a result, in causality, the discourse operation at issue would be closed up with processing of the second discourse segment; by contrast, in counter-argumentation, the reader would still have to search for the actual cause of the communicated assumption after processing the whole utterance. • Processing in an L2 overstrains cognitive resources compared to L1 processing, a pattern most manifest as task complexity increases. Overstrained cognitive

resources can give rise to shallower processing and to less automatic, more conscious processing.

Hypotheses$_3$

- Causality will be easier to process than counter-argumentation for all participant groups. Due to the nature of the inferential steps involved in each relation, more effortful processing of counter-argumentation is expected particularly during re-analysis.
- Globally, however, stronger condition effects are expected for less proficient readers due to non-automatized processing: causality and counter-argumentation are not expected to be processed as the same task (= processing feasible, normative discourse relations), but as differentiated tasks (= processing causality and processing counter-argumentation).
- Different strategies are expected for the participant groups also due to cognitive limitations and differences in processing depth. This is expected to lead to differences in the time-course at which condition effects deploy (early versus late processing) and the functional areas focused on most prominently by each group to recover the communicated assumptions.

Table 15. Study 1: Conclusion and hypotheses$_3$

Study 2

Phenomenon under study

Processing of explicit versus implicit causal relations (+ *por tanto* vs. – *por tanto*)

Background

- Communication is an ostensive-inferential process. As a result, speakers make use of procedural guides that constrain their interlocutors' inferential processes. As a connective, por tanto is an inferential-constraining (procedural-meaning) device. When provided, as in explicit causal relations, it instructs the reader to process its host segment as a consequence of the assumption derived from the previous segment. As a result, new information is combined with mentally-stored assumptions to give rise to the communicated assumption.
- As far as the context and the reader's mind-stored assumptions allow him to do so, two consecutive discourse segments will be processed as causally related, even in absence of a procedural mark instructing a reader to do so, as occurs in the causal implicit relations that are the subject matter of study 2.

- The human mind is geared to the maximization of relevance and stimuli (utterances) are relevant if they are worth the audience's processing effort and are the most compatible with the audience's preferences and abilities (Sperber & Wilson 1995). Relevance is thus a trade-off between effort and benefit. In this sense, additional information (e.g., the explication of a discourse marker) will only be relevant if the cognitive effects arrived at by processing it are also larger than in the absence of such information.
- Experimental findings about the influence of explicit discourse marking in an L2 are not clear-cut, with some evidence pointing to facilitation effects of connectives and to online sensitivity to misuses for L1 and L2 readers similarly; and some evidence reporting better comprehension for L2 readers in explicit discourse.
- Processing in an L2 overstrains cognitive resources compared to L1 processing, a pattern most manifest as task complexity increases.

Hypotheses$_3$

- Implicit causal utterances will be less effort demanding than explicitly linked utterances as proficiency increases. Two competing sub-hypotheses are posited for this expected proficiency-based pattern:

  1) *Por tanto* will be processed as "void" by most proficient readers, who are able to recover the causal relation by merely resorting to the assumptions derived from the segments combined with their mind-stored assumptions. By contrast, less proficient readers are expected to profit from the semantics of *por tanto*, which makes the causal relation conspicuous and constraints processing effort.

  2) *Por tanto* will trigger the search for further contextual effects if pragmatic competence and cognitive capacity allow for it. Therefore, more proficient readers are expected to invest more effort in recovering the assumption communicated in the explicit utterance, but for more contextual effects. On the contrary, shallower processing is expected for B1 readers: condition effects would not reflect quantitatively in processing effort but in poorer, sketchier representations from the explicit utterance.

Table 16. Study 2: Conclusion and hypotheses$_3$

Study 3
Phenomenon under study
Processing plausible versus implausible causal relations (+ *por tanto* + plausible vs. + *por tanto* – plausible)

Background
• Contextual access, specifically the access to mind-stored assumptions that allow readers to establish a causal link between discourse segments, is disrupted in implausible causal utterances. However, geared by their search for relevance and in virtue of the accommodation processes triggered by the rigid semantics of the connective *por tanto*, readers try to recover an assumption both in plausible and in implausible utterances. • Pragmatic mismatch-resolution poses a strain on cognitive resources. Such overstrain will be more pronounced as proficiency decreases.
Hypotheses$_3$
• Implausible utterances are cognitively more complex and thus put a stronger strain on cognitive resources than their plausible counterparts. As a result, two sub-hypotheses can be formulated: 1) Pragmatic information, usually resorted to by L2 speakers to compensate for deficits at other processing levels, will also be compromised in the sense that access to it becomes more complex. As a result, less automatic (= more effortful) processing is expected as proficiency decreases for the implausible condition, albeit leading to shallower mental representations. 2) Alternatively, less effort is expected to be invested in implausibility recovery as proficiency decreases if readers adopt an attitude of naïve optimism in terms of epistemic vigilance. • In terms of processing stages, where slowdown effects of implausibility are predicted, these are expected to arise during initial processing already but to be particularly conspicuous during re-analysis, due to the need to create an *ad hoc* context to accommodate the assumptions derived from each of the segments during the construction of an initial assumption. • Due to the linear nature of causal-consecutive relations ($p \rightarrow q$), stronger re-analysis is expected particularly at the connective (as the accommodation triggering device) and the second discourse segment.

Table 17. Study 3: Conclusion and hypotheses$_3$

Study 4

Phenomenon under study

Processing plausible versus implausible counter-argumentative relations
(+ *sin embargo* + plausible vs. + *sin embargo* – plausible)

Background

- Contextual access, specifically the access to mind-stored assumptions that allow readers to establish a counter-argumentative link between discourse segments, will be disrupted in implausible counter-argumentative utterances. However, geared by their search for relevance and in virtue of the accommodation processes triggered by the rigid semantics of the connective *sin embargo*, readers will try to recover an assumption both in plausible and in implausible utterances.

Hypotheses$_3$

- Implausible utterances are cognitively more complex and thus put a stronger strain on cognitive resources than their plausible counterparts. As a result, two sub-hypotheses can be formulated:

  1) Pragmatic information, usually resorted to by L2 speakers to compensate for deficits at other processing levels, will also be compromised in the sense that access to it becomes more complex. As a result, less automatic (= more effortful) processing is expected as proficiency decreases for the implausible condition, albeit leading to shallower mental representations.

  2) Alternatively, less effort is expected to be invested in implausibility recovery as proficiency decreases if readers adopt an attitude of naïve optimism in terms of epistemic vigilance.

- In terms of processing stages, where implausibility slowdown effects are expected, these are expected to be particularly conspicuous during re-analysis, due to the need to create an *ad hoc* context to accommodate the assumptions derived from each of the segments during the construction of an initial assumption. In addition, due to the non-linear nature of counter-argumentative relations, stronger re-analysis is expected particularly for the connective (as the implausibility and accommodation triggering device) and the first discourse segment.

Table 18. Study 4: Conclusion and hypotheses$_3$

5. Methodology

The four studies comprised in this work aim to test how procedural meaning, as encoded in causal and counter-argumentative connectives, impacts discourse processing of readers differing in their proficiency of Spanish, and whether such impact is proficiency-dependent. To test our hypotheses an eye-tracking reading study was carried out with three participant groups (§ 5.4.1). The rationale behind using eye-tracking to give account of how linguistic phenomena influence processing is the strong link found to exist between eye movements, which are "uniquely poised between perception and cognition" (Richardson et al. 2007: 326), and cerebral activity. The human eye has indeed been found to dwell on a given stimulus as long as information is being extracted from it. Such association, termed as the *eye-mind assumption* (Just & Carpenter 1980: 330), lies at the basis of one of the most solid findings of eye-movements research: longer dwelling on a stimulus is linked to deeper, more effortful processing (Holmqvist et al. 2011: 381)[105].

5.1. *The eyes as windows into discourse processing*

The characteristics of eye behavior differs and gives account of certain cognitive processes depending on the nature of the task at issue and, in relation to that, on the features of the stimulus that an individual is exposed to.

Reading is "a process of deriving meaning from print" (Juhasz & Pollatsek 2011: 881). During reading, the eyes do not glide smoothly along a written text, but come forward by alternating *fixations*, the periods of time during which the eye remains relatively stable[106] on a given stimulus, and *saccades*, small jumps carried out between fixations. An average fixation during reading amounts to approximately 225-250 milliseconds[107]; the length of a saccade amounts to about 7-8 letters. Importantly, during

[105] But there are exceptions to this rule (see Holmqvist et al. 2011: 382-383).

[106] During a fixation the eye is never completely still, but performs micro-movements: tremors (or physiological nystagmus), drifts and micro-saccades, caused mainly by oculomotor reasons (Holmqvist et al. 2011: 22-23).

[107] It is acknowledged, however, that there is a strong variation between individuals during reading both in relation to fixation durations and to the total time needed to process a stimulus (cf. for instance Just & Carpenter 1980)

saccades no new information can be extracted because the eyes move very fast between fixated stimuli; information processing, however, can continue during saccadic movements (Rayner 2009: 1458). Saccades are needed because of the limited extension of the region of visual acuity of the human eye (Rayner et al. 2013: 558). Indeed, in normal circumstances, high acuity vision is only possible in the *foveal region*, which corresponds to the central two degrees of visual angle (idem). During reading, readers can perceive words parafoveally too. This occurs specially when words next to the currently fixated one (to the right) are very short or highly predictable words. In those cases, such words are *skipped*[108], that is, they remain un-fixated. Also, preview benefit has been found to be inversely related to the difficulty of the word currently fixated. However, most frequently the quality of perception in parafoveal vision during reading is so low that no meaningful information can usually be extracted from information disposed in parafoveal regions (Rayner 2009).

Sometimes, readers need to revisit previous parts of the text in order to "reencode it or to process it to deeper levels" (Just & Carpenter 1980: 337), mainly due to particularly complex or unconcluded processing. In those cases, they perform *regressive saccades* or *regressions*, backwards-oriented saccadic movements towards previous text spans[109]. As to discourse processing, regressions are particularly informative of processing effort related to the resolution of ambiguous, implausible or unexpected information (Hyönä et al. 2003; Rayner 2009).

Eye movements are the most frequent movements in human behavior (Bridgemann 1992, apud Richardson et al. 2007: 325) and are driven both by bottom-up and by top-down processes (idem: 326). As regards written discourse processing and comprehension, this means that readers' behavior is influenced both by the characteristics of the written text itself and its components, most notably words and syntactic structures, and by expectations and entertained assumptions or world knowledge. Retrieving

[108] Word length has been found to be a stable predictor of word fixation probability. 2-3-character words are skipped about 75% of the time; 8-letter words are fixated almost always. As regards word classes, content words are fixated about 85% of the time, whereas functional words are fixated only about 35% of the time, albeit most probably because they are usually short words (Rayner 2009; Rayner et al. 2013).

[109] The cause of regressions can also be a poor landing of a saccade, in which case readers would make a correction by jumping back to the right text spot. When motivated by processing difficulties, regressions tend to be short and be directed to the previous word; longer regressions are due to particular difficulties in text comprehension (Rayner 2009; Rayner et al. 2013).

meaning from a text, thus, involves word decoding, lexical access, assignation of semantic roles or parsing and combining information retrieved from the stimulus with already entertained information, which can stem both from previously processed verbal stimuli or from stored knowledge (Just & Carpenter 1980). In this sense, the reading process has been modelled as a workflow of processes or steps taken by an individual in his way to retrieve a relevant mental representation of discourses:

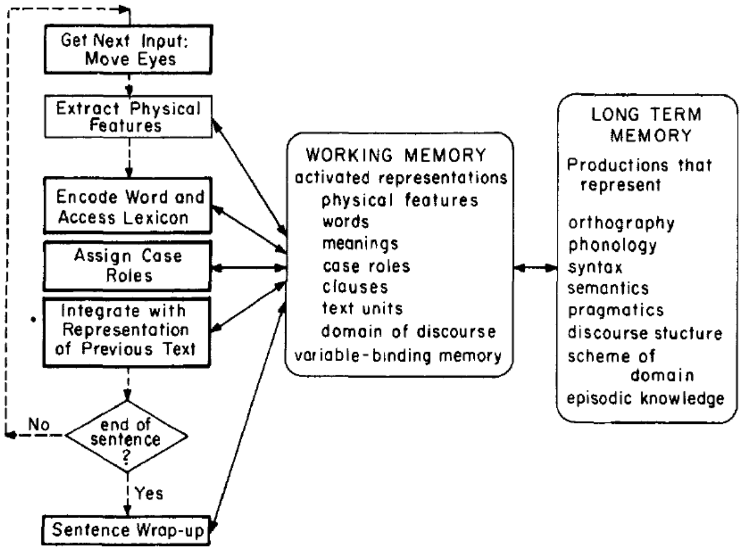

Figure 9. (from Just & Carpenter 1980: 331) A schematic diagram of the major processes and structures in reading comprehension.

Importantly, these processes must not necessarily be executed in the canonical order as represented in the diagram. Otherwise, no top-down influences could be predicted for reading comprehension. During processing, hence, sometimes stages are skipped or executed earlier or later, in which case they exert an influence over earlier stages (Just & Carpenter 1980). Several stages can also be executed co-temporaneously, so that "firings of productions of two or more stages may be interleaved" (idem: 333). This is compatible with the view that the stages of the interpretation process involving inferencing, i.e., the retrieval of explicatures and implicatures, do not take place sequentially but in parallel in virtue of a process of mutual adjustment (Sperber & Wilson 1998; Carston 2002b; Wilson & Sperber 2002; Recanati 2004; Escandell Vidal 2014), which stabilizes "when the overall interpretation is warranted by (…) the principle of relevance (Sperber & Wilson

1998: 197). It is also in line with incremental-processing accounts supported widely by literature (Traxler, et al. 1997; Altmann & Kamide 1999; Sedivy et al. 1999; Boland 2004, among many others; see also § 5.1.3): readers process newly impinging information as soon as it becomes available and incorporate it into a relevant (dynamic) context which, in turns, exerts its top-down influences on how the processing of the new information occurs. Context can indeed constrain the predictability of incoming linguistic material to an extent that disruptive effects that could have arisen from implausibility can be overridden, thus showing that top-down processes can influence bottom-up ones, their role being "to participate in selecting interpretations" (Just & Carpenter 1980: 352).

5.1.1. The word level

Words have been found to be mentally represented at an orthographical, a phonological, a morphological and a semantic level. A general effect affecting all four levels of word representation is frequency (Just & Carpenter 1980; Kliegl et al. 2004; Juhasz & Rayner 2006; Juhasz & Pollatsek 2011 among others): processing effort of a word increases as its frequency decreases. Findings also point to the fact that morphological, orthographical and phonological features of words can influence on fixation duration (Juhasz & Pollatsek 2011). As concerns access to the semantics of a word, this may be affected by the sentence context in which it is inserted and by the semantic properties of the word itself (idem). When a word is highly predictable in the context of sentences, its processing times decay and the probability of it being skipped goes up (Rayner & Well 1996, among others). Equally, contextual anomaly or implausibility of a word leads to either immediate disruptive reading (anomaly) or reflects in late processing (implausibility) (Rayner et al. 2004; Joseph et al. 2008; cf. also Warren 2012 and references therein). Semantic ambiguity of words also affects eye movements. In general, readers seem to activate the most frequent meanings possible for a lexeme and, in the absence of contextual constraints, their late processing is strongly disrupted when they have to adjust for a less frequent meaning (cf. for instance Rayner et al. 2006a; Sereno et al. 2006). Context seems thus to interact with word frequency in determining activation preferences of a meaning or other of a given word (Duffy et al. 1988; Rayner et al. 2013), which is again proof of top-down factors' permeability to lower-level processes. Finally, semantic properties of words, such as whether they designate concrete or abstract entities (Juhasz & Rayner 2003), display a larger or smaller number of semantic associates (Duñabeitia et al. 2008) or are learned earlier in life (Juhasz & Rayner 2003, 2006) have also been found to exert an influence on word processing ease.

5.1.2. The syntax level

As regards syntax, major factors impacting eye movements and thus cognitive performance are garden-pathing (being confronted to a structure in which an initial syntactic or structural analysis must be revised and corrected after encountering a constituent later on in the sentence forcing the reader to do so), memory effects, syntactic prediction and the presence of syntactic violations in a sentence (Clifton & Staub 2012). More complex processing, i.e., increased cognitive effort, has been found to apply when the syntactic structure of a sentence leads to a garden-path, when it is particularly demanding for memory (for instance due to a greater distance to between dependent constituents, cf. Gibson 2000; or limitation of working memory capacity, Just & Carpenter 1992), when it is not predictable or when it does not match structural expectations (Staub & Clifton 2006; Staub 2010, among many others). For resolution of garden-path structures, it is yet unclear whether semantic and pragmatic aspects affect preferences for a syntactic analysis from the beginning of the processing task or only once an initial analysis has been performed and has to be revised (idem).

5.1.3. Processing discourse relations: evidence from eye-movements

In relation to higher-level processes as is the processing of discourse relations, several models have been proposed based on experimentally gathered evidence about the time-course of processing utterances marked by a connective. These models can be arranged according to whether they postulate a delayed integration of the assumptions derived from the connected segments, incremental processing, or are half-ways between incremental and delay proposals.

5.1.3.1. *Delayed integration*

Models within this account (Millis & Just 1994; Kintsch & van Dijk 1978; Kintsch 1988) claim that the integration of the propositions derived from two connected discourse segments takes place at the end of the second segment.

Millis & Just's (1994) Connective Integration Model, based on the *delayed integration hypothesis*, postulates that connectives are signals instructing the reader to integrate an upcoming segment with the previous one, but that such integration does not occur until the last segment is processed. Importantly, readers are considered to construct a representation of each segment before integrating both segments into a sole representation. Hence, during integration of segments linked by a connective the first segment is reactivated when the end of the second is reached (Millis & Just 1994: 144). In the absence of a connective, by contrast, integration does not seem to take place during sentence wrap-up[110] but immediately when the second discourse segment is encountered (idem). As a result, longer wrap-up times are expected at the end of the second discourse segments when connectives are provided, particularly at the very end of the utterance. In this account, connectives are treated as devices that modulate activation levels during comprehension, in line with a view of connectives as inference-constraining (and thus effort-controlling) devices.

Integration at the end of the sentence is also proposed in Kintsch & van Dijk's (1978) and Kintsch's (1988) Construction-Integration theory of discourse processing (CI). The CI model also claims that the construction of an integrated representation of marked utterances happens as soon as readers encounter the final word of the final segment. As regards reading behavior, again, this model predicts longer reading times during sentence wrap-up at the end of the second connected segment.

[110] Wrap-up is a phenomenon consisting in reading longer regions or words that are sentence or clause-final than those which are in an internal sentence or clause position (Just & Carpenter 1980; Rayner et al. 2000; Warren et al. 2009). While traditionally linked to integrative processes considered to occur at the end of sentences or clauses, evidence also shows that wrap-up effects can occur as a result of pauses associated with intonational factors and may be affected too by punctuation (Hirotani et al. 2006).

5.1.3.2. *Incremental models*

Delayed integration (§ 5.1.3.1) has been refuted by experimental evidence on the processing of connected discourse relations, according to which readers rapidly construct interpretations of connected utterances. This has been operationalized in the *incremental processing hypothesis* (Traxler et al. 1997).

Incremental processing finds wide support in extensive experimental evidence showing that connectives exert their effects immediately as regards the construction of a mental representation of the utterance as a whole (Cozijn, et al. 2011; Kuperberg et al. 2011; Canestrelli 2013; Canestrelli et al. 2013; Köhne & Demberg 2013; Drenhaus et al. 2014; Xiang & Kuperberg 2015, among others). Similarly, like connectives, prior context has also rapid effects on several, partly lower-order processes, such as lexical processing, syntactic parsing and anaphora resolution (Traxler et al. 1997: 482). With respect to reading behavior, incremental processing hypotheses predict an immediate disruption as soon as the connective is encountered and onwards. This could translate into either faster or slowed down processing of the region/s following the connective depending on the semantics of the connective at issue and additional utterance features, but is in any case already visible in early measures.

5.1.3.3. *Halfway between incrementality and delayed integration*

Immediate processing had been put forth in the *eye-mind hypothesis* and the *immediacy assumption* (Just & Carpenter 1978, 1980, see also above). Although in verbal comprehension many processes happen immediately, wrap-up effects at the end of sentences are to be expected in some occasions, most notably in “interclause integration” (idem: 343 ff.). The model, however, suggests that wrap-up effects translating into longer processing times are subject to “the desired depth of processing” (idem: 346).

Reconciliation of delayed integration and incremental approaches to processing of discourse relations comes also from Green et al.’s (1981) two-phased model. In a first stage of processing (Phase I), sentences are translated into sets of instructions for a reader to construct a mental representation; in a second stage (Phase II), the instructions are executed to build a coherent mental representation of the text by carrying out a series of operations: modification, evaluation or coherence processes. While modification of representations and evaluation of changes can be performed at any time, coherence-building seems to be possible only when the boundary of a sentence is reached, particularly due to the fact that it relies on previously carried out evaluation.

In sum, models which are half-ways between delayed integration and immediacy approaches predict effects of connectives translating into longer or faster reading at different points of discourse segments depending on the process at issue, but predict for the reader to slow down at the end of the second segment in pursue of reconstructing a discourse relation.

Taken together, discourse relations seem to be at the basis of differences in reading behavior both during early and late processing. Depending on when the features of the discourse relation at issue trigger such effects, the effects will be taken as an indicator of cognitive phenomena affecting the construction of an initial assumption, the re-construction of a communicated assumption, or both (cf. Nadal et al. 2016; Recio et al. 2018; Nadal 2019; Cruz (2020); Narváez García (forthcoming); Torres Santos (forthcoming)).

5.2. *Dependent variables: eye-tracking measures of early and late processing*

For the purposes of the present study, reading data for three eye-tracking measures have been gathered, computed and analyzed: the first-pass reading time (FPRT), the second-pass reading time (SPRT) and the total reading time (TRT). The measures represent the dependent variables of the study and allow us to gain insight into several stages of the interpretative process, as just set out.

The FPRT, SPRT and TRT belong to the group of *position duration measures* (Holmqvist et al. 2011: 356 and 376-390)[111], they focus “on the temporal characteristics of eye movement events at specific positions in space” (idem: 356). They all refer to the

[111] Other position-measures categories are *position dispersion measures*, *position similarity measures* and *position dilation measures* (cf. Holmqvist et al. 2011, §11). Apart from measures that are position-dependent, other measures that can be registered by means of eye-tracking are *movement measures*, *numerosity measures*, and *latency* and *distance measures* (idem).

amount of time a reader's gaze stays on a specific stimulus. Their basis are fixations durations, also called "fixation time" (idem: 377), and are measured in milliseconds (ms).

The first-pass reading time (FPRT), alternatively called "first-pass fixation time", "first-pass dwell time" or "gaze duration"[112], is the sum of all fixation durations on one stimulus from entering it to exiting to the right (Rayner 1998; Holmqvist et al. 2011; Hyönä et al. 2003). According to experimental evidence on reading, the FPRT is informative about difficulty in extracting word information and may therefore be highly sensitive to word frequency, word familiarity and predictability in context (Rayner 1998). In general, it is taken to reflect early processing (Holmqvist et al. 2011). As regards the processing of discourse relations specifically, for critical regions longer than a word, the FPRT is taken as an indicator of the cognitive effort invested by readers to recover an initial assumption from the information of the utterance (Nadal et al. 2016; Nadal 2019; Cruz & Loureda 2019; Nadal & Recio 2019).

The second-pass reading time (SPRT), "look-back fixation time" or "re-reading time", is the summed duration of all returning fixations to a particular stimulus, that is, the amount of time that a participant needs to re-read a stimulus or area of interest. As a late measure, SPRT is taken as a good candidate measure to give account of higher-level structural or discursive factors influencing processing during reading, most notably context effects (Carrol & Conklin 2014: 6; cf. also Staub & Rayner 2007). In this sense, when dealing with (implicit or explicit) discourse relations, SPRT is considered to reflect the cognitive effort employed by a reader to re-analyze a particular region in his purpose to re-construct a communicated assumption. As concerns accommodation processes needed to create an *ad hoc* assumption (as in study 3 and 4 in the present work), it would be precisely at this stage where particularly marked effects are expected.

Finally, total reading time, also termed "total dwell time", is the sum of all fixation durations on a critical region. It is taken to be sensitive to higher-order cognitive processes, but is better reported together further more fine-grained measures like FPRT and SPRT (Holmqvist et al. 2011: 389).

[112] Another term used for FPRT as operationalized in this study "cumulative region reading time" when computed for multi-word regions (Brysbaert & Mitchell 1996: 678)).

5.3. *Experimental design*

5.3.1. Independent variables

The hypotheses presented in chapter 4 (§ 4.6) have been operationalized in four independent discourse-related variables with two conditions each. A further independent variable is the proficiency level of Spanish of the three participant groups (native speakers, L2 speakers with a C1-C2 proficiency level and L2 participants with a B1+ proficiency level, see § 5.4.1).

The discourse variables have been discussed in the previous chapters and are set out here again for convenience. Conditions correspond to manipulations undertaken in the experimental utterances (the critical stimuli) in relation to the type of argumentative relation at issue (study 1), the explicitness of causal relations (study 2), and the plausibility of causal (study 3) and counter-argumentative utterances (study 4):

Study and variable	Conditions[113]
Study 1 Type of marked argumentative relation	Causal relation marked by *por tanto* (DP1Ca)
	Counter-argumentative relation marked by *sin embargo* (PPCo)
Study 2 Explicitness of causal relation	Implicit causal relation (-*por tanto*) (DP0Ca)
	Explicit causal relation (+*por tanto* (DP1Ca)
Study 3 Pragmatic plausibility of causal relation	Pragmatically plausible causal relation (DP1Ca)
	Pragmatically implausible causal relation (PICa)
Study 4 Pragmatic plausibility of counter-argumentative relation	Pragmatically plausible counter-argumentative relation (PPCo)
	Pragmatically implausible counter-argumentative relation (PICo)

Table 19. Independent variables and experimental conditions.

[113] Conditions were coded as follows for analysis reasons (see chapters 6 to 9):
DP1Ca: Discourse particle present, pragmatically plausible causal relation
DP0Ca: Discourse particle absent, causality
PICa: Pragmatically implausible causal relation
PPCo: Pragmatically plausible counter-argumentative relation
PICo: Pragmatically implausible counter-argumentative relation

5.3.2. Materials

Experimental quintuplets were designed to account for the phenomena investigated in the four studies. The fact that quintuplets instead of sets containing eight items each (2 conditions x 4 variables) were designed for the processing study is due to the fact that some types of experimental utterances correspond to several experimental conditions at the same time. In this sense, DP1Ca-type utterances were used in studies 1, 2 and 3, as the conditions expressing a causal relation (study 1), an explicit causal relation (study 2) and a plausible causal relation (study 3); similarly, PPCo-type utterances were used in study 1 as the condition expressing a counter-argumentative relation; and in study 4 as the condition conveying a pragmatically plausible counter-argumentative relation (a list of all experimental items is in Appendix 2):

8a	DP1Ca	*Ricardo y Susana dirigen un hotel muy bonito.* ***Por tanto****, reciben muchos turistas.* 'Ricardo and Susana run a very **nice** hotel. **Por tanto**, they receive a lot of guests.'
8b	DP0Ca	*Ricardo y Susana dirigen un hotel muy bonito.* ***Ø*** *Reciben muchos turistas.* 'Ricardo and Susana run a very **nice** hotel. **Ø** they receive a lot of guests.'
8c	PICa[114]	*# Ricardo y Susana dirigen un hotel muy feo.* ***Por tanto****, reciben muchos turistas.* # 'Ricardo and Susana run a very **ugly** hotel. **Por tanto**, they receive a lot of guests.'
8d	PPCo	*Ricardo y Susana dirigen un hotel muy feo.* ***Sin embargo****, reciben muchos turistas.* 'Ricardo and Susana run a very **ugly** hotel. **Sin embargo**, they receive a lot of guests.'
8e	PICo	*# Ricardo y Susana dirigen un hotel muy bonito.* ***Sin embargo****, reciben muchos turistas.* # 'Ricardo and Susana run a very **nice** hotel. **Sin embargo**, they receive a lot of guests.'

Table 20. Example of a critical item (no. 8)

Twenty experimental quintuplets were employed in the study (§ 5.3.2.4 and Appendix 2), which were selected from an original set of thirty quintuplets according to the results of a norming study (§ 5.3.2.3) performed to validate the researcher's intuitions about the acceptability of the discourse relation conveyed by the designed experimental items. In all stimuli subject to the norming test, word frequency, syntactic structure and further semantic features had been previously controlled for.

[114] Pragmatically implausible utterances (PICa and PICo) are marked with the sign #.

5.3.2.1. *Formal and semantic features of the experimental stimuli*

All stimuli used for the norming study and, thus, for the final processing study all exhibited the same structure. As depicted in table 20 above, they consisted of two discourse segments linked by a connective (conditions a, c, d and e) or implicitly related (condition b).

As to the syntactic structure, both segments present an SVO order, which, in absence of further constraints (contextual, intonational, or arisen from topicalization strategies), is a non-marked structure in Spanish in which thematic information (the subjects in the experimental stimuli) appears at the beginning of the sentence (NGLE § 40). In the first discourse segment, the subject of the utterance is explicated, in the second discourse segment, there is a null subject, which in Spanish is used to present non contrastive information (NGLE §33.5a) and allows readers to naturally interpret it as referring to the subject of the previous segment (NGLE § 33.4k, 33.4o):

(60) [*Ricardo y Susana*]$_{S}$ [*dirigen*]$_{V}$ [*un hotel muy bonito*]$_{O}$. [Ø]$_{NULL\ S}$ [*Reciben*]$_{V}$ [*muchos turistas.*]$_{O}$
‘Ricardo and Susana run a very nice hotel. They receive a lot of guests.’

The direct objects of the discourse segments always consist on either a quantifier and a noun (*mucho trabajo* ‘a lot of work’, *pocas vacaciones* ‘very few vacation days’) or a noun followed by an adjective (*una familia grande* ‘a big family’). These slight syntactic differences are, however, the only structural divergences between the stimuli:

Syntactical structures of experimental items	**Critical items exhibiting each structure**
Quantifier + N / Quantifier + N Elena y Blanca *tienen* ***mucho trabajo.*** Por tanto, *toman* ***pocas vacaciones.*** ‘Elena and Blanca have a lot of work. Therefore, they don’t take much vacation.’	5, 7, 16, 19, 28 (n = 5)
N + adjective / Quantifier + N *José y Carmen tienen una* ***familia grande.*** *Por tanto, necesitan* ***mucho espacio.*** ‘José and Carmen have a big family. Therefore, they need a lot of room.’	1-4, 6, 8-15, 17, 18, 20-27, 29, 30 (n = 25)

Table 21. Syntactic predicate structures and experimental items exhibiting them

The experimental stimuli contain the minimum amount of information required to process the discourse relation at issue involving the entities (always two persons mentioned by their given names) that are the topic of the sentence. In this sense, by including quantifiers like *mucho* (‘much’, ‘a lot’) or *poco* (‘not much’, ‘few’) or descriptive adjectives instead of only a common noun allows us to better control the mental assumptions arisen from processing a discourse segment, since they act as linguistic constraints to pragmatic enrichment processes, thus activating more constrained contextual assumptions:

(61) *Elena y Blanca tienen trabajo. Toman pocas vacaciones*
‘Elena and Blanca have a job. They don’t take much vacation.’
(62) *Elena y Blanca tienen mucho trabajo. Toman pocas vacaciones*
‘Elena and Blanca have a lot of work. They don’t take much vacation.’

In (61) the noun *trabajo* (‘work’) can be seen as encoding an incomplete conceptual representation (Iten 1999) and requires pragmatical adjustment or modulation (see Carston 1998; 2016) to construct an *ad hoc* concept triggering an assumption that permits integration with the information encoded in the second discourse segment to arrive to a relevant assumption[115]; comparatively, in the second example (62) the search is further delimited by the presence of the quantifier (or by an adjective in other utterances). They help narrow down the noun conceptually (idem) and thus constrain the sort of contextual assumptions—world knowledge—brought to bear by the segment in which the noun occurs in a direction that ensures relevant integration of the information conveyed in the second discourse segment. The adjective and the quantifier operate as conceptual-restriction devices: they determine and specify the noun by limiting its extension, and explain it by increasing its intention (Flórez 1995: 164; for experimental evidence on the restrictive effects of adjectives in focus structures see also Cruz & Loureda 2019 and Cruz (2020)).

In sum, in the first discourse segments of the critical stimuli, participants are given a conspicuous frame to integrate the content of the subsequent segment into a relevant assumption. A further constraint for interpretation comes from the fact that all

[115] It should be recalled that in Relevance Theory most words are seen as corresponding with mental representations of (aspects of) states of affairs, not with states of affairs themselves.

experimental stimuli are preceded by a presentative context and a visual stimulus (a picture of the subjects of the connected utterances) intended to constrain the range of interpretations available for the reader (see § 5.3.2.4).

5.3.2.2. *Control of word frequency*

Extensive experimental evidence in reading research confirms that word frequency and word familiarity affect processing speed (see references in § 5.1.1 above) and, thus, cognitive effort. For that reason, the experimental stimuli of the present studies only contain words that pertain to the 5,000 or 10,000 most frequent words in Spanish (Almela et al. 2005; Real Academia de la Lengua Española[116]).

The frequency of the conceptual words (as opposed to procedural-meaning expressions, i.e., the connectives; and to function words) of the critical items was determined in a two-step study upon distributing them according to their morphological category in two groups. The first group comprised verbs, quantifiers and adjectives. The frequencies were determined for the uninflected forms, that is, for the lemma (masculine and singular for the adjectives and quantifiers; infinitive form for the verbs). The second group comprised all common nouns in the critical items. For them, type frequencies were determined, that is, frequencies for their inflected forms as they appear in the critical items. This decision underlies the fact that morphological variation can be determinant of a word's meaning (for instance, *espacio* 'room' versus its plural *espacios* 'spaces' (item 3)) or affect pragmatic senses due to, for instance, diaphasic variation (for instance *ropa* 'clothes' versus the plural *ropas* 'garments' (item 8)).

[116] Almela et al.'s dictionary of frequencies is based on the *Cumbre* corpus, a recompilation of the most frequent words of the Spanish language along the last decade of the 20th century. The list of the 10,000 most frequent tokens or inflected words has 20,662,306 words; in turn the 5,000 most frequent lemmas have been extracted from a subcorpus of the *Cumbre* corpus with 2,096,011 words. Words are integrated in one of five frequency bands. Words in our study belong mostly to the very high frequency band (over 75 tokens per one million words), the high frequency band (26 to 75 tokens/Mio) and to the considerable frequency band (11 to 25 tokens/Mio). Words not found in Almela et al.'s dictionary, were searched for in the *Corpus de Referencia del Español Actual*, the reference corpus of modern Spanish by the Royal Academy of the Spanish Language.

5.3.2.3. *Norming test*

To select the final critical items of the experiment a norming test was carried out consisting on a plausibility judgment task. Its main objective was to validate the researcher's intuition regarding the pragmatic acceptability of the causal and counter-argumentative relations conveyed by the utterances.

Thirty sets of experimental quintuplets were originally designed and subject to the norming test, each set containing all five experimental conditions of the study (see tables 11 and 12 above). Sets were distributed into five lists according to a Latin-square design (Winer 1962), so that participants read six items for each condition but always pertaining to different sets.

A total of seventy-five participants took part in the study (33 male, 42 female; mean age 35.43 [19-73]; survey A: n = 12; survey B: n = 14; survey C: n = 14; survey D: n = 19; survey E: n = 16). All of them were native speakers of Spanish. Diatopic variation was not controlled for when selecting the participants due to two reasons. On the one hand, the argumentative content of the experimental utterances was designed to reflects everyday world knowledge in Western cultures; on the other hand, participants of the final processing study were native speakers of peninsular or Latin-American varieties of Spanish; similarly, L2 participants could have been exposed to any variety.

The norming test was carried out online with the open-source survey software *LimeSurvey* in August and September 2016. At the beginning of the test, which was anonymous, participants were asked to indicate their sex and age and to select their qualification degree: secondary education, vocational training (or the like, either finished or in course), University degree (either finished or in course) or doctorate (either finished or in course).

Participants were then asked to rate the acceptability of the utterances they read according to a five-point Likert scale. Specifically, they were asked the question "How do you find this sentence?" and given five options as a multiple choice, which were given a numerical value for statistical evaluation purposes: fully acceptable (*totalmente aceptable*, = 5), rather acceptable (*bastante aceptable*, = 4*)*, neither acceptable nor unacceptable (*ni aceptable ni no aceptable*, = 3), hardly acceptable (*poco aceptable*, = 2), not acceptable at all (*nada aceptable*, = 1). The test was not timed[117]. The structure and contents of the norming test are given in Appendix 1.

Participants' acceptability judgements were evaluated by means of descriptive statistics measures: median, mode and interquartile range (IQR). To that purpose, the responses gathered for an item (i.e., an utterance) were compared with the expected median and mode for that specific item. A set was excluded from the final study if any of its five conditions exhibited a median and/or a mode diverging from the expected values previously established by the experimenter. The IQR was explored as a confirmation measure. Based on the results of the norming test, ten experimental sets were discarded, and the other twenty sets were included in the final processing study. A list of the final experimental sets is provided in Appendix 2; a list of the ten discarded sets is provided in Appendix 3.

5.3.2.4. *Critical items, filler items and distractors; item contextualization*

After evaluation of the norming test, twenty sets of critical items were selected and used in the processing study. Sets were distributed among five experimental lists according to a Latin-square design, so that each participant read a total of four items belonging to the same condition, but never belonging to the same set. The experiment was untimed. Participants decided when to pass onto the next screen and text by pressing the space bar of the computer keyboard.

The study's critical items (also the fillers and distractors used, see further down below in this section and Appendices 2 and 4) were visually and linguistically contextualized. Visual contextualization consisted in a picture showing the two characters that were the subject of the predication contained in the critical item. Linguistic contextualization consisted of an introductory sentence where the given names of the two characters and a short description about their background were provided:

[117] Response times were registered but not taken into account to evaluate results. Participants were sent a link to take the test, so potential factors that could affect response time could not be controlled for.

Figure 10. Example of a contextualization item
(‘These are Jorge and Gonzalo. [They] have studied at a film school in Madrid’)

The linguistic contextualization has the form of a common presentative structure used in Spanish to introduce people (*Este/a es*... / *Estas/os son*... ‘This is’… / ‘These are…’). With this contextualization sentence and the visual contextualization, the characters that constitute the subject of the experimental utterances become part of the mental context of the participants and are known to them when they are confronted subsequently with the critical items. This helps prevent a processing overload that could occur were the given names of the two characters encountered for the first time in the experimental items, with participants starting the search for a referent without entertaining any previous knowledge that enables them to do so. Critical items were followed by a wrap-up sentence, which added some information thematically related to the experimental utterances but not affecting the argumentative relation at issue. A further sentence or short text followed in the subsequent screen as a closing. Since linguistic and visual contextualization items and closing texts appeared in subsequent screens and were aimed at drawing participants’ attention away from the research aim, they acted as fillers. Critical items were thus combined with fillers in a 2:1 ratio. Additional eight distractors[118] with a similar structure to the critical items (preceded by a picture, a presentative context and background

[118] Although very frequently the terms *distractor* and *filler* are used indifferently, we stick to Keating and Jegerski’s (2015) distinction according to which distractors are part of other experiments outside the research scope of the study at issue, while fillers are stimuli designed to merely distract the reader’s attention away from the actual subject matter of the ongoing investigation and prevent learning effects.

information on the subjects of the utterance) were added to the experiment. The distractors employed in the experiment are provided in Appendix 4.

The order of presentation of context and items was as follows. Every screen was preceded by a fixation cross placed exactly at the coordinates where the subsequent text was programmed to appear. The text appeared as soon as the participant had fixated the cross for 1000 ms. When this occurred, the contextualization item was shown (picture and linguistic introductory context). After pressing the space bar and fixating a further cross, the critical/filler/distractor item appeared on the screen. When the space bar was pressed a further time, the closing-up short text consisting of one or two sentences was shown to the participants. Four verification items were also included in every experimental list to further draw away the participant's attention from the researchers' goals and the aim of the reading task. They consisted in simple *yes*/*no* questions addressing a non-critical aspect of the item just read. Verification items were always placed after critical items encoding a plausible causal relation. This way we intended to prevent that a potential cognitive overload derived from the processing of implausible and/or plausible counter-argumentative utterances (especially in the case of non-native speakers) affected performance in the verification items. Verification items are provided in Appendix 5.

5.4. *Eye-tracking study*

5.4.1. Participants

A total of 242 participants were recruited for the experiment. Among them, 113 participants (mean age: 21.2; mode = 18; median = 20; 31 male) were native speakers of Spanish, 62 participants (mean age = 26.2 [19-51]; mode = 24; 11 male) were highly proficient L2 speakers of Spanish and 67 participants (mean age: 23.3 [19-46]; mode = 20; 11 male) were intermediate-level L2 speakers of Spanish. All participants had a higher education qualification or were studying at a university when the experiments were performed. They all had normal or corrected-to-normal vision.

Selection and distribution of L2 speakers of Spanish in either of the two L2 experimental groups (highly advanced speakers = C1-C2 group; intermediate speakers = B1-B1+) was done in two steps. Firstly, participants rated their own proficiency level in Spanish. Secondly, the researcher carried out a brief oral assessment interview before starting the eye-tracking study. The interview and the participants' self-assessment allowed the researcher to place them in one of either experimental group. Additionally, a C1-C2 level of Spanish is a requirement for access to the Masters' programs in Translation and Interpreting at Heidelberg University, which many of the participants in this group were attending at that time. The same applies for participants studying the B.A. in Translation with Spanish as their first foreign language. As for the B1/B1+-level groups, participants of the Goethe University Frankfurt tested in the experiments were taking B1/B1+-level university courses at the Department of Romance Languages; a number of intermediate participants studying at Heidelberg University were studying the B.A. program with Spanish as a second foreign language, which requires a proficiency level of B1/B1+ for successful course completion.

In a first data cleaning procedure, data from thirty-three participants had to be discarded because of problems with the eye-tracker or due to a tracking ratio lower than 90%. After that, the study's sample size taken for statistical evaluation (see § 5.4.4 below) amounted to 209 participants, distributed as follows across participant groups and experimental lists:

	L1	B1	C1	Total per list
List 1	21	17	14	**52**
List 2	25	14	7	**46**
List 3	16	8	8	**32**
List 4	20	10	10	**40**
List 5	20	9	10	**39**
Total per group	**102**	**58**	**49**	**209**

Table 22. Participant group size according to proficiency in Spanish and experimental list

The experiments were carried out between November 2016 and July 2017. Data for L1 speakers were mainly recorded at the University of Valencia (Spain); L2 data were mainly recorded at Heidelberg University and at the Goethe University Frankfurt (Germany). Participants were paid a small fee for participation.

5.4.2. Procedure and apparatus

Twenty sets of experimental quintuplets (causal plausible explicit / causal implicit / causal implausible explicit / counter-argumentative plausible / counter-argumentative implausible) were designed as described above (§ 5.3.2), distributed in five lists according to a Latin-square design and combined with filler items and distractors. Critical stimuli, filler items and distractors were arranged and presented in a pseudo-randomized order to prevent anticipation order effects and learning effects.

Participants were recorded individually either at the Heidelberg University Language and Cognition Laboratory (HULC Lab) equipped with a RED 500 eye-tracker (SMI Research set at 500 Hz) or in a suitable room for the experiments carried out elsewhere. Data gathered out of the HULC Lab were recorded with the RED 500 eye-tracker (experiments carried out at the University of Valencia), or with a RED 250 mobile eye-tracker (SMI Research set at 250 Hz).

Participants were welcomed to the laboratory or the eye-tracking room and told that they were going to take part in a study. They were seated at about 65 cm distance from the computer screen. In some introductory indications given orally by the researcher, participants were instructed to read normally and at their own pace the series of short texts they were going to be shown on the screen. They were also asked to remain still during reading and given some indications about the use of the space bar and the mouse to respectively pass onto the next computer screen or answer the questions of the verification items. Orally conveyed instructions were strictly held constant and given in Spanish for all participants. The researcher just adjusted her speech pace for non-native speakers as necessary.

Each trial started with the participant reading on the screen the instructions that he had just been given orally by the researcher plus further indications about the subsequent calibration procedure. After reading the instructions, a 9-point calibration procedure took place, followed by calibration-rate validation by the researcher. After that, participants read two practice items with the same structure ([linguistic and visual] contextualization + three segments text + closing text) of the experimental items plus a verification question after the second practice item. Subsequently, the actual reading study started. Participants needed about 20 minutes to complete the whole test.

5.4.3. Segmentation of critical items for data evaluation

Reading times were recorded and are reported for the following areas of interest (AOI):

AOI abbreviation	AOI explication
DS1	First discourse segment
DS2-conn	Second segment (excluding the connective)
Utterance	DS1+DS2 (including the connective)
Conceptual-meaning word	DS1+DS2-conn (does not apply for study 2 - Explicitness of a causal relation)
Connective	*sin embargo* or *por tanto*
disamb	disambiguation area: last two (or three) words of the DS2 (only for studies 3 and 4 – Implausibility effects in causal and counter-argumentative relations respectively)

Table 23. Areas of interest (AOIs) reported

This is illustrated in the following sample item:

(63) [*Ricardo y Susana dirigen un hotel muy bonito.*]$_{\text{DS1}}$ [***Por tanto,***]$_{\text{CONN}}$ [*reciben* [*muchos turistas.*]$_{\text{DISAMB}}$] $_{\text{DS2.}}$] $_{\text{UTTERANCE/CONC. MEANING WORD.}}$
‘Ricardo and Susana run a very nice hotel. *Por tanto*, they receive a lot of guests.’

Reading times at the AOIs “DS1” and “DS2-conn” give account of the cognitive effort invested by participants to process respectively the cause and the consequence of the discourse relations at issue. The AOI “Utterance” is informative of the time needed to process an average word in the utterance (see data evaluation in § 5.4.5 below). The AOI “conceptual-meaning word” equals the time needed to process linguistic expressions of the critical utterances that have a representational or conceptual meaning. By contrast, the cognitive effort brought about by procedural meaning expressions in each condition is computed with the processing times obtained for the AOI “connective”. Note that both *sin embargo* and *por tanto* were computed in the mixed models as only one word. Finally, the disambiguation area is reported in studies 3 and 4 (see § 8.4. and § 9.4), where plausibility effects are the independent variable. Data obtained for the disambiguation area in these studies give insight into potential effects arising at the region where the discourse relation is informatively and pragmatically disentangled. In other words, it is informative about the part of the utterance where the reader should become aware of whether he is confronted with a plausible or implausible discourse relation. The disambiguation region comprises the last two words of the second discourse segment and, thus, of the critical item[119].

5.4.4. *Data treatment and data clean-up*

As stated above, a first data cleaning procedure was carried out before statistical evaluation and closer inspection of recorded data. This first, more coarse-grained procedure led to eliminating participants with a tracking ratio lower than 90% or poor data due to problems with the eye-tracker. Data from thirty-three participants were removed from the final data subject to statistical evaluation.

5.4.4.1. *Handling of outliers*

Fine-grained data cleaning affected handling of outliers. Observations (areas of interest [AOI] from one critical item corresponding to one dataset row) were removed if one of the following conditions was satisfied:

1. *Skip or track loss*: First fixation duration (FFD) per word = 0 (all AOIs); total reading time (TRT) per word = 0 (all AOIs but the connective) or first-pass reading time (FPRT) per word = 0 (all AOIs but the connective);
2. *Fast readers*: FPRT per word < 80 ms and second pass reading time (SPRT) per word < 80 ms (all AOIs but the connective and the disambiguation region);

[119] The disambiguation region of item no. 9 had three words ("mucha crema solar" 'a lot of sun cream'). The last two words, however, form a compound noun.

3. *Fast readers* (3 SD): FPRT per word, SPRT per word or TRT per word > 3 standard deviations (SD) from the mean for the particular AOI, condition and language group;
4. *Slow readers* (3 SD): FPRT per word, SPRT per word or TRT per word < 3 standard deviations (SD) from the mean for the particular AOI, condition and language group.

The multiplicative value 3 for SD was chosen after visual inspection of the histograms with 2, 2.5 and 3 SD marked. The dataset comprised 36,960 observations; 176 of them had to be selectively removed as coming from a determined participant, thus the outliers handling was performed on a dataset with 36,784 observations. From this, a total of 3,018 observations was removed (8.20% of the total dataset). 368 observations (1.00%) satisfied the condition "skip or track loss", 1,057 (2.87%) the condition "fast reader (values)", a total of 1,593 (4.31%) either "fast readers (3 SD)" or "slow readers (3 SD)".

5.4.4.2. *Data evaluation*

Recorded eye-tracking data were analyzed statistically via generalized additive models (GAM). Four models were computed for each of the independent variables of the study (cf. § 5.3.1) for the dependent variables first-pass reading time (FPRT), second-pass reading time (SPRT) and total reading time (TRT). Thus, the results of twelve models are reported (chapters 6 to 9).

The models give account of predicted average reading times per word, where predictions are computed assuming a constant number of 6.65 characters per word throughout all AOIs and conditions[120]. The models take condition (§ 5.3.1), AOI (§ 5.4.3) and language group (L1, C1 or B1 participants, § 5.4.1) as fixed effects with pairwise and three wise interactions. The subjects and themes (each experimental quintuplet) were entered as random effects. The number of letters per word of the AOI/Condition was

[120] This value was calculated as the average of the letters per word among the AOI and conditions considered in the data. Previously, (reading times of) 1, 2 or 3-letters functional words (*y* 'and', all items; *la* 'the$_{[FEM]}$', item 14; *un* 'an$_{[MASC.]}$', item 13; *una* 'an$_{[FEM]}$', item 3) had been eliminated for the computations of mean word length of a given AOI. Short quantifiers or adjectives, by contrast, length (*muy* 'very', items 10, 12, 13 and 14; *mal* 'bad', item 12) were maintained due to their function as realizing modifiers of their host constituents/utterances and thus to their potential role as constraints of mental assumptions.

included in the models as a non-linear ("smoothing") effect. The AOI "connective", in particular in the conditions PICo and PPCo (connective = *sin embargo*) showed a very different number of words. As a result, no comparisons between the connectives and any other AOIs are given in the discussion chapters (chapters 6 to 9). Processing effort at the AOI connective (*sin embargo* and *por tanto*) is thus only reported and discussed between conditions.

The following intercepts were used for the different sub-analyses (models):

- Study 1, AOI "DS1+DS2-conn" in DP1Ca – Average time needed by the control group (L1) to read a conceptual-meaning word in experimental utterances in causal relations marked by *por tanto*.
- Study 2, AOI "DS1+DS2-conn" in DP0Ca – Average time needed by the control group (L1) to read a conceptual-meaning word in experimental utterances in implicit causal relations [-*por tanto*]).
- Study 3, AOI "DS1+DS2-conn" in DP1Ca – Average time needed by the control group (L1) to read a conceptual-meaning word in experimental utterances in pragmatically plausible causal relations.
- Study 4, AOI "DS1+DS2-conn" in PPCo – Average time needed by the control group (L1) to read a conceptual-meaning word in experimental utterances in pragmatically plausible counter-argumentative relations.

The statistical analyses were performed using the statistical software *R* (2014). The functions "gam" and "predict.gam" from the package mgcv (Wood 2017) were used to calculate the models and produce the predicted values and plots.

In all sub-analyses (analysis of the eye-tracking parameters considered in each study), the average reading times for the reported AOIs (§ 5.4.3) were compared between and within conditions (first versus second discourse segment). For that purpose, additionally to the predicted reading times in milliseconds, percentage differences are reported. Such differences have been treated as effect magnitudes and arranged according to the following scale (see also Recio et al. 2018; Nadal 2019; Cruz & Loureda 2019;

Nadal & Recio 2019; Salameh Jiménez 2019; Cruz (2020); Narváez García (forthcoming); Torres Santos (forthcoming)).

Percentage difference in average reading times	Effect magnitude
≤ 3.99%	trivial
4.00% to 4.99%	small
5.00% to 9.99%	medium
10.00% to 19.99%	large
≥ 20%	very large

Table 24. Percentage differences in reading times and corresponding effect sizes

The output of all computed GAM is provided in Appendix 6. The discussion of the results obtained for each processing study are provided subsequently in chapters 6 to 9.

6. Processing causal versus counter-argumentative relations

This chapter presents the results and discussion of the processing data obtained for causal versus counter-argumentative discourse relations in an across-subject study carried out, as previously set out, for the two groups of L2[121] speakers of Spanish with an intermediate (B1 CEFR) and an advanced (C1 CEFR) proficiency level respectively. Processing data and patterns obtained for the L2 groups are discussed in relation to the control group (L1 speakers of Spanish) and to each other. Causal relations are marked by the consecutive connective *por tanto* and coded as DP1Ca; in counter-argumentative relations the discourse segments are linked by the counter-argumentative connective *sin embargo*. These utterances are coded as PPCo:

DP1Ca: *Ricardo y Susana dirigen un hotel muy bonito.* ***Por tanto****, reciben muchos turistas.*
‘Ricardo and Susana run a very nice hotel. *Por tanto*, they receive a lot of guests.’

PPCo: *Ricardo y Susana dirigen un hotel muy feo.* ***Sin embargo****, reciben muchos turistas.*
‘Ricardo and Susana run a very ugly hotel. *Por tanto*, they receive a lot of guests.’

The results and discussion are arranged by critical regions or areas of interest (AOI) considered and, within them, by processing measures: total reading time (TRT), first-pass reading time (FPRT) and second-pass reading time (SPRT) for all regions. Results refer always (also in the subsequent chapters 7 to 9) to reading times of an average word with a mean length of 6.65 characters (cf. § 5.4.4.2). Comparisons between conditions are followed by comparisons within conditions.

Between conditions, we begin by discussing data for the critical regions “Utterance”, which comprises all utterance words, including the connective; and “Conceptual-meaning word”, which excludes the connective (*por tanto* or *sin embargo*). Subsequently, data obtained for the functional areas of the critical utterances are presented and discussed: “First discourse segment” (DS1 henceforth), the cause of the argumentative causal relation; “Connective”, either *por tanto* or *sin embargo*; and

[121] L1 is used along this work to refer to the group of Spanish native speakers, that is, to participants who have acquired the Spanish language from their birth. L2 is used to refer to those participants who have learnt Spanish here starting from youth or adulthood, but not simultaneously with another language from birth on and cannot therefore be taken as bilinguals (Meisel 1994; cf. also Klein & Dimroth 2003).

"Second discourse segment" (DS2 henceforth), the consequence of the discourse relation (RT for the connective are excluded).

Within-conditions comparisons are provided subsequently for the DS1 versus the DS2 of each condition for causal utterances followed by comparisons for counter-argumentative utterances.

6.1. *Average utterance word in causal versus counter-argumentative relations*

6.1.1. Total Reading Time (TRT)

In the comparison of global processing in terms of Total Reading Time (TRT) for the AOI "Utterance", which corresponds to the effort needed to process an average word in the utterance of causal-consecutive discourse relations marked by the Spanish connective *por tanto* (DP1Ca) versus counter-argumentative (or counter-causal) relations marked by *sin embargo* (PPCo), a main effect of language group was found. Native speakers of Spanish (henceforth L1) exhibit lower TRT than the non-native groups (advanced learners and intermediate learners [C1 and B1 respectively henceforth]).

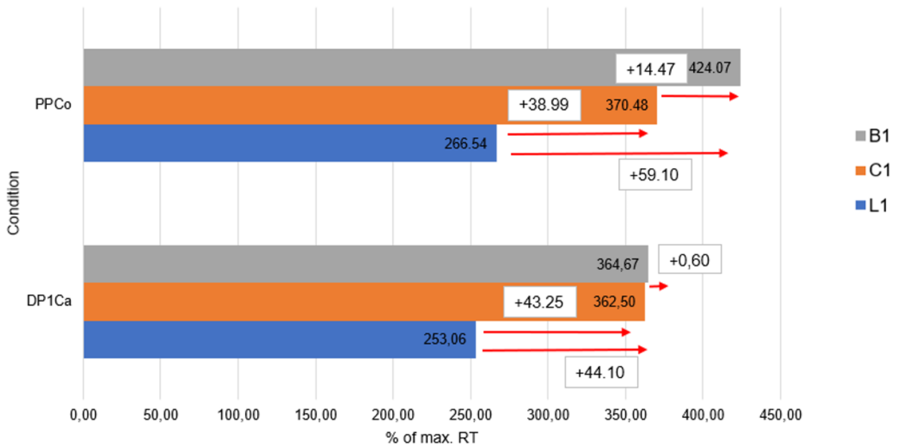

Figure 11. Percentage change in TRT by participant group for each condition

The cognitive-effort gap between the L1 and the C1 group (i.e., the next most proficient group) amounts to +43.25% for the C1 group for the causal relation and +38.99% for counter-argumentation. The gap is even greater for B1 speakers: +44.10% for causal relations and +59.10% for counter-argumentative relations, thus leading to very large effects as to native speakers. While a more in-depth analysis is needed, these data already suggest a native and a non-nativelike processing pattern (this one including both C1 and B1 readers) for both discourse relations:

		Diff in ms	Diff in %	Effect magnitude
DP1Ca	L1-C1	109.44	43.25	very large
	L1-B1	111.61	44.10	very large
	C1-B1	2.17	0.60	trivial
PPCo	L1-C1	103.93	38.99	very large
	L1-B1	157.52	59.10	very large
	C1-B1	53.59	14.47	large

Table 25. TRT - Percentage differences and effect magnitude by participant group by type of argumentative relation

Note the proficiency effect on TRT also found for C1 versus B1 affecting exclusively counter-argumentation. While the magnitude of this second effect is comparatively lower (+14.47% more time for B1 speakers, i.e., almost three times lower than the effects obtained for all comparisons between non-native speakers and the L1 group), it points to possible interaction effects of language group and type of argumentative relation, suggesting markedly more effortful processing of counter-argumentation as proficiency diminishes. In sum, at this point a more *automatized processing* by native speakers in their recovery of a relevant assumption can already be suggested in global terms as indicated by TRT. In addition, the large slowdown effect of counter-argumentation in interaction with language group found for B1 processing (B1 speakers needed +14.47% more time to process counter-argumentative relations than C1 speakers) deserves a closer look. This more specific analysis is carried out by considering proficiency and type of argumentative relation as an additional factor. By doing so, the distribution of the processing patterns just suggested is altered:

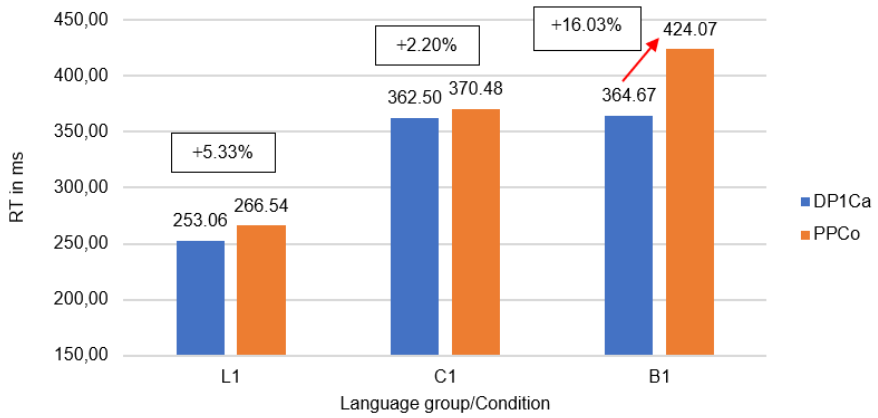

Figure 12. C6. Predicted mean TRT for an utterance word for each group by condition

	DP1Ca	PPCo	Diff in ms	Diff in %	Effect magnitude
L1	253.06	266.54	13.48	5.33	medium
C1	362.50	370.48	7.97	2.20	trivial
B1	364.67	424.07	59.40	16.03	large

Table 26. TRT – Percentage change and effect magnitude by type of argumentative relation

Firstly, B1 speakers need markedly longer to process an average utterance word in counter-argumentative relations, which leads to large effects of the type of argumentative relation. Secondly, an effect of type of argumentative relation is now found for L1 speakers as well, who also need longer to process counter-argumentation. The effect magnitude is, however, medium, and notably smaller than for the B1 group (indeed, it amounts to less than one third: +5.33% for counter-argumentation versus causality for L1 compared to over 16% for B1 learners). In a nutshell, in native and advanced reading, the effects of the type of argumentative relation as seen in an average word tend to be slight (L1) or inexistent (C1), in contrast to the markedly larger effects obtained for the factor "type of argumentative relation" for the B1 group.

In light of these results, the higher automaticity initially attributed to L1 processing by considering proficiency-level seems to be nuanced when task-related factors, i.e., processing a counter-argumentative or a causal-consecutive discourse relation, are additionally taken into account:

1. Considering proficiency (L1 versus L2 speakers), more automatic, less effortful processing is carried out when participants are confronted with their native language. Thus, at least according to a global parameter like TRT for an average utterance word, automaticity seems to directly correlate with proficiency. As a result, processing data are best distributed into a pattern of L1 versus L2 (B1+C1) speakers.
2. However, attending additionally to the factor "type of argumentative relation", data alter the distribution of participants' behavior. On one side are the two most proficient groups, L1 and C1, who process plausible causal and counter-argumentative relations that follow the "rules of discourse" (Canale & Swain 1980: 30) in a similar or near-similar fashion (table 26: trivial or medium-but-near-small effects of type of argumentative relation); on the other side are B1 speakers, for whom counter-argumentation poses higher cognitive demands than causality, leading to a large difference between both conditions in TRT for an utterance word. This suggests that the type of discourse relation affects the cognitive load of B1 speakers, who may perceive utterances of a different argumentative type as *two* different tasks: "processing causality" and "processing counter-argumentation", while the most proficient speakers seem to confront this task as processing a plausible, linguistically valid argumentative utterance.

This finding is in line with previous evidence that "tasks at different levels of complexity elicit different degrees of arousal and demand different amounts of attention and effort" (Kahneman 1973: 17; cf. also § 4.2), and that the degree of difficulty of written text correlates positively with total reading time (Rayner et al. 2006b). In relevance-theoretical terms, Sperber & Wilson (1995:138) state that "the mental activity in which the hearer is engaged also limits the class of potential contexts from which an actual context can be chosen at any given time". According to the data, thus, it is argued that while causality is mastered by speakers at an intermediate proficiency level (as seen in the absence of differences in cognitive effort between B1 and C1 readers), the mental activity required to process counter-argumentative utterances, specifically the instruction of *sin embargo* to contradict and suspend the assumption inferred from the DS1, is more demanding as proficiency decreases. In contrast to B1 reading, L1 and C1 speakers seem to approach the reading task as processing a plausible, normative discourse relation, which results in similar processing times for causality and counter-argumentation. Again, this can be attributed to a correlation between proficiency and processing automaticity of discourse relations which are possible in a language and comply with its discursive rules:

Pattern 1 – Proficiency	**L1**	**C1**	**B1**
Pattern 2 – Proficiency x type of argumentative relation	**L1**	**C1**	**B1**

Table 27. Processing pattern distribution according to factor(s) as observed in TRT

So far, the interim summary can be made that the two most proficient groups (native speakers and speakers with a native-like proficiency) are close in their processing patterns for the variable "type of argumentative relation". Note that such similarity in performance does not refer to similar absolute reading times of both groups, but to the patterns exhibited by them. The slight medium effect of L1 indicates a differentiation of causality and counter-argumentation, but not an effortful one. Under these circumstances, according to the data, L1 speakers and highly proficient L2 learners just seem to process argumentative utterances as linguistically and cognitively plausible. Experimental evidence can be found in line with these data, where causality and counter-causality are processed similarly in terms of TRT as long as world knowledge is involved (Zunino et al. 2012a; Zunino 2014)[122].

In contrast to these results, as proficiency decreases, moment-to-moment comprehension becomes more differentiated for different types of argumentative utterances, so that a cognitive differentiation arises: causal and counter-argumentative processing. Or, in other words, positive versus negative polarity causal relations (Sanders et al. 1992: 10-11; König & Siemund 2000; cf. also Zunino 2017a).

Total Reading Time is, however, too broad a parameter to give account of how detailed processing occurs. More fine-grained measures allow us to give a more exact account of how the *construction* of an initial assumption takes place, i.e., how effortful it is to recover its logical form and carry out primary pragmatic processes; and of how

[122] However, in her 2014 study Zunino observes a facilitation effect of causality on performance as given in correct answers.

readers *reconstruct* a communicated assumption. This more fine-grained information is given by First Pass Reading Times (FPRT) and Second Pass Reading Times (SPRT) respectively. First-pass and second-pass reading should not be equated with semantic and pragmatic processes respectively, since utterance understanding takes place according to a process of mutual adjustment of semantic and pragmatic (inferential) information (Recanati 2004; Escandell Vidal 2014) and should not, therefore, be seen as successive in time. Rather, first-pass and second-pass reading time give insight into the cognitive effort needed to construct and *re*construct a communicated assumption. In this sense, eventual processing difficulties—for instance, checking for effective comprehension or correct integration of an utterance fragment—are mostly solved during second-pass reading (i.e. late processing), the stage during which readers reconstruct a relevant mental representation of the utterance, that is, enrich the initially recovered assumption to confirm, add or eliminate a mental assumption and to arrive to contextual effects (Blakemore 2002; Escandell Vidal 2014; Nadal et al. 2016).

6.1.2. First-Pass Reading Time (FPRT)

Considering language proficiency alone, FPRT data replicate the patterns obtained for TRT: a main effect of language group was found, which translates into a lower cognitive effort by native speakers compared to both non-native groups:

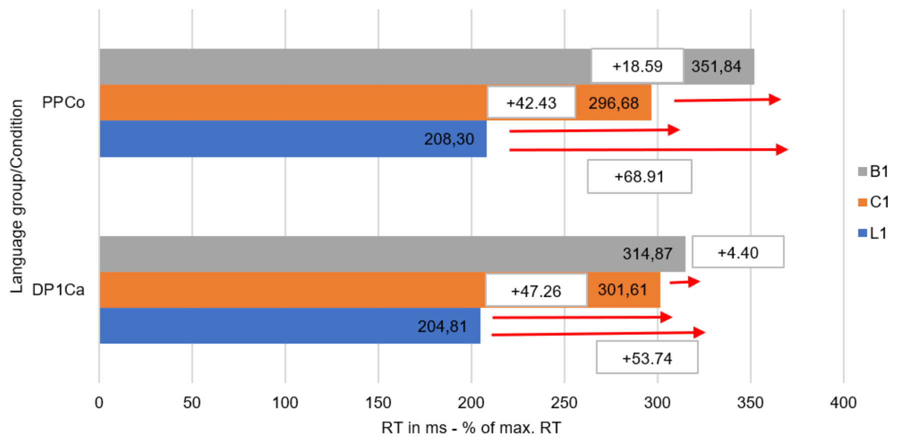

Figure 13. C6. Percentage change in FPRT by participant group for each condition

The cognitive-effort gap between the L1 and C1 group +47.26% larger for the C1 group in causality and +42.43% in counter-argumentation. The gap increases if differences on processing effort are looked at between L1 and B1 readers: +53.74% for B1-reading of causal relations and +68.91% for counter-argumentative relations. All comparisons lead to very large effects. As in TRT, these data suggest a native versus non-native-like pattern in terms of reading effort for all relations also during early processing; they also indicate that learners with an intermediate proficiency in the L2 (= the B1 group) already perform like highly-proficient learners as far as causality is concerned (only a small slowdown effect is found for B1 versus C1 reading, note also the almost identical processing differences in TRT between both groups). Data for counter-argumentative relations, in turn, reveal more effortful processing as proficiency decreases (18.59% difference in the C1 vs. B1 comparison compared to 4.40% difference in the C1 vs. B1 obtained in causality), thus giving rise to a threefold structure of the type L1-C1-B1:

		Diff in ms	Diff in %	Effect magnitude
DP1Ca	L1-C1	96.80	47.26	very large
	L1-B1	110.06	53.74	very large
	C1-B1	13.26	4.40	small
PPCo	L1-C1	88.38	42.43	very large
	L1-B1	143.54	68.91	very large
	C1-B1	55.16	18.59	large

Table 28. FPRT – Percentage change and effect magnitude between groups in causality and in counter-argumentation for an average utterance word

A closer look at data requires considering the factor type argumentative relation in interaction with the language group.

Again, data on FPRT practically replicate the proficiency-dependent pattern of differentiated versus non-differentiated processing of causality and counter-causality (counter-argumentation) as seen above for global processing:

	DP1Ca	PPCo	Diff. in ms	Diff. in %	Effect magnitude
L1	204.81	208.30	3.49	1.70	trivial
C1	301.61	296.68	-4.93	-1.63	trivial
B1	314.87	351.84	36.97	11.74	large

Table 29. FPRT – Percentage change and effect magnitude by type of argumentative relation on an average utterance word

During the construction of an initial assumption, L1 and highly proficient L2 readers (C1) also seem to process argumentation automatically, i.e., as linguistically possible relations, independently of the discourse relation expressed by them. In other words, if discourse relations expressing causality or counter-causality are plausible in discourse and marked by a connective, no distinction is made by advanced and native readers when a first assumption is constructed. By contrast, B1 speakers carry out more effortful processing during FPRT already if recovering an assumption requires an operation of suspension and elimination of assumptions.

At first sight, this seems to pose a challenge on Murray's continuity-hypothesis (1995, 1997) according to which readers tend to interpret successions of events (in narrative texts, however) in a linear, continuous fashion, which would argue for faster processing of causality compared to counter-argumentation as a discontinuous relation already during first-pass reading. In our study, in terms of early processing and total reading time, this is only reliably supported by data from B1 processing[123]. Indeed, only B1 readers make a cognitive distinction of causality and counter-argumentation, the latter being processed more effortfully. However, Murray himself (1995) also provides experimental evidence that the effects of explicitly marking discourse relations with a connective are greater for discontinuous relations. ERP studies also confirm the different contributions to discourse processing of different types of connectives (Brehm-Jurish 2015). That being so, our findings can be explained as a result of the highly constrained discourse introduced by *sin embargo*, which specifies "that the subsequent text is likely to contrast or limit the scope of the preceding text." (Murray 1995: 120 in relation to

[123] As argued above, a slowdown effect on TRT amounting to 5.33% was found for native speakers too. The effect is, however, over three times smaller than the effect found for the B1 group (16.03%) and lies only 1.33% above the threshold of what is considered a reliable magnitude in this study.

adversative connectives as a class), compared to the fewer constraints imposed by *por tanto*, a "moderately constrained" connective (idem). When language proficiency is high enough, the alleged higher cognitive load of counter-argumentation as a discontinuous relation is compensated by more unconscious, in-depth processing of the procedural instructions of the connectives, as L1 and C1 speakers do during early processing stages and, as seen above, in global terms. This claim also fits into the view of connectives as procedural-meaning devices guiding discourse processing.

In conclusion, in the initial construction of a communicated assumption, an average utterance word in a counter-argumentative utterance is more costly when proficiency is not native or near-native like:

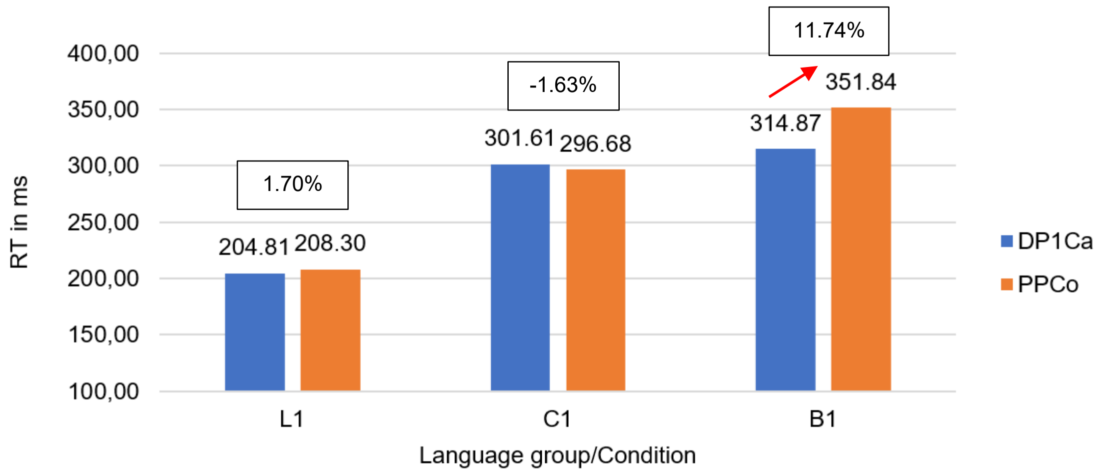

Figure 14. C6. Predicted mean FPRT for an utterance word for each group by condition

6.1.3. Second-Pass Reading Time (SPRT)

Second-Pass Reading Time (SPRT) gives account of how the re-analysis of causal versus counter-argumentative utterances is performed by each participant group. Data for this parameter is taken to reflect the cognitive effort needed to reconstruct a communicated assumption, specifically to perform or re-adjust the integration of the information processed in early reading into entertained mental assumptions (either already mind-stored or explicitly recovered from the utterance itself). It is, in essence, the stage where participants wrap up the process of assumption-recovery to add it to or correct already entertained assumptions. Data obtained for SPRT reveals two main findings:

a) A greater need for reanalysis for L2 highly proficient readers independently of the type of argumentative relation considered.
b) Considering re-reading times, a pattern of shallow *re*-processing by B1-speakers.
c) A greater need for reanalysis of counter-argumentative utterances independent of language proficiency.

Attending to language proficiency, non-native readers need almost 24% (B1) and 27% (C1) more time to reanalyze counter-argumentative relations; as for causal-relations, C1 speakers re-read them almost 27% longer than native speakers. B1 speakers, in turn, invest only 3.15% more time in re-analyzing causality than native speakers do:

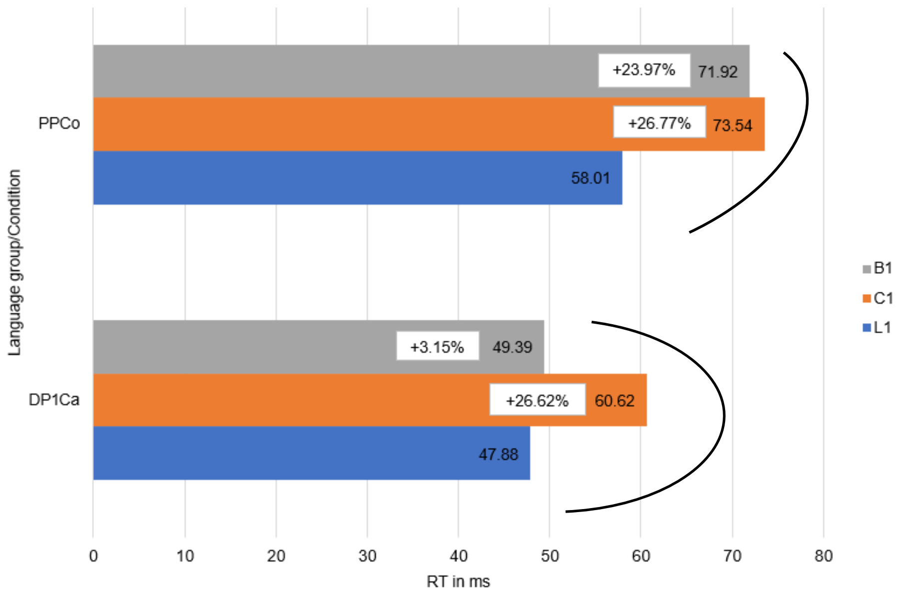

Figure 15. C6. Reading time and differences of SPRT for B1 and C1 vs L1

This implies that in plausible utterances as the ones in this first study, the weight of the reconstruction stage towards recovering the communicated assumption is greater in highly proficient non-native processing. Concerning faster re-reading of causality by B1 speakers compared to C1 speakers (and almost equal to native speakers' re-reading times), the suggestion is that less re-analysis is performed by the former due to a strategy of shallower *re*-processing compared to very conscious processing by the C1 group.

As for the proficiency-independent greater need for reanalysis of counter-argumentation, results seem at first sight to give rise to different findings that what was argued for the construction of a first mental representation (FPRT) and for global processing (TRT), namely that causal and counter-argumentative plausible discourse relations are recovered in an undifferentiated manner at high proficiency levels or in L1 processing:

	DP1Ca	PPCo	Diff. in ms	Diff. in %	Effect magnitude
L1	47.88	58.01	10.13	21.17	very large
C1	60.62	73.54	12.91	21.30	very large
B1	49.39	71.92	22.53	45.62	very large

Table 30. SPRT – Percentage change and effect magnitude
by type of argumentative relation on an average utterance word

During SPRT, all participants, independently of their proficiency, need more time to process counter-argumentation. This is expectable from a theoretical perspective, since counter-argumentation implies cancelling or eliminating a conclusion that has been previously inferred from the first segment of the discourse relation (Blakemore 2002; Portolés 2001[1998]; Zunino 2014, 2017). Counter-argumentation is discontinuous and non-linear, which allows us to argue for its higher complexity compared with causality. It implies a reinterpretation of discourse in the sense that the assumption derived from the first segment of a counter-argumentative utterance must be revised and suspended when the connective and second discourse segment are processed. Crucially, the fact that this complexity did not have a cognitive reflection during FPRT for the most proficient speakers and for the control group suggests that reinterpretation is a higher-order cognitive operation and, as a result, comes into play at a later processing stage. For B1 speakers, this fact is even more pronounced.

While very large effects were obtained for groups, a closer look at the data does suggest differentiated processing for, on one side, native (L1) and highly proficient L2 speakers (C1), and, on the other side, speakers with an intermediate proficiency in

Spanish (B1). For the latter group, counter-argumentation triggers a re-reading need compared to causality that results in over twice as large slowdown effects for an utterance word as for L1 and C1 speakers:

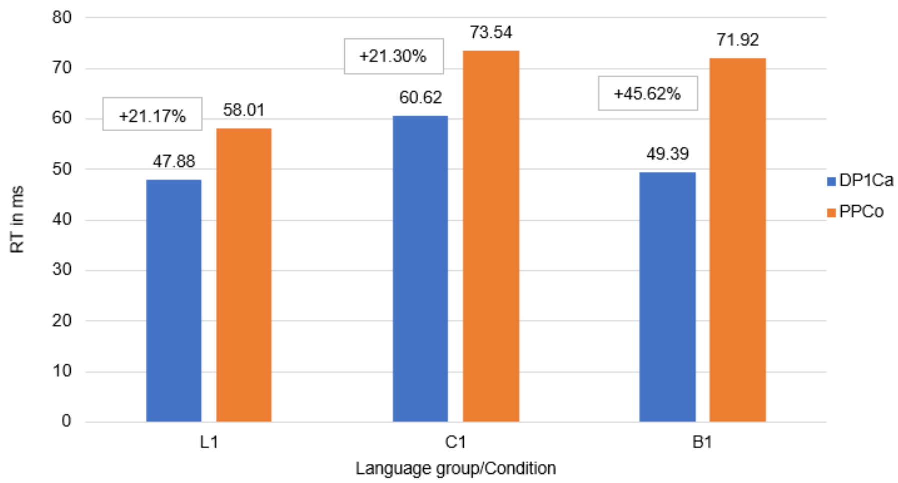

Figure 16. C6. Predicted mean SPRT for an utterance word for each group by condition with % differences

Reanalyzing counter-argumentation is more costly at this stage for all groups, but it is still more automatized for L1 and highly proficient speakers than for B1 speakers. We argue that, while for L1 and C1 speakers the need for re-analysis stems from the negative nature of counter-argumentation, in the case of B1 speakers, it originates from a combination of the negative nature and subsequent higher cognitive complexity of counter-argumentation and a strategy of very shallow re-processing (= very scarce re-analysis) of causal relations, which, if reading times are considered, is performed in native-like times (47.88 ms for L1 speakers and 49.39 ms for B1 speakers).

In conclusion, the higher the speakers' discourse competence[124] is, the less a cognitive differentiation they make between plausible argumentative relations.

[124] Discourse competence can be defined as the mastery of rules that determine how forms and meanings are combined to achieve a meaningful unity of spoken and written texts (Canale 1983a, 1983b). For the Common European Framework of Reference for Languages (CEFR), discourse competence is comprised within pragmatic competence, which is concerned "with the functional use of linguistic resources (production of language functions, speech acts), drawing on scenarios or scripts of interactional exchanges. It also concerns the mastery of discourse, cohesion and coherence, the identification of text types and forms, irony, and parody." (CEFR: 13). From the perspective of Relevance Theory (RT), however, distinguishing

6.2. *Conceptual-meaning words in causal versus counter-argumentative relations*

The critical region "conceptual-meaning word" was established to give account of the average effort needed by participants to process an utterance content word. Thus, contrarily to the AOI "average-utterance word" (§ 6.1.1), reading data for this region excluded the reading times registered for the connective (*por tanto* in causal and *sin embargo* in counter-argumentative utterances). Data for this region are illuminating specially when put in relation with the results obtained for an average utterance word set out in the previous section, because they provide a good picture of how conceptual meaning and procedural meaning interact in utterance understanding and to what extent the connective determines the cognitive effort put by participants with different degrees of proficiency in recovering a communicated assumption.

Results of the analysis of processing times for conceptual-meaning words are almost identical to those just discussed for an utterance average word, with a sole slight divergence in TRT (see table 26) for L1 speakers[125]:

	DP1Ca	PPCo	Diff. in ms	Diff. in %	Effect magnitude
L1	245.14	255.80	10.66	4.35	small
C1	346.37	352.03	5.65	1.63	trivial
B1	354.87	410.02	55.14	15.66	large

Table 31. TRT – Percentage change and effect magnitude
by type of argumentative relation on an average conceptual-meaning word

different types of competence is not necessary. Behaving in a "competent" way is rather understood as the ability to use language in a way that it generates the intended contextual effects in an interlocutor or, in the case of a reader or hearer, being able to access—by means of decoding and inferencing—the assumption intended by the reader (cf. Sperber & Wilson 1995 [1986], see also Foster-Cohen 2000 for a review of RT and Second Language Research).

[125] TRT of an average utterance word brought about medium (but nearly small) effects in FPRT.

	DP1Ca	PPCo	Diff. in ms	Diff. in %	Effect magnitude
L1	200.50	201.84	1.33	0.66	trivial
C1	290.94	283.78	-7.16	-2.46	trivial
B1	305.74	342.95	37.21	12.17	large

Table 32. FPRT – Percentage change and effect magnitude
by type of argumentative relation on an average conceptual-meaning word

	DP1Ca DS1	PPCo DS1	Diff. in ms	Diff. in %	Effect magnitude
L1	44.15	53.52	9.37	21.23	very large
C1	55.04	67.76	12.73	23.12	very large
B1	48.66	66.52	17.86	36.71	very large

Table 33. SPRT – Percentage change and effect magnitude
by type of argumentative relation on an average conceptual-meaning word

Results show that native and highly proficient speakers do not process conceptual meanings differently—or they do so only in to a very low extent, independently of whether such meanings must be mentally manipulated according to a causal or to a counter-argumentative instruction. By contrast, as seen above consistently, this differentiation is made by B1 speakers globally in TRT and during FPRT. As seen for an average utterance word too, such proficiency-dependent differences resulting in a pattern L1/C1 ←→ B1 seem to vanish attending to effect magnitudes during the re-construction of the causal or counter-argumentative relation. However, here again, in terms of percentages, B1 learners' re-analysis need of counter-argumentative utterances compared to causal utterances is almost 60% stronger than for C1 readers and over 70% stronger than for native speakers. Again, this is attributable to their perceived complexity of reading counter-argumentative utterances *plus* a strategy of very shallow re-processing as causality is concerned:

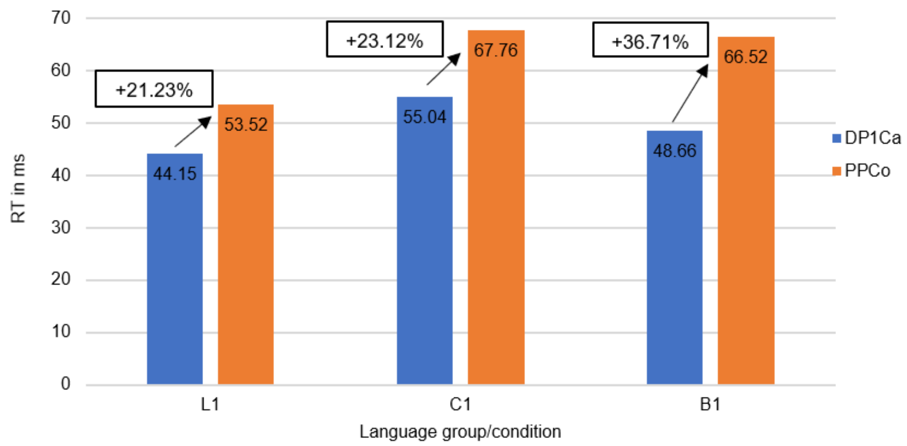

Figure 17. C6. Predicted mean SPRT (in ms) for a conceptual-meaning word for each group by condition with % differences

6.3. *Discourse segments and connectives in causal versus counter-argumentative relations*

The pattern of higher automaticity in correlation with higher proficiency found for the whole utterance, operationalized as reading times for an average word and for conceptual-meaning words, remains valid if the effort needed to process the discourse segments and the connectives of each condition is observed. Again, when plausible and formally possible discourse relations—whether causal or counter-argumentative—are at issue, native speakers exhibit full automaticity compared with non-native speakers, specially B1 learners of Spanish. This reflects in the non-differentiated processing of causality and counter-argumentation for L1 and C1, compared with the differentiated processing of both operations for B1 speakers. Mastering a language means being able to build a coherent representation of discourse. This, in turn, means being capable of assigning discourse members of an utterance their actual argumentative status and, at a wider level, assigning argumentative utterances their meaning within discourse.

In what follows, the effects of causality and counter-argumentation alone and in interaction with proficiency will be exposed for all the TRT, the FPRT and the SPRT for all functional areas of the discourse operation: the first discourse segment, the connective and the second discourse segment.

6.3.1. Total Reading Time (TRT)

Starting from the total time needed to process the first and second discourse members of a causal and a counter-argumentative utterance and the respective connectives signaling them (*por tanto* versus *sin embargo*), all three areas of interest (AOIs) are globally more costly in counter-argumentation:

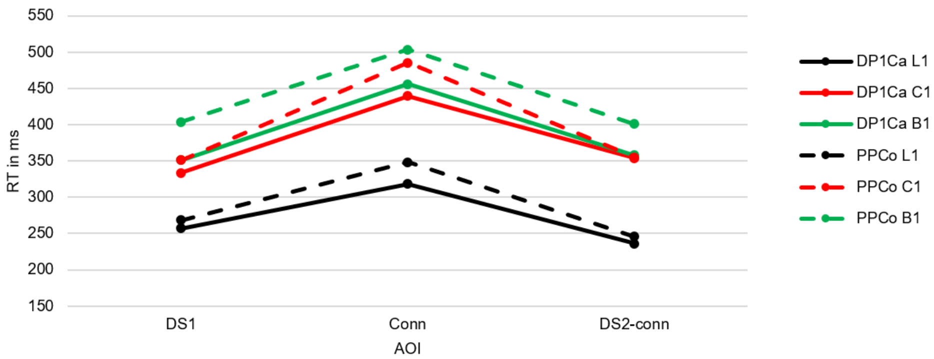

Figure 18. C6. Predicted mean TRT by AOI per language group and condition

However, in general, these effects become subtler as proficiency increases:

	DP1Ca DS1	PPCo DS1	Diff. in ms	Diff. in %	Effect magnitude
L1	257.15	268.24	11.09	4.31	small
C1	333.36	351.26	17.90	5.37	medium
B1	351.34	403.98	52.64	14.98	large

Table 34. TRT – Causality vs. counter-argumentation at DS1

	DP1Ca DS2-conn	PPCo DS2-conn	Diff. in ms	Diff. in %	Effect magnitude
L1	235.99	245.75	9.76	4.14	small
C1	354.22	355.22	1.00	0.28	trivial
B1	357.93	400.83	42.90	11.99	large

Table 35. TRT – Causality vs. counter-argumentation at DS2

Native speakers only exhibit small effects of counter-argumentation at the discourse segments. The highly proficient group (C1) behaves similarly. A higher automatization in argumentation processing can be again attributed to L1 and C1 speakers which correlates with proficiency[126]. Specifically, we suggest that integrating the contents of the cause and (counter-)consequence of a discourse relation is easy for proficient readers and L1 speakers. Both groups are able to recover a communicated assumption from causal and counter-argumentative utterances as tasks consisting in reading normative, plausible discourse relations and, therefore, in a similar fashion. This pattern contrasts with the pattern found for B1 speakers, who differentiate between causal and counter-argumentative relations, as previously seen also for average utterance words. For B1 speakers, processing both the first and the second discourse members of counter-argumentative utterances is more effortful than processing causality and leads to large effects: 14.98% and 11.99% more effort is invested by B1 speakers in processing a counter-argumentative DS1 and DS2 respectively. This, again, indicates that processing argumentation is not an automatic cognitive operation for this group. Indeed, the—at least theoretically—alleged higher complexity of counter-argumentation is at this proficiency stage not yet overridden by the fact that it is a cognitively plausible discourse operation, in contrast to the findings for the L1 and C1 groups.

The picture changes if total reading times at the connective are considered, albeit with L1 speakers showing the lowest condition effects again:

	DP1Ca Conn	PPCo Conn	Diff. in ms	Diff. in %	Effect magnitude
L1	318.37	348.57	30.20	9.49	medium
C1	439.45	485.55	46.10	10.49	large
B1	455.79	503.58	47.79	10.49	large

Table 36. TRT – Causality vs. counter-argumentation at connective

Processing *sin embargo* is more costly than processing *por tanto* for all speakers. However, a pattern distribution of L1 versus L2 readers arises considering effect magnitudes. The pattern becomes even more clear if condition effects in milliseconds are

[126] Differences in percentages of the effect magnitudes of counter-argumentation between language groups for the critical regions DS1 and DS2 support this claim further: between L1 and C1, differences in the impact of counter-argumentation amount to +24.51% and -93.19% for the DS1 and DS2 respectively. For B1 speakers, the effects of processing a counter-argumentative relation are +179.10% (DS1) and +4151.79% (DS2) larger than for C1 speakers; and +247.51% (DS1) and +189.66% (DS2) larger than for L1 speakers.

observed: the time-impact of reading a counter-argumentative connective is over 50% stronger for the C1 and B1 groups than for native speakers (+46.10 ms and +47.79 ms compared to +30.20 ms respectively). An explanation in terms of linguistic knowledge of connectives could be brought up for B1 speakers.

From a global consideration of the TRT just discussed and the suggested distribution of processing patterns into L1/C1 versus B1 (DS effects) or L1 versus L2 (connective effects), we claim a pattern of progressive automaticity as proficiency increases:

1. B1 speakers exhibit very effortful processing *of all AOIs* of counter-argumentation compared to causality.
2. C1 speakers exhibit very effortful processing of the counter-argumentative connective compared to the causal connective. However, this extra effort brings about a facilitation effect which deploys on the discourse members and leads to swift reading of the DS2 and a less effortful reading of the DS1 as well. In other words, the extra effort invested in processing *sin embargo* leads to reducing condition effects on the cause and the consequence of the utterance.
3. Finally, L1 speakers exhibit a comparatively flatter processing of counter-argumentation as to causality and thus subtler effects of the type of discourse relation, particularly on the discourse segments. This is so despite exhibiting markedly more moderate effects of discourse relation at the connective than the L2 groups.

What is suggested is that an effect of causality versus counter-argumentation progressively vanishes as proficiency increases: discursive normativity and mastery of the rules of discourse seems to override the complexity effect of counter-argumentation (discontinuity) versus causality (or continuity) for the most proficient readers and the control group, while it is still perceived by B1 speakers.

6.3.2. First-Pass Reading Time (FPRT)

Further insights can be gained into how causality and counter-argumentation differ in terms of processing depending on language proficiency by looking at early measures. As

FPRT data show, the distributional pattern L1/C1 versus B1 ascertained by looking at total reading times seems to arise early, at the stage where readers construct a first mental representation from connected utterances.

At the area of the connective, all groups process *por tanto* and *sin embargo* similarly:

	DP1Ca Conn	PPCo Conn	Diff. in ms	Diff. in %	Effect magnitude
L1	212.57	210.81	-1.76	-0.83	trivial
C1	309.42	320.00	14.90	3.42	trivial
B1	352.94	354.44	1.49	0.42	trivial

Table 37. FPRT – Causality vs. counter-argumentation at connective

Data seem to argue for no differentiated processing of the connectives themselves, independently of their semantics, at least during early processing. The results obtained for the second discourse segment, however, deliver a different picture:

	DP1Ca DS2-conn	PPCo DS2-conn	Diff. in ms	Diff. in %	Effect magnitude
L1	190.03	189.88	-0.15	-0.08	trivial
C1	297.25	285.51	-11.75	-3.95	trivial
B1	296.95	327.82	30.87	10.40	medium

Table 38. FPRT – Causality vs. counter-argumentation at DS2

Neither the L1 nor the C1 group show an effect of type of argumentative relation on the discourse member following the connective. Only the B1 group dwells largely more time on the consequence of counter-argumentative utterances. These findings are best explained by relating the results obtained for the DS2 following each connective with the features of continuity and discontinuity applied to the discourse relations at issue.

According to Murray's *principle of continuity*, "readers have a bias towards interpreting sentences in a narrative as following one another in a continuous manner. (…) [T]hey assume that the events will follow in a linear fashion. And when this occurs, reading is relatively easy." (Murray 1997: 228)[127]. Applied to our study, this would mean that discontinuous relations—as are counter-argumentative relations marked by *sin embargo*—are cognitively more complex than continuous relations—as those marked by the consecutive connective *por tanto*. If this is so, on the one hand, processing counter-argumentation should be consistently more costly than processing prospective causality. On the other hand, if continuity is expected by default, then the impact of *por tanto* and *sin embargo* on the processing of their respective subsequent segments should differ (Murray 1995, 1997), and *sin embargo* should have a stronger impact on its subsequent discourse visible already in an early processing stage, since discourse is processed incrementally (Traxler et al. 1997; Mak & Sanders 2010; Canestrelli et al. 2013, among others). Specifically, *sin embargo* should guide readers to process its host segment as an unexpected conclusion from what was inferred and mentally represented in the cause.

At first sight, our data do not seem to confirm these hypotheses, since none of the groups exhibit a facilitating effect, i.e., a higher impact of the counter-argumentative connective: L1 and C1 learners read a causal and a counter-argumentative DS2 in an undifferentiated manner, and for B1 group reading a counter-argumentative DS2 is even more costly than reading a causal one. This must be, however, nuanced from the claim that counter-argumentation is cognitively more complex, so that a distribution of L1/C1 readers versus B1 readers arises:

1. L1 and C1 readers perform identically in early stages of processing and do not make any cognitive differentiation between causal and counter-argumentative connectives nor between their host segments. At least during the construction of an initial assumption, similar performance in the reading of both relations is expectable, since both connectives, their use and the inferences they give rise to are possible in Spanish and comply with the "rules of discourse" (Canale & Swain 1980: 30). Despite being two sides of a coin semantically speaking, by observing the data it could be argued that the different procedural semantics of *sin embargo* and *por tanto* do not have any

[127] In similar terms, when discussing conjunctions as (I-)implicature-triggering devices, Levinson (2000: 122) points that "when events are conjoined, they tend to be read as temporally successive and if at all plausible, as causally linked."

effects in early processing. However, according to the baseline set out before that counter-argumentation is deemed to be more complex cognitively than causality from a cognitive perspective (again, it truncates by-default expectations of linearity and communicates an unexpected assumption), identical processing efforts do suggest a stronger facilitating effect and, therefore, a stronger immediate impact of *sin embargo*, whose explication constrains the effort by L1 and highly proficient readers in processing the consequence under its scope. As introduced above, this is in line with previous findings of a stronger facilitating effect of discourse connective in discontinuous relations when properly used (Murray 1995, 1997; Köhne & Demberg 2013; see also Zunino 2017c for an overview).

2. B1 readers, on their part, seem to perform like L1 and highly proficient learners as regards processing of *por tanto* and *sin embargo*, which they do almost identically. However, when put in relation with the results obtained the area of the DS2, a more satisfactory explanation is provided by suggesting, as already mentioned, a pattern distribution of L1/C1 versus B1. The B1 group shows a large slowdown effect of counter-argumentation at the DS2 already during first-pass reading. As a result, rather than attributing the absence of effects at the connective region to automatized and native-like performance at a B1 learning stage, we claim that this is due to *shallower processing* (Clahsen & Felser 2006a, 2006b, 2006c). Shallow processing for non-native behavior has been commonly related with different parsing strategies as to L1 speakers and associated with a lack of complex hierarchical structure in the case of syntactic representations (idem, see § 4.5.1). We proposed to expand the *shallow processing hypothesis* to the realm of discourse processing and to associate it with a lack of full integration of mental representations into a sole assumption in the case of complex utterances[128] (either linked by a connective or inferentially, see chapter 7). Here, it is argued that B1 learners process the connective shallowly, so that, contrarily to the L1 group and to C1 learners, they are not able to generate fully-fledged expectations about the upcoming text from the instructions or constraints

[128] Note that we intentionally refer to *complex utterances* and not to complex clauses or sentences, and deal with mental representations, thus highlighting the distinction between discourse and syntax.

encoded in *sin embargo* and thus need to put more effort in processing the second discourse segment—the counter-argument—in relation to causality.

While further evidence should be gathered that reinforces our claims, the above seems to suggest that lower reading times do not necessarily correlate with less effortful but at the same time successful (= in-depth) processing; rather, they can also be a signal of a lack of depth during processing. A similar explanation is proposed by Clahsen & Felser's *Shallow-Structure Hypothesis* (2006a, 2006b) for syntactic processing:

> In sentence processing, adult L2 learners have been found to rely on lexical, semantic, and pragmatic information in the same way as native speakers, whereas *effects of syntactic structure that were seen in native speakers appear to be absent in L2 processing* (Clahsen & Felser 2006a: 31, our emphasis).

What we suggest according to the data, is that shallow processing can also arise at levels of processing other than parsing, and affect, as far as the present study is concerned, on the one hand, the adequate execution of procedural instructions as encoded by connectives; and, on the other hand, the integration of mentally derived assumptions from the discourse segments into a sole representation.

So far, global and initial effects of the type of argumentative relation were found almost exclusively for the less proficient group. As was suggested, this was attributable to more automatic processing or to a path towards automaticity for L1 and C1 speakers respectively, and to non-automatized or shallow processing by B1 learners. The picture will be now completed by looking at the re-analysis stage (SPRT).

6.3.3. Second-Pass Reading Time (SPRT)

During SPRT, the distribution native speakers/highly proficient learners found so far is nuanced as follows. There is a generalized effect of type of argumentative relation on all critical regions and for all groups:

	DP1Ca DS1	PPCo DS1	Diff. in ms	Diff. in %	Effect magnitude
L1	71.84	77.62	5.78	8.05	medium
C1	70.73	96.52	25.80	36.47	very large
B1	61.54	101.44	39.91	64.85	very large

Table 39. SPRT – Causality vs. counter-argumentation at DS1

	DP1Ca Conn	PPCo Conn	Diff. in ms	Diff. in %	Effect magnitude
L1	104.61	131.28	26.68	25.50	very large
C1	128.66	159.03	30.37	23.60	very large
B1	101.57	142.61	41.04	40.41	very large

Table 40. SPRT – Causality vs. counter-argumentation at connective

	DP1Ca DS2-conn	PPCo DS2-conn	Diff. in ms	Diff. in %	Effect magnitude
L1	45.37	55.31	9.94	21.92	very large
C1	56.37	69.12	12.75	22.62	very large
B1	60.32	72.39	12.07	20.01	very large

Table 41. SPRT – Causality vs. counter-argumentation at DS2

Independently of proficiency, counter-argumentation is more costly than causality, in line with previous evidence attributing a higher cognitive complexity to discontinuous relations (Murray 1995, 1997; Zunino et al. 2012b; Köhne & Demberg 2013; Zunino 2017a). However, as seen in the sections above, this is an effect that does not emerge in early measures (FPRT) nor endures in global processing (TRT)—or does so but not to the with pronounced magnitudes—for the most proficient groups. As for SPRT, the generalized late effect obtained differs as to its magnitude on different critical regions depending on speakers' proficiency.

During re-analysis, the clearest differences arise at the DS1, with effects of the type of argumentative relation over four and eight times larger for the C1 and B1 group compared to native speakers (36.47% and 64.85% for C1 and B1 respectively compared to 8.05% for L1). For non-native speakers, the type of argumentative relation leads to very large effects at the DS1, which in counter-argumentation is re-processed markedly longer than in causality. For the connective and DS2 regions, very large slowdown effects of counter-argumentation were found for all groups. However, the area of the connective deserves a closer look.

The data landscape so far indicates that discursive discontinuity and negative polarity relations are more costly than causality in their re-analysis, independent of proficiency, but, at the same time, that re-analysis is performed differently by each group. While native speakers focus on the connective and the DS2 of a discontinuous relation more than in a continuous relation to recover the communicated assumption, C1 and B1 speakers exhibit higher processing over-costs *on all AOIs*. At the connective, however, such over-costs are almost 60% larger for B1 speakers than for L1 readers. By contrast, C1 speakers only differ clearly from native processing on the DS1 (medium vs. very large effects of counter-argumentation for L1 and C1 readers respectively). This suggests a B1-reading pattern notably different from L1 performance, and a C1-reading pattern in a path towards L1 performance.

In any case, data show that the higher complexity of counter-argumentation as to causality translates in a late integration pattern 'of two places' for native speakers—i.e., re-reading the counter-argumentative connective and the counter-argumentative DS2 longer—but generates a pattern 'of three places' for non-native speakers, who exhibit large or very large effects of the type of argumentative relation at all critical regions.

As occurred when the SPRT was discussed for an average utterance word, from these results, it could be argued that the automaticity criterium does not apply here either to native and native-like processing: after all, throughout all critical regions results show a higher need for re-analysis in counter-argumentative relations. However, what we suggest is that automaticity does not apply here in the same manner as in global processing (TRT) or during the first construction of an assumption from plausible argumentative utterances. We argue that what is qualitatively different, should be processed differently too, and that, as discussed in § 6.1.3 above (SPRT for an average utterance word) and in chapter 3 (differences between causality and counter-argumentation), the latter is more complex a discourse operation that, importantly, implies revising an assumption inferred during an earlier stage. Expectably, thus, all participants of the study exhibit an effect of type of discourse relation in more or less similar terms during the stage of re-analysis, but not during FPRT nor in global processing. In addition, the fact that, on the one hand, very large effects of counter-argumentation arise only in two regions for L1 speakers and on all critical regions for B1 and C1 speakers; and, on the other hand, that re-reading a counter-argumentative DS1 is only slightly different than re-reading a causal DS1 for the L1 group can be seen as indicating different approaches to processing argumentation in general by different proficiency groups. Indeed, it is illuminating that B1 and C1 speakers concentrate largely more on re-processing the DS1 in counter-argumentation than native speakers. The higher complexity of this kind of discourse relations seems to hinder non-native speakers' reactivation of information extracted from the DS1 during early processing, thus leading them to re-read the DS1 considerably more than in causality, which is cognitively less complex. Note that this is specially marked for B1 speakers, for whom the effect of counter-argumentation at the DS1 is over twice as large as for C1 speakers, and eight times larger compared to L1 reading. This ties in with capacity limitations, specifically with working memory constraints, as discussed in chapter 4 (§ 4.5.1), which are considered to lie at the basis of differences in performance between native and non-native processing.

The following sections present analyses of processing patterns within conditions. To that purpose, processing of the DS1 and the DS2 of each condition are contrasted.

6.4. *Causes and consequences in causal relations*

6.4.1. Total Reading Time (TRT)

Data from global processing show a proficiency-related pattern as regards differentiated processing of the discourse segments:

	DS1	DS2-conn	Diff. in ms	Diff. in %	Effect magnitude
L1	257.15	235.99	-21.16	-8.23	medium
C1	333.36	354.22	20.86	6.26	medium
B1	351.34	357.93	6.58	1.87	trivial

Table 42. TRT – DS1 vs. DS2 in causal relations

Native speakers seem to make use of the instruction of the connective that leads them to clearly differentiate between functional areas of the utterance in terms of discourse units. As proficiency decreases, this effect is progressively less nuanced. Notably, B1 speakers do not differentiate between the cause and the consequence of a causal utterance in global terms during reading. We argue that this is attributable to their shallow processing; C1 speakers, in turn, do make this differentiation, thus pointing to a development towards native-like processing yet not with the degree of nuance of L1 speakers. As a result, while they exhibit native-like patterns when it comes to processing the discourse members (they process the cause and the conclusion differently), the connective does not reduce processing costs of the conclusion as it does for L1 speakers. In fact, the DS2 attracts more attention than the DS1. This may be due to a spillover effect of the procedural instruction of *por tanto* as a result of comparatively more conscious processing by the C1 group. A look at early and late processing stages should shed more light on this claim.

6.4.2. First-Pass Reading Time (FPRT)

During early processing of continuous causal relations (FPRT) quantitatively different results are obtained for the C1 group compared to L1 and B1 speakers. We suggest that this is due to different underlying processing strategies during this early stage, which endure during TRT as just put forth above:

	DS1	DS2-conn	Diff. in ms	Diff. in %	Effect magnitude
L1	184.60	190.03	5.43	2.94	trivial
C1	261.95	297.25	35.30	13.48	large
B1	289.12	296.95	7.83	2.71	trivial

Table 43. FPRT – DS1 vs. DS2 in causal relations

For C1 speakers, processing the DS2 is very costly compared to the DS1. This seems to confirm our claim that the connective's procedural meaning is processed particularly consciously by the C1 group and that such processing effort spills over the DS2 already during early reading. This is not the case for the B1 nor the L1 group.

However, instead of considering that this suggests a pattern of the form B1/L1 ←→C1, which could hardly be anchored on theoretical claims, we rather suggest that participants' behavior is proficiency-dependent and distributes as follows:

1. Native speakers process both discourse segments in a normal manner, as indicates the absence of effects in DS1 versus DS2 comparisons. Since consecutive relations are prospective, continuous relations (basic-order relations, cf. Sanders 1992, 1993, Spooren & Sanders 2008), relatively flat processing of cause and consequence are expected, particularly during the construction of an initial assumption.
2. C1 speakers are claimed to process (i.e., to grasp) the procedural semantics of the connective as well already during FPRT. The manifestations thereof are, nonetheless, different than for the L1 group. Instead of flat processing of DS1 and DS2, processing of the connective seems to spill over the DS2 leading to a cognitive differentiation of cause and consequence. This is a pattern where C1 speakers move away from the B1 group, yet not exhibiting a native-like pattern.
3. B1 speakers, finally, quantitatively show an L1-like pattern of no differentiation of the DS1 and the DS2. However, this should not be due to native-like performance, but to their inability to carry out nuanced processing of cause and consequence, even if a discourse marker procedurally signals the distinction. This pattern is again attributed to a shallow processing.

Expectations about the upcoming discourse and how such expectations are seized by each group are considered to also play a role in the pattern obtained. Contrarily to conceptual-meaning expressions, as a procedural-meaning device, *por tanto* does not only generate an expectation (affected by the content its preceding segment but, in any case, *imposed* by its procedural semantics) about upcoming discourse, but also an expectation that what comes next is conceptual content, thus showing that a) procedural meaning always operates upon conceptual meaning, and not the other way around; and b) that, as a corollary thereof, procedural meaning devices always need conceptual representations upon which to deploy their instructions (Leonetti & Escandell Vidal 2004; Escandell Vidal et al. 2011):

Conceptual meaning
→ Expectations about upcoming discourse
Procedural meaning
→ Expectations about the argumentative content of the upcoming discourse
→ Expectations about the kind of semantics (i.e., conceptual) of the upcoming discourse ("segmentation function" [Haberlandt 1984])

In this sense, what is suggested is that the higher effort put by the C1 group in processing the DS2 might indicate that *expectations are not always effort-constraining*. Instead, expectations might also enhance the attention drawn to what comes next. This seems to be the case during when processing is carried out in a particularly conscious way, as argued for non-native speakers with a high proficiency degree in the L2.

6.4.3. Second-Pass Reading Time (SPRT)

During late processing, the way in which the procedural instruction of the connective interacts with the states of affairs communicated in the discourse members leads to partly proficiency-related differences when the re-processing of both discourse members compared to each other is observed. As seen for other comparisons and measures so far, an L1/C1 ←→ B1 pattern emerges:

	DS1	**DS2-conn**	**Diff. in ms**	**Diff. in %**	**Effect magnitude**
L1	71.84	45.37	-26.48	-36.85	very large
C1	70.73	56.37	-14.36	-20.30	very large
B1	61.54	60.32	-1.22	-1.98	trivial

Table 44. SPRT – DS1 vs. DS2 in causal relations

The L1 and C1 groups process the DS1 and the DS2 differently. It thus seems to be the case that when it comes to reorganizing the discourse structure processed and the mental representations obtained during FPRT, L1 and C1 speakers re-read the first discourse segment notably more than the second, which comparatively gets almost 37% and over 20% less attention. On the contrary, no processing differences between both discourse members are found for the B1 group. This suggests that the most proficient speakers differentiate units at the discourse level during reprocessing, which does not apply to the less proficient group. This is in consonance with the discussion of FRPT data, and confirms our intuitions that an alleged native like-performance for B1 speakers is merely an illusion, and that similarities arise in quantitative terms but have a different motivation.

6.5. *Causes and consequences in counter-argumentative relations*

6.5.1. Total Reading Time (TRT)

For the comparisons between the processing patterns between discourse segments in causal relations, we argued that differences in reading times were proficiency-related and, importantly, depended on the strategy applied to seize the procedural instruction encoded in *por tanto*. It was also suggested that patterns that quantitatively pointed to similar performance by B1 and L1 readers actually arose as a result of different processing strategies and of qualitatively differentiated processing depth (automatic processing/conscious processing/shallow(er) processing).

As for counter-argumentative utterances linked by *sin embargo*, when global processing of the DS1 and DS2 is compared, a pattern distribution native ←→ non-native processing arises. Despite their higher processing costs at an absolute level compared to native speakers, when global processing is considered, none of the L2 groups makes a cognitive distinction between the cause and consequence (or counter-cause) of the utterance:

	DS1	DS2-conn	Diff. in ms	Diff. in %	Effect magnitude
L1	268.24	245.75	-22.49	-8.38	medium
C1	351.26	355.22	3.96	1.13	trivial
B1	403.98	400.83	-3.16	-0.78	trivial

Table 45. TRT – DS1 vs. DS2 in counter-argumentative relations

Initially, it could be argued that the semantics of *sin embargo* are seized globally more efficiently by L1 speakers and that, as a result, they process the host segment of the connective faster than the consequence. It could—alternatively or additionally—be the case that *sin embargo* is specially effort-demanding for non-native speakers (§ 6.3.1 and table 35) and that its procedural semantics spills over the second discourse segment, thus evening off any facilitation effect that it could have brought about.

6.5.2. First-Pass Reading Time (FPRT)

During the construction of the initial assumption, the pattern of native ←→ non-native processing is reproduced, albeit with different tendencies:

	DS1	DS2-conn	Diff. in ms	Diff. in %	Effect magnitude
L1	189.98	189.88	-0.10	-0.05	trivial
C1	254.07	285.51	31.44	12.38	large
B1	301.88	327.82	25.94	8.59	medium

Table 46. FPRT – DS1 vs. DS2 in counter-argumentative relations

Native speakers process both members in a similar fashion as a result of automaticity: connected discourse segments giving rise to a normative discourse relation are processed smoothly during early stages (note that the same effect was found for causal discourse segments). By contrast, the C1 group makes a clear cognitive differentiation already during early processing of the cause and the consequence segments of counter-argumentative utterances. Finally, for the B1 group, despite the fact that their absolute processing effort is the highest of all groups, the differentiation between the cause and the consequence is over 30.5% less nuanced than for C1 speakers. As suggested in the discussion of TRT above (§ 6.5.1), this seems to indicate that the cognitive effort needed to process *sin embargo* as a procedural device spills over to the DS2 for the non-native speakers, which is read comparatively longer than by native speakers. From the above follows that the absence of effects or their higher magnitude deserve different explanations:

1. The absence of an effect between cause and consequence during the construction of a first assumption for the L1 group is due to an *automatized recovery* of the initial assumption in plausible, discourse-conform counter-argumentative relations.
2. The large effects found for the C1 between discourse members signal a higher effort in processing the consequence of the utterance. On the one hand, this indicates that processing is not automatized, since performance is not native-like. On the other, it evidences that the procedural instruction of *sin embargo* is processed and spills over the conclusion of the argumentative relation.
3. The medium effects found for B1 learners suggest that processing is not automatized for them either (since the pattern moves away from that of native speakers), nor is nuanced enough to sufficiently differentiate—always in terms of early reading—between the cause and consequence of the utterance, although the processing effort for the DS2 by the B1 group is almost 15% higher than for C1 speakers. In other words, the procedural instruction encoded in *sin embargo* does not serve the less proficient speakers neither to establish strong discourse-semantic nuances between the discourse segments (contrarily to C1), nor to process both discourse segments in a similar fashion. Thus, results so far point again to shallow(er) processing for B1 speakers, in line with the findings discussed above for FPRT in the between-conditions comparison (§ 6.3.2), and for the within-condition analysis for causal utterances (§ 6.4.2). In light of these data, it could be argued that especially early processing is characterized by *shallow processing* for the less proficient group.

6.5.3. Second-Pass Reading Time (SPRT)

During late processing of the discourse segments of counter-argumentative utterances, proficiency-related differences found in TRT and FPRT disappear:

	DS1	DS2-conn	Diff. in ms	Diff. in %	Effect magnitude
L1	77.62	55.31	-22.31	-28.75	very large
C1	96.52	69.12	-27.41	-28.39	very large
B1	101.44	72.39	-29.06	-28.64	very large

Table 47. SPRT – DS1 vs. DS2 in counter-argumentative relations

In early processing, the effect magnitudes concerning the differentiated processing of DS1 versus DS2 were large only for C1 speakers. In contrast, during the reconstruction of the communicated assumption a clear-cut distinction is made in cognitive terms by all participant groups, for whom re-processing the first discourse segment is markedly more costly than re-processing the second segment.

Again, this can be anchored on cognitively grounded theoretical claims about the discursive status of DS1 versus DS2 in counter-argumentation, about the role of counter-argumentative connectives like *sin embargo*, and about the information given by late measures like SPRT about processing:

1. In counter-argumentation, a conclusion that might have been inferred from the propositional meaning of the first discourse segment is eliminated or suspended when the second discourse member is read, in this case, in virtue of the instruction encoded in *sin embargo*. In this sense, more effortful reprocessing of the DS1 leading to very large effects, as shown in our data, is expectable: readers go back to the segment from which the mental representation subject to elimination or revision had been derived (presumably, during the recovery of the initial assumption, i.e., during early reading).
2. This re-reading pattern, however, was also observed in causal relations (§ 6.4.3), where the DS1 required larger re-processing than the DS2, except for B1 learners (who showed no effects). What is therefore argued is that functional areas of consistent argumentative utterances are attributed their distinctive discourse-semantic status (cause – procedural guide – consequence) during late processing, i.e., during SPRT, but that less proficient speakers only achieve such differentiation in presence of procedural devices with very strong semantics. In other words, when a counter-argumentative connective like *sin embargo* is provided, native speakers and non-native speakers, regardless of their proficiency, are able to carry out nuanced re-

processing. In contrast, causality marked by *por tanto*, which in utterances like those employed in the present study makes less essential a semantic contribution to recovering the communicated assumption—the underlying discourse relation can be recovered by merely connecting the content of the segments—, less proficient speakers do not achieve a nuanced distinction of cause and consequence, not even during the re-construction stage. This is in line with experimental evidence gathered for hypotheses formulated under the assumption of the *principle of continuity* dealing with the different constraining power of different types of connectives, as set out above. Note that in FPRT we could confirm such hypotheses only partially. However, during the stage of re-construction of the communicated assumption they seem to apply:

> Following the activation of the connective-appropriate knowledge and the generation of an expectancy for the postconnective sentence, it is proposed that the reader then attempts to integrate the postconnective text *with the immediately preceding sentence*. The model stipulates that the probability of the connective facilitating online local coherence processes (i.e., decreasing reading times) is a joint function of (a) the degree to which the postconnective text "matches" the expectancy generated during the constraint-activation phase and (b) the constraint level associated with the previously encoded connective" (Murray 1995: 120-121, our emphasis)

While both *por tanto* and *sin embargo* bring about a high degree for expectancy-matching ([a]), we argue that—under identical contextual constraints—for less proficient readers only *sin embargo* imposes a high level of constrain ([b]) during the recovery of the communicated assumptions in terms of imposing a discursive differentiation of the DS1 and the DS2. Indeed, as shown in the previous section (§ 6.4), B1 speakers are not capable of establishing nuanced distinctions in these terms in consecutive utterances, despite exhibiting the highest processing times

6.6. *Closing discussion*

Data on causality and counter-argumentation processing obtained in this first study seem to support, so far, the idea that processing patterns change (align) with proficiency, but that they do so in several ways depending on the phenomenon under consideration and the processing stage. What is never the case, however, is that B1 and L1 readers exhibit the same pattern consequently. Even if identical or very close effects derived from quantitative data are obtained for L1 and B1 speakers in a certain condition or critical region, this is motivated by different, theoretically-anchored explanations.

In between-conditions comparisons, very large effects found during the stage of re-analysis for all groups vanish or are reduced to a minimum in global processing (TRT) for the most proficient groups. As a result, it can be claimed that proficiency interacts globally with the type of argumentative relation leading to *lower effects* as proficiency increases. In other words, in line with previous experimental evidence with native speakers (Köhne & Demberg 2013), in global terms, if discourse is clear, utterances are feasible, and the meaning of the connective is processed as an actual constraint on interpretation, more predictive effects and a more natural processing arise in the form of none or almost no differences between causality and counter-argumentation. As proficiency decreases, by contrast, the constraining power of the counter-argumentative connective (*sin embargo*) seems to diminish, probably because speakers do not grasp its procedural meaning fully. This again is considered to be due to limitations in working memory leading to a higher cognitive load in processing of counter-argumentation compared to causality for the B1 group. As a result, considering the whole reading process, the DS1 and DS2 of the counter-argumentative relation are processed more effortfully by B1 speakers only.

A similar pattern is found for global processing effort. Indeed, only the less proficient group makes a cognitive differentiation between feasible and normative discourse operations, with L1 and C1 speakers processing an average utterance/conceptual-meaning word in causality similarly than in counter-argumentation. In sum, what is perceived as one task by highly proficient L2 and native speakers, namely processing argumentative relations, is perceived and approached as two different tasks by B1 speakers. This gives rise to patterns of highly automatized L1 and C1 processing. By contrast, B1 speakers exhibit either very high processing or similar effects to native speakers while moving away from the C1 group. We argue that these results are mainly due to shallow instead of in-depth processing, due to the higher cognitive complexity of counter-argumentative relations, which is dealt with in a non-native-like manner at intermediate proficiency levels.

Shallow processing sometimes affects procedural meaning. In that case, the guiding semantics of the connective is not fully grasp and seized as a constraint on contextual access, thus leading to very effortful processing of a subsequent discourse segment which should have been highly predictable due to the presence of the connective (§ 6.3.2). In other occasions, shallowness compromises the re-analysis stage. This is the case of causal relations, which are barely re-analyzed by B1 readers. As a consequence, the global main effects of type of argumentative relation found for the B1 group in terms of a clear slowdown effect of counter-argumentation are arguably not only due to the higher cognitive load imposed by counter-argumentation, but to their strategy of scarce re-analysis of causality.

The closer look at the processing patterns obtained within utterances has revealed differing patterns for all three language groups. Such threefold differentiation is not always given quantitatively, but anchored on theoretical assumptions about the effects of proficiency on discourse processing, and, in general, on language processing. As a result, detailed pattern explanations arise which, however, need further investigation with complementary experimental methods and settings.

In causality, B1 readers never carry out a nuanced processing of the cause and the consequence, a behavior also attributed to shallow processing arising from capacity limitations. Limitations in cognitive resources seem to be precluding B1 readers from anticipating some parts of discourse clearly expectable on the basis of processing principles (linearity, causality-by-default), procedural constraints (*por tanto* introduces a consequence), and structural constraints (*por tanto* must be followed necessarily by conceptual meanings). For L1 readers, in turn, automaticity is always the case and leads to differentiation of causes and consequences. Finally, C1 readers show a tendency to process marked causal relations native-like, albeit with some signs of highly conscious and very effortful processing. *Conscious processing* is suggested as definitory of the C1 group's behavior. As discussed, it is reflected in longer reading times and effects compared to the other two groups. We suggest that the stage of conscious processing indicates a move away from a conspicuous non-native-like processing but is still insufficient to be fully native-like.

As for nuanced processing of discourse segments in counter-argumentation, although distinctions arise during late processing for all groups that suggest differentiated processing of segments, the effect endures only for L1 learners. As a result, only native speakers seem to have a global processing advantage from *sin embargo* in terms of nuanced discursive-semantics distinctions and to show differentiated discourse integration strategies depending on the discourse relation at issue. For their part, C1 patterns diverging form a native-like behavior are taken to indicate a development towards L1-like performance in terms of internal discourse distinctions and management of expectations derived from connectives and general principles governing discourse. As a result, very effortful processing is taken as an indicator of ongoing processing. Contrarily, B1 reading is shallower: it is neither leads to nuanced processing nor is effortful enough to be explained in terms of highly conscious management of counter-argumentation.

These claims deserve further in-depth investigation where main effects and interactions of further causal and counter-argumentative connectives and different language proficiency groups are dealt with. Such experimental settings would provide robust data and a more comprehensive picture of the facilitating role of procedural meaning devices in relation to linguistic and pragmatic competence.

7. Processing implicit versus explicit causal relations

This chapter presents and discusses the processing data obtained for implicit versus explicit causal relations, the latter marked by the consecutive connective *por tanto*:

DP0Ca: *Ricardo y Susana dirigen un hotel muy bonito. Reciben muchos turistas.*
'Ricardo and Susana run a very nice hotel. They receive a lot of guests.'

DP1Ca: *Ricardo y Susana dirigen un hotel muy bonito.* ***Por tanto****, reciben muchos turistas.*
'Ricardo and Susana run a very nice hotel. *Por tanto*, they receive a lot of guests.'

Processing data and patterns obtained for the L2 groups (C1 and B1) are discussed in relation to the control group (L1 speakers of Spanish) and to each other.

The results and discussion are again arranged by critical regions and, within them, by processing measures: total reading time (TRT), first-pass reading time (FPRT) and second-pass reading time (SPRT) for all regions. Results refer always to reading times of an average word with a mean length of 6.65 characters (cf. § 5.4.4.2). Comparisons between conditions are followed by comparisons within conditions.

We start by presenting results and discussing data for between-conditions comparisons for a conceptual-meaning word, followed by data obtained for the first discourse segment (DS1 henceforth), i.e., the causal segment; and the second discourse segment (DS2), i.e., the consequence segment. Reading times reported for the explicit condition (DP1Ca) exclude reading times at the connective to make stimuli fully comparable with the implicit condition (DP0Ca). The absence versus presence of a connective in the conditions at issue is also the reason why the reading times for an average utterance word (AOI "Utterance", i.e., all words including the connective) are not reported extensively. Instead, some references are made to reading times for the AOI "Utterance" when pertinent for the discussion.

Within-conditions results are provided and discussed subsequently (§ 7.3. and 7.4.) for the comparison of the DS1 versus the DS2 of each condition. First, processing times for implicit causal relations for the three measures considered are dealt with; subsequently, results are provided for the same comparisons in explicit causal relations.

7.1. *Conceptual-meaning words in implicit versus explicit causal relations*

The AOI "conceptual-meaning word" is the average time needed to process an average word with conceptual meaning. Thus, in the explicit condition, the connective was not considered to compute reading times.

7.1.1. Total Reading Time (TRT)

In global terms, data suggest two slightly different processing patterns, one found for the two most proficient groups (L1/C1), and a second one for the less proficient readers (B1):

	DP0Ca	DP1Ca	Diff. in ms	Diff. in %	Effect magnitude
L1	243.84	245.52	1.68	0.69	trivial
C1	342.80	348.01	5.21	1.52	trivial
B1	370.09	354.97	-15.12	-4.09	small

Table 48. TRT – Conceptual-meaning word in implicit vs. explicit causality

For the most proficient groups, implicit and explicit causality are equally effort-demanding. Globally, L1 and C1 speakers do not seem to have any advantage from the presence of *por tanto*, which seems to have a nuanced role as a guide for processing when the mental representations arisen from the lexical content of the linguistic expressions conforming the connected segments can be combined to derive a communicated assumption by resorting to world knowledge. This is explainable from several theoretical claims supported by empirical evidence. Firstly, the human mind, driven by its seek for optimal relevance (in a trade-off of effort and benefits), tends to process two adjacent segments as causally related (Sanders 2005, see also Zunino 2017c for a state-of-the-art, cf. also § 3.1.1). Secondly, and as a result from the first tenet, continuous causal relations are highly predictable in discourse (Segal et al. 1991; Murray 1995, 1997; Brehm-Jurish 2005; Asr & Demberg 2012; Köhne & Demberg 2013). Thirdly, explicating a consecutive connective is not essential "to derive additional contextual effects" (Loureda et al. 2016a;

Nadal & Recio 2019)[129], at least if the relative amount of effort invested in processing an utterance marked by *por tanto* is put in relation with the obtention of such effects.

Contrarily to L1 and C1 readers, B1 speakers globally invest more effort to process a conceptual-meaning word in the absence of *por tanto*. This suggests a slight facilitating effect of *por tanto* for this group that deploys as a constraint on the effort needed to process the conceptual-meaning regions, i.e., the segments. It also suggests—again, in general terms as given by a global measure as is TRT—that at an intermediate proficiency level, second language learners are not yet fully able to process plausible explicit and implicit causal relations in a completely undifferentiated and thus automatic manner. Conversely, at a C1 proficiency level, speakers perform native-like as far as the global recovery of a communicated assumption is concerned. Importantly, however, despite such differences, the fact that only small effects are found (and only for B1 speakers) suggests that native-like performance of processing explicit versus implicit causality is almost achieved at B1. This will be further discussed below.

The pattern changes if for the explicit condition mean reading times of an average utterance word are computed by including the time needed to read the connective[130]:

	DP0Ca	DP1Ca	Diff. in ms	Diff. in %	Effect magnitude
L1	243.84	253.06	9.23	3.78	trivial
C1	342.80	362.50	19.71	5.75	medium
B1	370.09	364.67	-5.42	-1.46	trivial

Table 49. TRT – Average utterance word in implicit vs explicit causality

The distribution L1/C1 ←→ B1 obtained for an average conceptual-meaning word turns into a pattern where C1 speakers are the only group for which condition effects arise, specifically in the form of a slowdown in reading times for the explicit condition

[129] A number of corpus studies also report that causal relations are conveyed implicitly more frequently than other discourse relations, e.g., Carbonell Olivares (2005) for Spanish or Asr and Demberg (2012) for English. See, however, Hoek and Zufferey (2015) for partly different findings in a cross-linguistic analysis of translations.
[130] Results for the AOI "utterance word" are not offered in a separate subsection in this chapter, since they are only meaningful in relation to findings about conceptual-meaning words.

computing the connective. When put in relation to the results for a conceptual-meaning word above, the comparison of both patterns allows for three claims:

- For B1 and C1 speakers processing *por tanto* is effort-demanding. This reflects in a slowdown effect of explicit causality for this AOI for C1 speakers and in the dilution of the facilitating effect of *por tanto* for B1 speakers (cf. table 49 vs 50).
- Native speakers, conversely, exhibit a flat processing pattern with no differences, irrespective of whether reading times for the connective are taken into consideration.

In general terms, we may claim that explicating the connective does not bring about processing advantages in terms of speed-up effects for any participant group. Instead, *por tanto* is itself costly for non-native speakers in TRT. For the L1 group, in contrast, *por tanto* does not lead to increase processing effort: as a result of a fully-fledged discourse competence, reading explicit and implicit causal relations is done automatically and, thus, in the same manner from a quantitative viewpoint.

7.1.2. First-Pass Reading Time (FPRT)

The non-facilitating effect of *por tanto* argued above for the two most proficient groups for conceptual-meaning words during TRT becomes more conspicuous during the initial stage of construction of a communicated assumption. Explicating the connective in a plausible causal relation that can be also built by connecting the mental representations derived from the two segments—in other words, the co-occurrence of a conceptual and procedural guide—only constrains processing effort for less proficient readers. For the most proficient groups it slows down reading of an average conceptual-meaning word:

	DP0Ca	DP1Ca	Diff. in ms	Diff. in %	Effect magnitude
L1	190.04	200.29	10.25	5.40	medium
C1	277.56	291.17	13.61	4.90	small
B1	309.38	305.24	-4.14	-1.34	trivial

Table 50. FPRT – Conceptual-meaning word in implicit vs. explicit causality

Constructing an initial assumption by means of implicitly linked causal segments seems to be easy for C1 and L1 speakers. It suggests automatized processing of the implicit condition by native speakers, and an almost native-like performance for C1 learners. Both groups are able to construct an initial assumption when no procedural guide is provided. In other words, expectations about the upcoming discourse and, specifically, expectations of causality and continuity (Murray 1997; Brehm-Jurish 2005; Sanders 2005; Köhne & Demberg 2013; Zunino 2014; Nadal & Recio 2019)—and the fact that the causal link between the cause and consequence can be established by combining the mental representations arising from the lexical guide given by conceptual-meaning words of the premise and the conclusion of the utterance (Fraser & Malamud-Makowski 1996: 864)—are enough for them to activate frames, scripts and schemas that help create a relevant causal representation from the two utterance segments. For those two groups, no essential contribution of *por tanto* to relate both segments causally as the premise and the conclusion is visible from the data.

If the connective is computed in the average processing time for an utterance word in the explicit condition, the results in terms of slowdown effects of the connective are replicated and become more manifest for C1 learners, who behave fully native-like:

	DP0Ca	DP1Ca	Diff. in ms	Diff. in %	Effect magnitude
L1	190.04	204.81	14.77	7.77	medium
C1	277.56	301.61	24.05	8.66	medium
B1	309.38	314.87	5.49	1.77	trivial

Table 51. FPRT – Average *utterance* word in implicit vs explicit causality

By contrast, for the B1 group, explicating the connective is not costly: here and in the data for a conceptual-meaning word, B1 readers process explicit and implicit causality in an undifferentiated manner. The connective does not facilitate nor disrupts processing. Instead, could be taken as an indicator of a facilitating effect of *por tanto*.

In a nutshell, both in the TRT for a conceptual-meaning word and for an average utterance word, the connective increases the informative load of the utterance in which it is explicated (conceptual + procedural guide vs. only conceptual information in the implicit condition, see Loureda et al. 2016a and Nadal & Recio 2019 for further experimental evidence on Spanish *por tanto*). For L1 and C1 speakers, this leads to slower processing. The B1 group, by contrast, does not perceive the instruction as superfluous and performs equally in both conditions during the recovery of an initial assumption. We suggest that, globally, B1 speakers seem to seize the meaning of *por tanto* as an instruction on "how the proposition [it] introduce[s] is to be interpreted as relevant" (Blakemore 1987: 122). It is, in a strict sense, a guiding device.

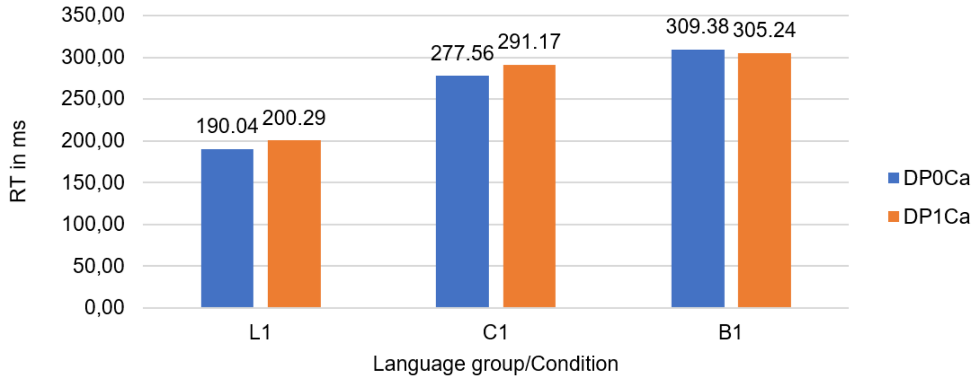

Figure 19. C7. FPRT – Predicted mean for a conceptual-meaning word for each group by condition

7.1.3. Second-Pass Reading Time (SPRT)

Results obtained for the stage of re-analysis reveal notable differences compared to TRT and FPRT. During re-analysis the initially recovered assumption is confirmed, enriched or corrected by contrasting it with mind-stored and contextually given assumptions.

The presence of the connective constrains the need to re-analyze utterances for all participants and brings about a large processing advantage compared to implicit causality:

	DP0Ca	DP1Ca	Diff. in ms	Diff. in %	Effect magnitude
L1	53.40	44.76	-8.63	-16.17	large
C1	64.99	56.46	-8.53	-13.12	large
B1	60.20	49.21	-10.99	-18.26	large

Table 52. SPRT – Conceptual-meaning word implicit vs explicit causality

The absence of differences between groups at this stage argues for an early effect of *por tanto*. During the recovery of an initial assumption (i.e., FPRT), *por tanto* seemed to impose a "processing liability" (Murray 1995: 115) for C1 and L1 speakers leading to slower reading of a conceptual-meaning word and an average utterance word. On the contrary, B1 speakers had an advantage from the procedural guide, in the sense that the comparatively higher information load of the explicit utterance in respect to the implicit condition did not lead to more effortful processing. Observing SPRT data, it could be argued that *por tanto* facilitates re-processing for all groups. However, we claim that the effects of *por tanto* during FPRT translate in a strong constraint for the need for re-analyze the explicit utterance irrespective of proficiency:

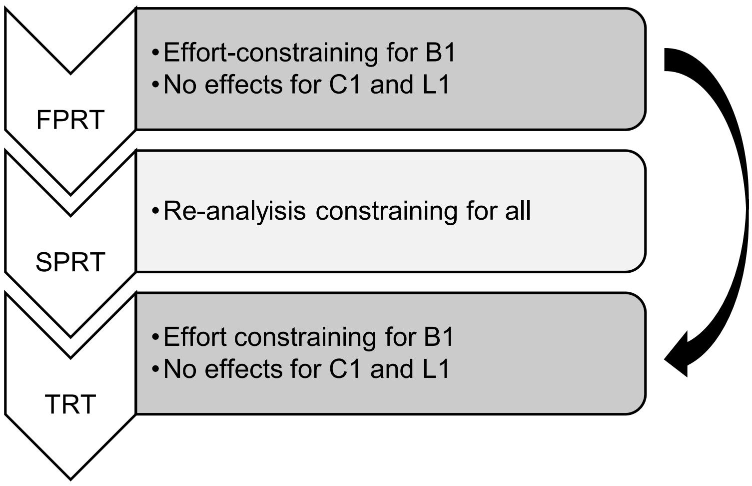

Figure 20. C7. Effects of *por tanto* on a conceptual-meaning word by participant group and processing stage

In line with previous experimental evidence, this argues for early effects of causal connectives (Haberlandt 1982; Millis & Just 1994; Cozijn 2000; see also Canestrelli 2013, Canestrelli et al. 2013 for immediate subjectivity-effects in causality).

This line of argument also applies if the time to process the connective is computed in the explicit condition:

	DP0Ca	DP1Ca	Diff. in ms	Diff. in %	Effect magnitude
L1	53.40	47.88	-5.52	-10.34	large
C1	64.99	60.62	-4.37	-6.72	medium
B1	60.20	49.39	-10.82	-17.97	large

Table 53. SPRT – Average *utterance* word in implicit vs. explicit causality

Por tanto constraints re-analysis for all groups. In terms of effects, it is more moderate for C1 readers compared with the other two groups. However, considering percentage change and compared with the results obtained for a conceptual-meaning word, for L1 speakers the magnitude of the speed-up effect diminishes by approximately 6%, almost equally to C1 readers, with a decrease of about 7%. Thus, even though effect magnitudes differ, C1 and L1 speakers exhibit an almost identical re-reading pattern of *por tanto*, with C1 speakers again approaching native-like performance.

From the results of TRT, FPRT and SPRT for average conceptual meaning and utterance words the following conclusions can be suggested that point to a processing pattern of the sort L1/C1←→B1, with some slight nuances:

- During the recovery of an initial assumption, in this case, the forward causal-consecutive relation holding between the two utterance segments, *por tanto* speeds up processing only for the less proficient group. Importantly, this seems to indicate that the procedural guide is particularly useful as proficiency decreases and that the threshold for it to be actually seized as a processing facilitator lies between an intermediate and an advanced L2-proficiency level.
- *Por tanto* reduces the need to re-analyze conceptual-meaning regions for all groups. For less proficient readers, it additionally informs about the discourse relation at issue. It is therefore argued that causality is established during early processing and, in the case of the two most proficient groups, by combining the conceptual contents of the connected segments, since the explicit condition never leads to a processing advantage in a strict sense[131].

[131] Again, significantly shorter reading times in SPRT are not considered an outcome of the facilitating effect of *por tanto*, but a result of the deployment of its effects during early processing, which subsequently constrain the need for re-analysis leading to a clear speed-up of the explicit condition in late stages.

All in all, the guiding role of the connective is manifest throughout the whole reading process for the less proficient speakers, whereas for native speakers and highly proficient speakers it only deploys during late processing in the form of constraint on re-analysis.

7.2. *Discourse segments in implicit versus explicit causal relations*

The facilitating effects of the explicit condition for less proficient speakers just discussed for a conceptual-meaning word (and briefly for an average utterance word) remains valid when the effort needed to process causal and consequence discourse segments (DS1 and DS2 respectively) between conditions is observed. For C1 speakers, for which the previous data suggested attention shifting to the connective in SPRT, a facilitating effect of the connective is only seen during re-reading. For their part, native speakers seem to apply the processing strategy seen so far for conceptual-meaning words. With the exception of effortful processing of the explicit DS1 (see discussion), *por tanto* acts as a constraint on re-analysis and does not have any impact during early processing. The confluence of a procedural guide, continuity effects and contextually constrained expectations of causality to access a relevant assumption lead to very fast processing when linguistic abilities are fully fledged.

7.2.1. Total Reading Time (TRT)

In total reading time, condition effects are only found for B1 and L1 readers at the causal segment (DS1), but in opposite directions. All participant groups perform thus differently:

	DP0Ca DS1	DP1Ca DS1	Diff. in ms	Diff. in %	Effect magnitude
L1	243.48	255.97	12.49	5.13	medium
C1	329.83	332.30	2.46	0.75	trivial
B1	369.58	349.63	-19.95	-5.40	medium

Table 54. TRT – Implicit vs. explicit causality at DS1

Globally, the presence of a connective slows down processing of the DS1 for L1 speakers, has no impact for the C1 group and speeds up processing of B1 speakers, thus leading to a facilitation pattern inversely proportional to proficiency:

- The procedural instruction encoded in *por tanto* facilitates global processing for the DS1 by the B1 group.
- L1 processing of the cause of an implicit causal forward relation seems to be disrupted by the presence of the connective.
- C1 speakers are halfway between a fully native-like and a non-native-like pattern.

Percentage change for condition-related processing times, indeed, goes up in a nearly linear fashion as proficiency increases, with facilitation effects for B1 readers of approximately 5%, no condition effects for C1 readers, and a slowdown effect of about 5% for the L1 group. Without having considered data for early processing and re-analysis yet, the pattern obtained for L1 readers may tentatively be attributable to the globally trivial contribution of *por tanto* to recovering the semantic relation between the segments. The connective could be triggering L1 readers to search for further contextual effects specially by re-fixating the DS1. Were this so, very low or no effects of *por tanto* are expected during initial processing and stronger effects for re-analysis, when additional cognitive effects are searched for[132].

Considering the consequence segment (DS2), as in the DS1, for C1 readers the presence of *por tanto* does not have an effect on cognitive effort, while the B1 and L1 group process a consequence introduced by *por tanto* faster than in the implicit condition:

	DP0Ca DS2	DP1Ca DS2	Diff. in ms	Diff. in %	Effect magnitude
L1	253.10	234.01	-19.09	-7.54	medium
C1	350.62	352.79	2.17	0.62	trivial
B1	374.09	355.18	-18.90	-5.05	medium

Table 55. TRT – Implicit vs. explicit causality at DS2

[132] Note, however, that the argued derivation of contextual effects when *por tanto* is present did not lead to more effort-demanding processing of an average conceptual-meaning word in TRT, as discussed in § 7.1. Instead, effects were visible in FPRT.

The data-driven pattern B1/L1 versus C1 obtained for previous comparisons is seen again here and must be interpreted qualitatively, once more, as a parabola of the sort B1-C1-L1. Tentatively, several possibilities could be at the root of these findings, which shall be confirmed or discarded by inspecting early reading (FPRT) and re-analysis (SPRT) data:

a) It could be that *por tanto* brings about anticipatory effects for both L1 and B1 speakers, which differ qualitatively in that they are solely generated by the instruction of the procedural guide in the case of the B1 group ("process the member as a consequence reasoned out from the content of the first discourse segment", [*DPDE*, *s.v. por tanto*]) and by the instruction of the connective added to expectations of causality and continuity, which results in very fast reading of the DS2 for the L1 group. If this is so, lower FPRT at the DS2 are expected for both groups in the explicit condition.
b) It could be that *por tanto* constrains the need to re-read the DS2 for both groups, which would reflect in faster reading of the DS2 in explicit utterances, an effect that endures in TRT, thus explaining the medium-sized effects obtained.
c) Finally, it could be that *por tanto* deploys its effects upon the DS2 at different processing stages *for each group*, thus showing—in line with the results for a conceptual-meaning word (§ 7.1.1.)—that similar effects are motivated by different strategies depending on linguistic proficiency: the connective either facilitates early integration of the DS2, which would speed up FPRT; or constrains the need to re-read it, which would lead to lower SPRT compared to the implicit condition; or both, but leading to differentiated behavior of the two groups under consideration.

First and second-pass reading data provide further insight into how the discourse segments of implicit and explicit forward causal relations are processed depending on proficiency and, consequently, give access to the best fitting explanation for the same effect magnitudes obtained for B1 and L1 speakers in TRT.

7.2.2. First-Pass Reading Time (FPRT)

During the construction of an initially communicated assumption, the presence of *por tanto* has an effect only for the less proficient readers. Explicating the connective leads to faster reading of the DS2:

	DP0Ca DS2-conn	DP1Ca DS2-conn	Diff. in ms	Diff. in %	Effect magnitude
L1	187.55	187.99	0.44	0.24	trivial
C1	288.78	294.99	6.21	2.15	trivial
B1	310.30	294.45	-15.86	-5.11	medium

Table 56. FPRT – Implicit vs. explicit causality at DS2

These data seem to confirm the above-mentioned claim of proficiency-dependent processing. Integrating the consequence into the mental representation built so far is facilitated by the procedural instruction of *por tanto* only for B1 readers. For the L1 and C1 group, constructing causality is possible both in presence and in absence of a procedural mark. When the relation holding between two discourse segments can be easily interpreted, the connective can be even perceived as imposing “some sort of processing liability” on the upcoming text (Murray 1995: 115). Explicating *por tanto* does not slow down processing of the DS2, but it does not generate any processing advantage for the two most proficient groups either. These findings can be tied in with experimental findings suggesting that expertise—operationalized in our case as the ability to cope with task demands in Spanish—is inversely related to the advantage of connectives for discourse processing and discourse interpretation (McNamara et al. 1996; Sanders 2005; Taboada 2006, 2009; , Zunino et al. 2012a, 2012b; van Silfhout et al. 2015; Zunino 2017a). They also prove that processing is guided by expectations of relevance. These are created and adjusted during comprehension and “give rise to anticipatory hypotheses as to subsequent linguistic material and to intended representations, so the search space to process subsequent constituents is significantly constrained” (Escandell Vidal 2014: 134). Expectations of continuity (Murray 1995, 1997) are added to expectations of relevance—and, derivative thereof, expectations of causality (Sanders 2005, see also Townsend 1983)

—thus leading L1 and C1 speakers to process the consequence similarly in implicit and explicit causality. By contrast, B1 speakers profit from the presence of the procedural device, which acts for them as a real constraint on contextual access and leads to faster processing of the consequence in explicit causality. The more limited linguistic competence is, the more a reader seems to rely on explicit linguistic material to build an assumption that can be easily recovered otherwise, since L2 speakers seem to exhibit less sophisticated expectations of relevance (Sperber 1994; Wilson 1999). Conversely, fully-fledged discursive competence goes hand in hand with stronger relying on the cognitive principles that govern communication (relevance and, subsequently, causality and continuity).

The fact that the presence of a causal connective does not have an immediate speed up effect on the area following it may seem at odds with previous experimental evidence on several languages showing that connectives function as *immediate* processing instructions (Haberlandt 1982; Noordman & Vonk 1997; Kamalski et al. 2008; Cozijn et al. 2011; Canestrelli et al. 2013). By contrast, in our study we cannot report a facilitation effect on the DS2 following a causal connective (for L1 and C1 readers) compared to an implicit DS2. Our results, however, do not challenge previous evidence and can be explained commenting on the experimental design.

In studies reporting an immediate effort-constraining effect of causal connectives, the processing advantage is found for the words directly following the connective, whereas in our study the DS2 comprises all words within the consequence segment. In fact, in studies pointing to results in line with ours (= no immediate processing advantage of the presence of a causal connective (Murray 1995, 1997) the division in critical regions of the segment following the connective is similar to the one used in our experiments (§ 5.4.3). Other experiments carried out for Spanish did not find either an acceleration effect of connectives (Moncada 2018; Narváez García, forthcoming). More recently, Kleijn et al. (2019) only found a “trend toward facilitation” (p. 12) and a “marginally significant effect” (idem) on comprehension tasks for causal connectives.

Other differences concern the semantics and pragmatics of the connectives analyzed. Whether experiments are carried out with backward (e.g., *because*, or their equivalents in other languages) or with forward causal connectives (*por tanto*, *therefore*…), or whether connectives exhibit substantial semantic differences must be taken in to account when interpreting results (cf. Knott & Dale 1994; Knott & Sanders 1998; Maury & Teisserenc 2005).

7.2.3. Second-Pass Reading Time (SPRT)

The picture changes during re-analysis, as given in SPRT. Condition effects are now found for all groups, both at the DS1 and the DS2, yet in partly very different ways. In general, results point to an L1 ←→ L2 processing pattern. Additionally, for L1 and B1 speakers, condition effects differ greatly depending on whether re-reading of the DS1 or of the DS2 is considered.

At the DS1, for the B1 group the presence of *por tanto* leads to very large (over 20%) constraining effects of the re-reading need compared to the implicit condition. The same effect is found for C1 speakers, albeit one of a small magnitude (4.35%). This considerably more limited effect of *por tanto* suggests an incipient path towards native-like processing, since the L1 group not only does not benefit from the connective, but even incurs in longer re-reading of the DS1 in the explicit condition:

	DP0Ca DS1	DP1Ca DS1	Diff. in ms	Diff. in %	Effect magnitude
L1	68.13	73.60	5.46	8.01	medium
C1	75.08	71.81	-3.27	-4.35	small
B1	77.94	62.31	-15.64	-20.06	very large

Table 57. SPRT – Implicit vs. explicit causality at DS1

For this group, smooth processing of the DS1 is precluded by the explication of the causal connective, which seems to act as a processing liability that compels native speakers to re-read the cause. We suggest that this effect is due to the fact that participants with fully-fledged linguistic and discursive abilities try to search for the relevance of a connective that is not actually needed to (re)build a coherent causal relation (cf. § 3.1.1 and references therein): "Use of a connective tie does constitute a special situation, since in most cases the same or similar inferences can be made between sentences in discourse without a connective tie as well" (Brehm-Jurish 2005: 214). Longer re-analysis of the DS1 by L1 readers may thus be due to their intention to derive further contextual effects:

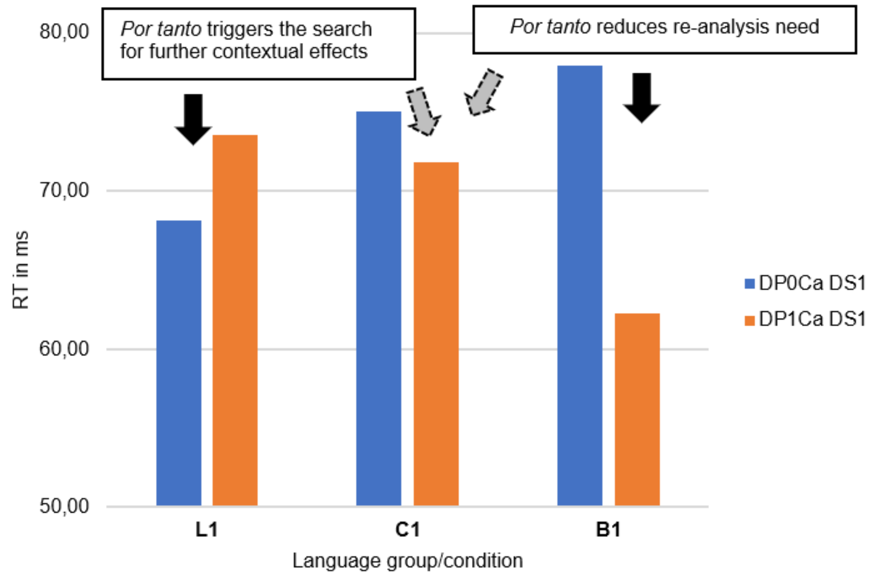

Figure 21. C7. SPRT – DS1 by condition and language group

The lower re-analysis of the DS1 by both L2 groups in the explicit condition suggests a strategy of shallower processing: in their way to recovering the communicated assumption, L2 readers do not seek for contextual effects other than the discourse relation holding between the segments (or, in the case of the C1 group, they do not as deeply as L1 speakers). Again, non-native speakers seem to rely strongly on linguistic material, rather on cognitive principles that govern discourse, i.e., optimal relevance.

In relation to the consequence segment, it is re-read faster in the explicit condition irrespective of proficiency. A pattern L1 ←→ L2 processing is, however, suggested, considering the effect magnitudes obtained:

	DP0Ca DS2-conn	DP1Ca DS2-conn	Diff. in ms	Diff. in %	Effect magnitude
L1	64.99	45.41	-19.59	-30.14	very large
C1	61.37	57.23	-4.14	-6.75	medium
B1	63.12	59.99	-3.12	-4.95	small

Table 58. SPRT – Implicit vs explicit causality at DS2

Por tanto constraints the need to re-read the DS2 for all groups, but it does most notably for native speakers: they re-read the consequence about 30% less when it is introduced by a connective, compared to the medium and small effects found for C1 speakers (6.75%) and B1 speakers (4.95%) respectively. These results are taken as a further indicator of a more limited ability to make use of cognitive principles lying at the basis of communicative exchanges and, additionally, due to the overstrain of cognitive resources, which concentrate on explicit material and block automatically applicable principles of information processing. In the kind of explicit utterances under study, the cause-consequence relation holding between the segments is largely constrained. Firstly, it is explicated by the procedural device; secondly, the assumptions derived from the conceptual contents of each of the segments are stored mentally as related to one another according to a cause-consequence schema, i.e. a sort of *topos*. Additionally, the content and order of the segments satisfy expectations of causality and continuity. For native speakers, these expectations have been found to be activated early and to become manifest on the discourse material subsequent to the expectation-confirming device (*por tanto*) (Haberlandt 1982; Millis & Just 1994; Murray 1995, 1997; Cozijn 2000; Sanders 2005; Mak & Sanders 2013; Nadal & Recio 2019). Lower re-analysis of the DS2 in the explicit condition would thus be expected. According to the results, this is only the case for L1 readers. Our claim is that B1 and C1 readers benefit from the presence of the procedural guide, but not as much from expectations of relevance, causality and continuity. Subsequently, condition effects during SPRT at the DS2 are more moderate for them than for L1 readers. In sum, *por tanto* reduces the need to revise its host segment for all groups, but for L1 readers its effect as a procedural guide adds to the facilitating role of cognitive principles governing communication:

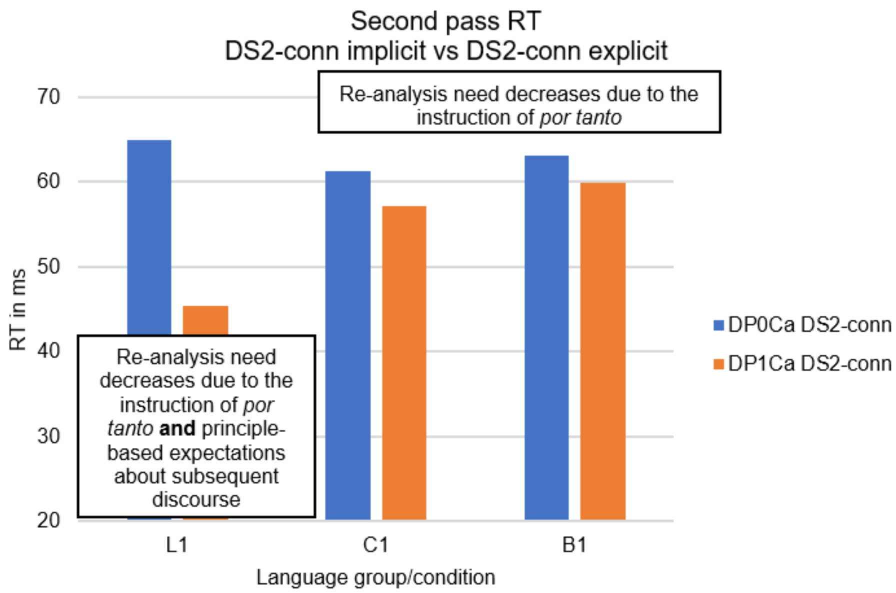

Figure 22. C7. SPRT at DS2 by condition and language group

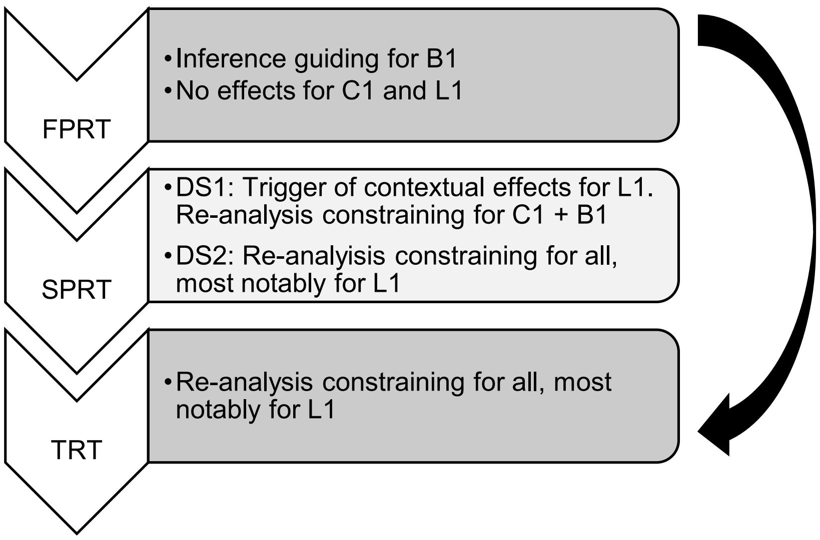

Figure 23. C7. Effects of *por tanto* on the discourse segments by language group and processing stage

Back to the possible explanations set out above (§ 7.2.1.) for the similar behavior of B1 and L1 speakers on the DS2 of TRT (medium speed-up effects in the DS2 of the explicit condition), the third thesis seems to apply: proficiency leads readers to apply different strategies depending on the processing stage. In FPRT, for B1 readers *por tanto* facilitates the integration of the DS2 into a relevant mental representation, an effect that, albeit moderately, is observed during SPRT as well and, subsequently, endures in TRT. Contrarily, L1 speakers do not need the instruction of the connective to integrate the two discourse segments and build a forward causal relation between them, but profit from the presence of *por tanto* as a very strong constraint or inhibitor of re-analysis at the consequence. Crucially, the explication of the connective also seems to be a trigger for native speakers to look for further contextual effects, as reflected in slowed down re-processing of the DS1 in the explicit condition, an effect absent for the other groups (and which dilutes in TRT for the L1 group). As for the C1 group, *por tanto* only constrains re-reading (both at the DS1 and the DS2), but its facilitating effects are evened out with early processing data, and, as a result, they dilute in TRT. Subsequently, on the one hand, C1 performance comes closer to native-like reading to the extent that *por tanto* is not needed to construct a forward causal relation recoverable from the content of the discourse segments. On the other hand, *por tanto* does not constrain the cognitive effort during re-processing as much as for native speakers, so that full native-like behavior cannot be claimed.

So far, condition effects haven been discussed for the critical regions of implicit and explicit causal relations. Along the next two sections, processing of the discourse segments within each condition will be dealt with. The discussion begins with the results obtained from comparing reading times (TRT, FRPT and SPRT) for the cause and the consequence of the implicit condition and is concluded with the results obtained for explicit causal relations.

7.3. *Causes and consequences in implicit causal relations*

7.3.1. Total Reading Time (TRT)

Results obtained from global processing times of the cause and the consequence segment in implicit causal relations show pattern frequently found so far of *automaticity*/*very conscious processing*/*shallow processing* depending on proficiency. It reflects in more effortful processing of the DS2 by C1 speakers (medium effects of DS of 6.30%) and in non-differentiated processing of both DS by L1 and B1 speakers (trivial effects of 3.95% and 1.22% respectively):

	DS1	DS2-conn	Diff. in ms	Diff. in %	Effect magnitude
L1	243.48	253.10	9.62	3.95	trivial
C1	329.83	350.62	20.79	6.30	medium
B1	369.58	374.09	4.51	1.22	trivial

Table 59. TRT – DS1 vs. DS2 in implicit causality

In the absence of a connective, the C1 group carries out differentiated processing of the cause and the consequence and need longer to read the consequence. This is an expectable outcome, since the discourse relation is pragmatically disambiguated in this part of the utterance, especially when no procedural guide is provided. The fact that this pattern is not found for L1 nor B1 speakers suggests an enhanced consciousness by C1 learners when it comes to conveying a semantic status to each of the discourse segments and to recover a communicated assumption. B1 speakers do not make any differentiation between discourse segments in global processing, which is attributed again to shallowness. For L1 speakers, automaticity is argued once more: we are confronted with a normative, plausible discourse relation in which the content of the segments as well as expectations of relevance (and, subsequently, of causality and continuity) seem to be enough to drive readers towards processing the discourse segments in an undifferentiated manner.

7.3.2. First-Pass Reading Time (FPRT)

Compared to TRT data, during first pass reading, all differences found for the comparisons between the two discourse segments against each other are always medium or large, regardless of proficiency. All participants dwell longer in the DS2 during early processing:

	DS1	DS2-conn	Diff. in ms	Diff. in %	Effect magnitude
L1	174.59	187.55	12.96	7.42	medium
C1	254.22	288.78	34.55	13.59	large
B1	290.79	310.30	19.52	6.71	medium

Table 60. FPRT – DS1 vs. DS2 in implicit causality

The absence of a procedural meaning device increases the processing effort of the consequence during the initial construction of a communicated assumption. This is, again, expectable. The DS2 is the fragment of discourse where the relation is disambiguated, but in this condition, there is no semantic instruction for the readers to either anticipate o disambiguate the semantic status of the subsequent discourse, i.e., the DS2.

The data-based pattern L1/B1 (medium effect of DS) ←→ C1 (large effect of DS) should also be qualified here to suggest a three-category pattern of the sort L1 – C1 – B1, corresponding, again, to a schema *automatized – conscious – shallow processing*:

- For C1 speakers, the consequence of an implicit causal relation is largely more costly than processing the cause as a result of more conscious, effortful processing as they try to disentangle the discourse relation at issue. It does not equate with the native-speakers' pattern, which is more automatized.
- B1 speakers perform quantitatively like native speakers, yet, as suggested, our claim is that they are not able to process the different status of cause and consequence in a nuanced manner. Instead, it is argued that both the L1 group—exhibiting over 50% and 45% less processing effort than B1 speakers to process the DS1 and DS2 respectively—and the C1 group (by means of a strategy of highly conscious processing) do. The suggested explanation is, again, one of shallower processing by the B1 group. Apparently equal effects of DS on processing effort for the B1 and L1 groups underlie different motivations.

7.3.3. Second-Pass Reading Time (SPRT)

The results obtained for the reconstruction of a causal assumption conveyed by means of two implicitly connected discourse segments can be arranged into a pattern native (small effects of DS) ←→ non-native processing (large effects of DS). However, leaving aside effect magnitudes giving rise to such pattern, now all groups read the consequence faster than the cause. Apparently, in processing implicit causal relations, readers return to the first segment of the utterance to revise whether the discourse relation built by combining the mental representations derived from the discourse segments is correct. In other words, the cause seems to be the *confirmation/integration area* for all participants, albeit with some differences that license the L1 versus L2 pattern introduced above:

	DS1	DS2-conn	Diff. in ms	Diff. in %	Effect magnitude
L1	68.13	64.99	-3.14	-4.61	small
C1	75.08	61.37	-13.70	-18.25	large
B1	77.94	63.12	-14.83	-19.02	large

Table 61. SPRT – DS1 vs. DS2 in implicit causality

Data suggest that native speakers reconstruct the causal assumption in a more automatized manner, as shown by the fact that they only re-visit the cause slightly longer (less than 5%) than the consequence. Processing is, thus, very flat. By contrast, non-native speakers need markedly longer to process the cause and exhibit large effects of the discourse segments. As can be seen, even at a high proficiency level (C1), in implicitly conveyed causal relations the segment-level strategy to re-process linguistic material to confront it with contextual material and mind-stored assumptions still differs from that of native speakers.

Results obtained for SPRT also show an infrequent processing pattern in the data. In this parameter and for this comparison, the lowest absolute reading times of the DS2 *do not* correspond to native speakers, but to C1 followed by B1 readers:

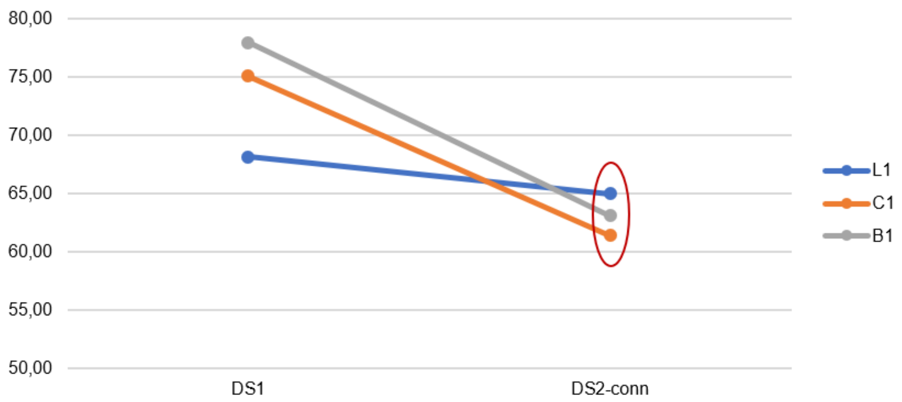

Figure 24. C7. SPRT DS1 vs DS2 implicit causality (- *por tanto*)

As argued above, native speakers recover a plausible causal relation early during processing, even in the absence of a causal connective. As a consequence, their SPRT is flat. Reprocessing is more controlled because a contextual assumption corresponding to an assumption formed by a cause and its consequence has already been accessed at the initial processing stage and the discourse segments have already been attributed a semantic status. By contrast, during re-reading both L2 groups shift their attention away from the consequence, which they read faster than native speakers, and incur in comparatively markedly longer reading times than native speakers of the causal segment, thus suggesting that, when no procedural instruction, integration of the segment endures during the stage of re-construction of the communicated assumption and leads to a their need to re-activate the first segment.

Limitations of working memory are claimed to come into play here again: the mind buffer of L2 readers does not seem to be capable of holding the (declarative and/or discourse-related) contents of the DS1 extracted during early reading and needed to perform full integration of the discourse segments. As a consequence, they need to re-visit the cause of the utterance.

7.4. *Causes and consequences in explicit causal relations*

7.4.1. Total Reading Time (TRT)

For the factor "discourse segment" in explicit causal relations marked by *por tanto* a first global pattern L1/C1 versus B1 speakers was observed. In general, the two most proficient groups process the two discourse segments in a manner that allows us to argue for a correlation of degree of nuance and proficiency. Nonetheless, major differences are seen between L1 and C1 speakers too that suggest different strategies towards attributing discourse segments their corresponding semantic status:

	DS1	DS2-conn	Diff. in ms	Diff. in %	Effect magnitude
L1	255.97	234.01	-21.96	-8.58	medium
C1	332.30	352.79	20.50	6.17	medium
B1	349.63	355.18	5.56	1.59	trivial

Table 62. TRT – DS1 vs. DS2 in explicit causality

According to data, L1 and C1 speakers perform differently concerning *how* they distinguish the cause from the consequence in the recovery of a communicated assumption when a causal connective is provided. C1 speakers focus on the consequence segment, while L1 speakers seem to focus on the cause of the discourse relation. We suggest, however, that L1 readers globally dwelling longer on the cause is just the first of two possible scenarios to be confirmed or discarded by inspecting FPRT and SPRT data:

- The reason to dwell longer on the DS1 than on the DS2 may be the fact that *por tanto* triggers in L1 speakers a search for further contextual effects beyond the explication of a forward causal relation. Note that data from comparisons between conditions already revealed that the L1 group re-visited longer the DS1 in the explicit than in the implicit condition.
- Alternatively, according to a second scenario, higher TRT obtained for the DS1 would not be due to very costly processing of that segment. Instead, it could be the case that L1 speakers may re-analyze the DS2 comparatively less, and that this effect

endures in TRT. Such lower need for re-analysis must be confirmed by looking at SPRT (discussed in § 7.4.2 below), but could be due to the strong anticipatory effect of *por tanto* (which native speakers fully seize) that adds to the effect of the lexical guides and underlying expectations of relevance—already seen for comparisons between conditions at the beginning of this chapter.

As for the B1 group, data suggest again a shallower processing where cognitive distinctions between discourses segments in terms of different reading times are not observed. Note that this pattern was also found in TRT in the comparison DS1 versus DS2 in the absence of *por tanto*. Thus, potential nuances that might have been established in early or late processing, as operationalized in FRPT and SPRT respectively, are diluted in global terms.

7.4.2. First-Pass Reading Time (FPRT)

During FPRT a pattern B1/L1 versus C1 that is qualified as L1 – C1 – B1 emerges. It is again a pattern of flat processing for native speakers, of conscious, effortful processing for C1 speakers and of shallow processing for B1 speakers:

	DS1	DS2-conn	Diff. in ms	Diff. in %	Effect magnitude
L1	179.32	185.82	6.50	3.63	trivial
C1	257.61	293.01	35.40	13.74	large
B1	284.44	292.36	7.91	2.78	trivial

Table 63. FPRT – DS1 vs. DS2 in explicit causality

L1 speakers recover an initial assumption by reading steadily along the cause and consequence segment, so no peaks are found at the initial reading stage of a marked causal relation. Reading is carried out automatically, since participants are confronted with a coherent and plausible relation in their native language and due to the fact that both discourse segments are causally related by their conceptual contents, by the instruction imposed by *por tanto* and by expectations of relevance, more specifically of continuity and causality.

C1 speakers, by contrast, carry out highly differentiated processing concerning the DS1 and DS2. The consequence introduced by *por tanto* is largely more costly than the cause. We argue that both the procedural meaning of the connective and the content of the discourse segments itself point towards the consequence and that *por tanto* is processed early by this group and its procedural meaning spills over the DS2. The confluence of both interpretative cues orients highly proficient readers towards the DS2, where they dwell longer, and seems to trigger in them specially conscious processing of the subsequent discourse. This is an interesting function or effect of discourse markers and poses a further way to understand their role as guides for interpretation: at least when discourse competence is not fully native-like, guiding—in the sense of constraining expectations on contexts and thus on upcoming discourse material—does not always equal to facilitating, but also to enhancing consciousness about what is being performed. Finally, the factor "discourse segment" does not reveal any effects for B1 speakers. As introduced above, we attribute this pattern to a shallower processing. Contrarily to native speakers, who exhibit the same (trivial) effects, our suggestion is that B1 speakers read both discourse segments in a similar manner, yet due to non-nuanced and shallow processing. Again, we argue that shallow processing leads to a lack of semantic differentiation between the semantic status of the segments, at least at this processing stage.

7.4.3. Second-Pass Reading Time (SPRT)

When the relation initially recovered during early processing is revised and contrasted with mind-stored assumptions, readers behave according to a pattern L1/C1 (very large effects of DS) ←→ B1 (no effects of DS):

	DS1	DS2-conn	Diff. in ms	Diff. in %	Effect magnitude
L1	73.60	45.41	-28.19	-38.30	very large
C1	71.81	57.23	-14.58	-20.30	very large
B1	62.31	59.99	-2.31	-3.71	trivial

Table 64. SPRT – DS1 vs. DS2 in explicit causality

As seen in FPRT and TRT, B1 speakers do not carry out a nuanced processing of cause and a consequence linked by a connective at this late stage neither. This contrasts clearly with the results obtained for implicit causality, where effects of the factor "discourse segment" were found both during the construction of an initial assumption and the re-analysis stage. The claim of non-nuanced, shallow processing finds further support in the fact that B1 speakers need less time than C1 and L1 speakers to re-read the DS1 of the utterance (note than more effortful reading by native speakers versus *both* L2 groups was seen too in SPRT of implicit causality, albeit for the DS2) as shown in the figures below:

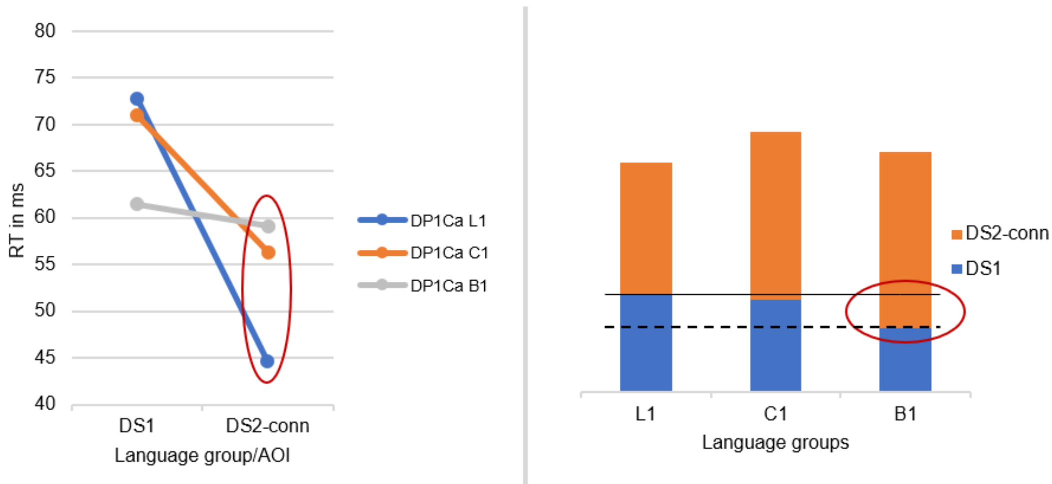

Figure 25. C7. SPRT DS1 vs DS2 explicit causality (+ *por tanto*)

For L1 and C1 speakers, on the contrary, the procedural meaning of *por tanto* combined with relevance expectations and the lexical guide of the first discourse segment itself seem to constrain the need for re-analysis considerably, which translates in very low dwelling on the DS2: 36.85% (L1) and 20.30% (C1) less that on the cause. Again, linguistic material and communication-governing rules facilitate particularly control and limit the re-reading need of the consequence. Note that in the same comparison in the implicit condition large effects had been also found for C1 readers, whereas native speakers exhibited only small effects. The fact that in explicit causality effects increase up to a large magnitude for native speakers seems to support the claims argued so far that connectives are effort-constraining devices in the sense that they control the need to revise what is already conspicuous and complies with mind-stored assumptions, as seems to be the case of forward causal relations as the ones at issue.

7.5. *Closing discussion*

The comparisons between conditions of implicit versus explicit causality show language proficiency-related patterns already observed in study 1 (causality vs. counter-argumentation). Depending on the comparison considered, patterns of automatized, conscious and shallow processing are manifest also in this study.

Patterns of automaticity in causal processing are attributed to native speakers and, globally, also to the C1 group. For them, the presence of a connective does not bring about any processing advantage in global terms. *Por tanto* does however constrain the re-analysis need for all groups. For the B1 group, additionally, it has a facilitating effect. This reflects the importance of explicit contents in non-native processing, which seems to be guided by explicit linguistic material to a notably greater extent as proficiency diminishes. Taken together, results point to a pattern with the distribution L1/C ←→ B1 as concerns an utterance as a whole (§ 7.1.1-7.1.3).

Processing strategies, by contrast, rather respond to a pattern L1 – C1 – B1, with native speakers processing the connective as a liability, B1 speakers profiting from its presence and C1 speakers exhibiting a pattern that is half ways between native-like and clearly non-native-like processing. In early stages C1 behave native-like; during re-analysis, however, only native speakers seem to start the search for further contextual effects triggered by the fact that a connective is used which is, however, not actually needed to recover a cause-consequence relation. This additional search for further cognitive effects seems to be possible only when individuals have fully-fledged (= native) linguistic and discursive competencies. To look for further implicated contents, L1 speakers deploy a strategy of cause-re-analysis. This pattern is not visible for the B1 group and only partially for the C1 group, for whom *por tanto* has exactly the opposite effect: it constrains their need to re-analyze the cause. At the same time, the re-analysis constraining power of *por tanto* does not deploy on the DS2 for L2 readers as much as for native speakers. This seems to be due to the fact that the procedural meaning of the connective adds to principles governing utterance processing (relevance, causality-by-default, continuity) for the L1 group, whereas the contribution of processing principles is less for as proficiency diminishes.

Finally, within-conditions comparisons, global processing results point to a pattern L1/C1 versus B1 in implicit causality, where the L1 and C1 group also differ, albeit slightly; and to a trichotomous pattern of the type L1-C1-B1 for explicit causality. In advance, it can be highlighted that less proficient speakers do not distinguish between discursive areas from a cognitive perspective in terms of differentiated reading effort for each segment, even though the connective had global effects for them in the between-conditions comparisons. Furthermore, also in global terms (TRT), differences in reading times between the discourse segments always lead to either small or medium effects independently of the condition, but never to large or very large ones. We interpret these data as a reflection of the ontological and particular cognitive status of causal relations. Specifically, we consider them to support of the idea that a) when confronted with forward relations, explicit or implicit, readers assume by default that the subsequent discourse is linked to the preceding segments in a continuous fashion (Murray 1995; 1997); b) that additionally, readers are “question-asking, explanation-seeking creatures” (Carston 1993: 157) and operate heuristically according to a mental causal schema, that makes them tend to process consecutive segments as causally related (Sanders 2005; Bezuidenhout 2017: 105); c) that both the *continuity hypothesis* and the *causality-by-default hypothesis* are, in turn, driven by expectations of optimal relevance, which also determine how the recovery of the explicit and implicit meanings of utterances interact in a process of *mutual parallel adjustment* to arrive to the assumption intended by the interlocutors (Sperber & Wilson 1998; Carston 2002b; Wilson & Sperber 2002; Recanati 2004; Escandell Vidal 2014).

8. Processing plausible versus implausible causal relations

The third aspect dealt with in the present work is the effect of pragmatic plausibility in processing causal relations with the causal connective *por tanto* on native speakers of Spanish, again the control group, and C1 and B1 learners of Spanish.

In a processing study, participants read pragmatically plausible and implausible causal relations marked by the connective *por tanto*. A causal utterance is taken as congruent or plausible when it conveys an assumption that can be integrated by the addressees of the utterance without any sort of interpretive conflict in other memory-stored assumptions that they entertain, thus leading to contextual effects (see § 2). By contrast, an implausible causal utterance communicates an assumption which clashes with mind-stored assumptions because these are not entertained as causal schemata (i.e., $p \rightarrow q$) in long-term memory, as communicated by the utterance, but as a counter-causal. Note that plausibility is always to be understood in relation to a reader's cognitive environment, and is, therefore, never an absolute notion[133].

In the stimuli of the study, the warranty of anomaly or implausibility arises from the presence of the causal-consecutive connective *por tanto*, which makes the clash between communicated and stored assumptions unavoidable. *Por tanto* inevitably imposes a forward causal reading of the connected segments ($p \rightarrow q$). More specifically, it instructs the readers to process the first discourse segment as the premise for the conclusion stated in the second discourse segment. Such reading is forced, even if the addressees hold the assumption that a different relation holds between the mental representations arising from the content of the segments, in this case, counter-causality. Thus, in the experimental stimuli at issue, the "cause-effect" interpretation imposed by the connective either is pragmatically felicitous as in (64a), or gives rise to semantic

[133] The representations stored in an individual's cognitive environment are of an internal nature: they correspond to "mental, personal and private images" (Escandell Vidal 2014: 38). Certain internal representations can be thought of "as propositions: they can describe states of things and among them one can establish the whole range of possible logical relations (cause-effect, inclusion, contradiction…) described independently" (idem: 39). Members of the same culture or community usually share schemata, a "common ground" (Clark 1996: 103, 121); schemata and assumptions are shared with others as a result of the contact with them give rise to a "personal common ground" (idem). These, however, can also vary individually.

anomaly[134] that must be solved by means of inference (Leonetti & Escandell Vidal 2004; Escandell Vidal & Leonetti 2011) in the cases where the recovered assumption does not fit in with any assumptions in the reader's cognitive environment as in (64b):

(64) a. *Pepe y Antonio tienen* ***muy mal*** *carácter. Por tanto, tienen muchas discusiones.*
b. *#Pepe y Antonio tienen* ***muy buen*** *carácter. Por tanto, tienen muchas discusiones.*
'Pepe and Antonio have a very *bad*/*#nice* character. *Therefore*, they get involved in many arguments.'

Following the structure of two previous chapters, in what follows the results and discussion of the processing data obtained for plausible versus implausible causal relations marked by the connective *por tanto* in an across-subject study for the three participant groups (L1, C1 and B1 learners) are provided.

The results and discussion are arranged by critical regions or areas of interest (AOI) considered and, within them, by processing measures: total reading time (TRT), first-pass reading time (FPRT) and second-pass reading time (SPRT) for all regions. Results refer always to reading times of an average word with a mean length of 6.65 characters (cf. § 5.4.4.2). Comparisons between conditions are followed by comparisons within conditions.

The first part of the chapter is devoted to between-conditions comparisons. Data are discussed for the critical regions "Utterance", which comprises all utterance words, including the connective; and "Conceptual-meaning word", which excludes the connective (*por tanto*). Subsequently, data obtained for the functional areas of the critical utterances are presented and discussed: "First discourse segment", i.e., the causal segment (DS1 henceforth); "Connective" (*por tanto*); "Second discourse segment", i.e., the consequence segment (DS2 henceforth); the disambiguation area, corresponding to the last two words of the DS2, i.e., to the part of the utterance were the compliance or clash

[134] "(…) true ungrammaticality results from mismatches involving grammatical categories or features, where no reinterpretation process is available; in the rest of cases [where there is a mismatch], semantic ill-formedness (anomaly) is obtained, unless some kind of reinterpretation process restores compatibility and solves the mismatch." (Escandell Vidal & Leonetti 2011: 87)

between mental-stored and communicated assumptions can be detected. Data about this critical region were not discussed in the two previous studies but will be provided here as well as in study 4 (chapter 9), which also deals with clashes between contextual assumptions and procedural meaning, albeit in counter-argumentative utterances marked by the connective *sin embargo*.

Within-conditions comparisons are provided subsequently for the DS1 versus the DS2 of each condition for plausible causal utterances followed by comparisons for implausible utterances.

8.1. *Average utterance word in plausible versus implausible causal relations*

8.1.1. Total Reading Time (TRT)

According to a global indicator of processing effort like TRT, an average utterance word in the pragmatically inconsistent condition is more costly for all participants independently of their proficiency:

	DP1Ca	PICa	Diff. in ms	Diff. in %	Effect magnitude
L1	251.84	317.74	65.90	26.17	very large
C1	363.13	442.76	79.63	21.93	very large
B1	363.28	462.73	99.45	27.38	very large

Table 65. TRT – Average utterance word in plausible vs. implausible causal relations

The slowdown effect of implausibility amounts to over 20% more cognitive effort for all groups. This extra time is a clear indicator of the additional effort that readers expend in accommodating an assumption recovered from an incongruent causal relation, which clashes with the assumptions already entertained by them, compared to the congruent condition, where the assumption processed out of the utterance fits in with other contextual assumptions entertained by the readers. Mismatches between contextual assumptions and procedural meaning, thus, seem to have an impact on language users from an intermediated proficiency already.

By turning to early and late processing measures, in the next subsections we provide an account of *when* the observed effects of incongruency arise and discuss whether such time course is proficiency-dependent.

8.1.2. First-Pass Reading Time (FPRT)

During FPRT a very different picture arises as concerns implausibility effects. It should be recalled that FPRT gives account of the effort needed to access word meaning but is also sensible to whether the meaning extracted from a word or a word group agrees or not with prior context (Rayner et al. 2012: 143). In the sort of utterances at issue, "prior context" corresponds to the contents expressed in the DS1, i.e. the, cause.

Results obtained for FPRT show that the mismatch present in the implausible utterances is already perceived by participants during the construction of an initial assumption: incongruency slows down reading for all groups.

	DP1Ca	PICa	Diff. in ms	Diff. in %	Effect magnitude
L1	203.53	220.15	16.62	8.17	medium
C1	301.18	315.06	13.89	4.61	small
B1	313.85	349.28	35.43	11.29	large

Table 66. FPRT – Average utterance word in plausible vs. implausible causal relations

FPRT effects differ however from effects obtained in TRT in two ways. Firstly, they are more moderate in FPRT (between medium and large, but never very large, as in TRT), specially for the two more proficient groups. Secondly, the slowdown FPRT effects differ for all groups. Medium and small incongruency effects were found for L1 and C1 speakers respectively; B1 speakers display large effects of incongruency. Two interim conclusions can thus be formulated so far:

- During early stages of processing, mismatches of procedural meaning and contextual assumptions have a different impact on the interpretive process depending on language proficiency.
- Less proficient speakers (the B1 group) need to put markedly more cognitive effort to form an initial mental assumption from an implausible utterance than highly proficient and native speakers. This could be due to the less fledged ability by B1 speakers leading to cognitive overstrain, which would make them dwell longer on the utterance words during the construction of an initial assumption and block or hinder a reaction in the form of a re-analysis strategy. A strategy of re-analysis is precisely what is argued to lie at the basis of the FPRT data obtained for the C1 group and, to a lesser extent, for L1 speakers. Were this so, stronger implausibility effects in SPRT are expected for L1 and C1 readers than for B1 readers.

8.1.3. Second-Pass Reading Time (SPRT)

When SPRT, i.e. the stage of reconstruction of the communicated assumption, is considered very large effects of implausibility are found for all groups:

	DP1Ca	PICa	Diff. in ms	Diff. in %	Effect magnitude
L1	48.19	97.44	49.25	102.22	very large
C1	62.02	127.77	65.75	106.01	very large
B1	48.87	112.86	63.99	130.93	very large

Table 67. SPRT – Average utterance word in plausible vs. implausible causal relations

In effect magnitudes, the SPRT draws an identical pattern to TRT. All participants need markedly more to process an inconsistent utterance. This seems to support theoretical proposals that semantic anomalies—as opposed to ungrammaticality—must be solved by means of inference, they are high-level pragmatic processes (Leonetti & Escandell Vidal 2004; Escandell Vidal & Leonetti 2011) that deploy specially during the stage where the addressees of an utterance revise the initially recovered assumption and evaluate it by contrasting it with mind-stored assumptions to, eventually, adjust it to the newly incoming material. Indeed, even if utterances are understood by means of a process of mutual parallel adjustment between semantics and pragmatics (Recanati 2004; Escandell Vidal 2014), with inferencing already coming into play in during early processing, the hardest inferential work seems to arise in second-pass, thus during the reconstruction stage. This is exactly what data show, more notably when put together with data from early processing (FPRT, table 66 above).

Although, in terms of effect magnitudes, implausibility seems to impact all participant groups equally, considerable differences can be suggested if the effect percentage differences of each group are observed. L1 and C1 speakers perform almost identically (the impact of implausibility is only 3.71% stronger in the latter group). By contrast, the effect of implausibility is 23.51% and 28.09% stronger for B1 speakers than for C1 and L1 respectively. Differences are shown in the shaded boxes:

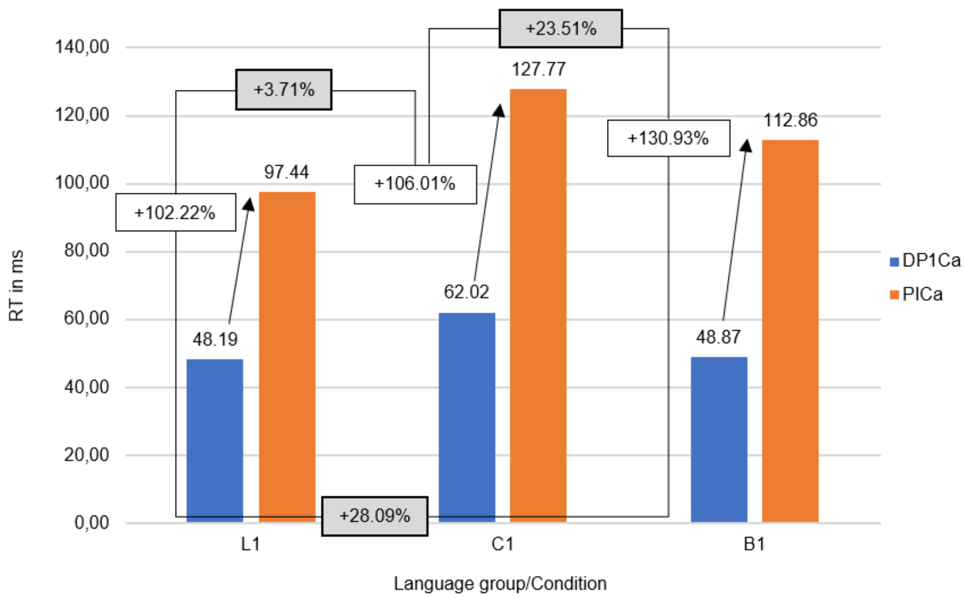

Figure 26. C8. SPRT – Differences in effects between conditions and between participant groups for an **average utterance word**

Put in relation with FPRT data, the patterns observed so far allow us to suggest:

a) a clear impact of implausibility on processing independent of proficiency, whereby accommodating a recovered assumption in cases of mismatches of procedural meaning and context is effortful;
b) that, as far as an average word is considered, accommodation takes place specially during late processing, as observed in the group-wide very large effects of incongruency versus more moderate effects during first pass reading;
c) that less proficient readers, however, are markedly affected by implausibility if the whole interpretation process is considered.

At this point, thus, we suggest that, in contrast with patterns found consistently in the two previous variables discussed, data for B1 speakers in this third study do not seem to support the claim of shallow processing as to their strategy for mismatch resolution, since implausibility comes at a high cost in terms of cognitive effort for them. Similarly, a pattern of automatic processing for native speakers and more proficient learners can also be discarded. This finds a logical explanation in the nature of the utterances to which participants were exposed. When linguistic and discursive abilities are fully-fledged, as they are in the case of the L1 group, plausible utterances reflecting world knowledge are processed automatically (see study 1, chapter 6): what is standard and plausible in a language and in discourse is hardly detected and goes unnoticed. By contrast, standard-deviated situations generate the opposite reactions: under normal circumstances, they are detected and striking[135]. If linguistic and discursive competence are sufficiently developed to detect such deviations (see also study 4, chapter 9), processing goes hand in hand with more effort. This is what data seem to reflect for all participant groups of the study, at least concerning global processing. Additionally, interpreting utterances is about

[135] Escandell Vidal (2014: 60) offers these explanations for situations deviating from or complying with social norms and expectations in terms of customs and common practices. Specifically, she relates them to culturally-constrained language interactions, i.e., to scripts and frames that are or can be culturally dependent. We argue, however, that schemata, scripts or frames deviating from those stored in the minds of participants are also good triggers for exceptional behavior. This translates here in processing patterns equally departing from those obtained for normal utterances, i.e., those giving rise to assumptions that comply with schema structures stored in the minds of the addressees.

potentially being able to access different assumptions and selecting the most relevant. Under a relevance-theoretical view of communication, speakers seek to do so at the lowest cost and for the highest benefit. In the implausible utterances a clash is provoked between the mental representations recovered from the discourse segments, which are stored in long-term memory as schemata holding a counter-causal (as opposed to a causal) relation, and the rigid instruction of *por tanto* which compels readers to connect both segments as causally (as opposed to counter-causally) related. As a result, the mental representation extracted from the utterance enters into a conflict with mind-stored assumptions. Since, for information to be processed, this mismatch must be solved and the procedural meaning overrides contextual meaning in virtue of its rigidity, language users engage in a process by means of which they try to accommodate the new derived assumption to their states of mind. Compared with processing plausible utterances, where the assumption derived from the linguistic input corresponds to world knowledge and just confirms what is already “there”, the first endeavor results in markedly more costly processing.

While, as mentioned, implausibility effects are detected for all three participant groups, a differentiated pattern can also be suggested with a distribution L1/C1 ←→ B1 in terms of the time-course of plausibility effects and of the differences in impact of the mismatch during the stage of re-analysis (see figure 26 above). Condition effects spill over the whole process of utterance interpretation (FPRT, SPRT and enduring in TRT) more conspicuously in the case of B1 speakers and are especially visible during the re-analysis stage.

8.2. *Conceptual-meaning words in plausible versus implausible causal relations*

Considering processing of a conceptual-meaning word—i.e., an average utterance word excluding the connective *por tanto*—almost identical patterns to the ones for an average utterance word are obtained. Since this critical region excludes the connective, this indicates that plausibility effects deploy on conceptual-meaning expressions.

8.2.1. Total Reading Time (TRT)

Regarding total reading times, indeed, the very large effects obtained for this parameter too for all participant groups indicate that the global effect of the incongruency does not—or at least not exclusively—stem from processing times at the connective. Again, conceptual contents are also processed over 20% more effortfully when participants are confronted with an incongruent causal relation:

	DP1Ca	PICa	Diff. in ms	Diff. in %	Effect magnitude
L1	244.13	300.47	56.34	23.08	very large
C1	347.49	422.46	74.97	21.58	very large
B1	353.91	450.78	96.86	27.37	very large

Table 68. TRT – Plausible vs. implausible causal relations at conceptual-meaning words

If the procedural-meaning device (*por tanto*) is excluded from the analysis, very similar effects of the mismatch between instructions and concepts are obtained. This suggests that the discourse segments are a hotspot—potentially together with *por tanto*, which is discussed further down in the comparison of the AOI "connective"—to recover the communicated assumption. In other words, information recovery and accommodation seem to be carried out by means of a more effortful (re-)analysis of all functional areas of the discourse operation of causality: the discourse segments and the connective, as suggested data for an utterance word as seen above.

8.2.2. First-Pass Reading Time (FPRT)

Similar to the results discussed in § 8.1.2 for an average utterance word, in early processing native and highly proficient speakers do not expend significantly more effort solving the mismatch of implausible utterances, as reveal the medium-but-close-to-small (L1) and trivial (C1) plausibility effect magnitudes. By contrast, B1 processing is already quite effortful at this stage:

	DP1Ca	PICa	Diff. in ms	Diff. in %	Effect magnitude
L1	199.03	209.48	10.45	5.25	medium
C1	290.29	299.81	9.52	3.28	trivial
B1	304.37	341.65	37.29	12.25	large

Table 69. FPRT – Plausible vs. implausible causal relation at conceptual-meaning words

This suggests, again, a different mismatch resolution strategy than the one deployed by C1 and L1 speakers, who seem to seize the initial processing stage to detect the mismatch and set in motion a strategy of re-analysis. Again, this is expectable due to the inferential nature of accommodation, which presupposes revising stored assumptions and readjusting them to construe "new *ad hoc* assumptions" (Escandell Vidal et al. 2011: XXIX) and, therefore, is expected to take place during late stages of processing.

8.2.3. Second-Pass Reading Time (SPRT)

The above is indeed confirmed by observing the impact of incongruency on the stage of re-analysis of conceptual-meaning regions:

	DP1Ca	PICa	Diff. in ms	Diff. in %	Effect magnitude
L1	45.05	90.94	45.89	101.86	very large
C1	57.31	122.79	65.48	114.26	very large
B1	49.11	108.65	59.53	121.21	very large

Table 70. SPRT – Plausible vs. implausible causal relation at conceptual-meaning words

Conceptual contents are also majorly affected by incongruency during their re-analysis, irrespective of proficiency. However, if the processing effort of an average conceptual-meaning word and an average utterance word are contrasted, the pattern B1 ←→ C1/L1 suggested above holds for conceptual-meaning words only partially. While such distribution can be maintained considering all processing stages—B1 speakers show more effortful processing of implausible relations during FPRT *and* SPRT—, late effects of implausibility rather fit a distribution L1 – [C1 – B1] speakers. Indeed, slowdown incongruency effects in SPRT are 12.18% and 19.00% stronger for the C1 and the B1 group respectively compared to native speakers, and the effect for the two non-native speaking groups differs by only 6.08% (stronger for B1 speakers). Performance by the C1 group takes on an in-between position as concerns global implausibility effects during the reconstruction of a communicated assumption:

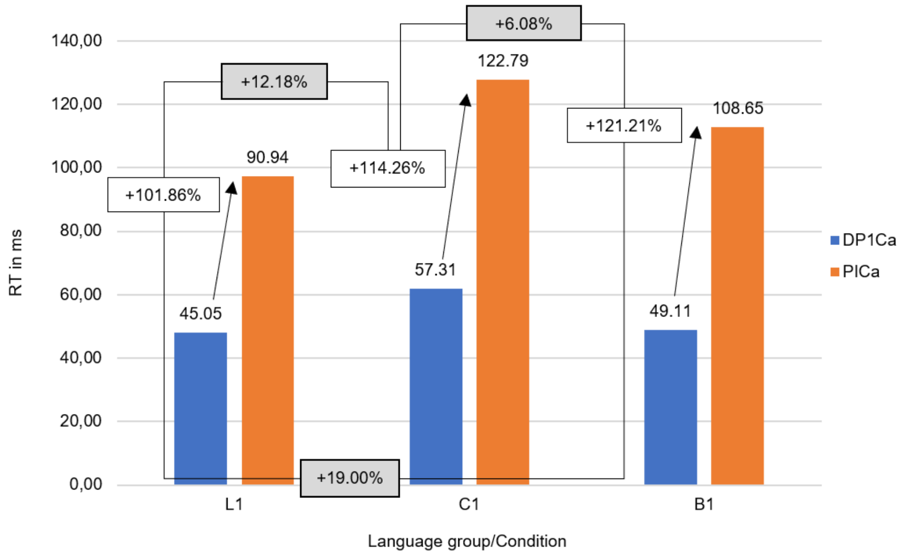

Figure 27. C8. Differences in effects between conditions and between participant groups for an average conceptual-meaning word during SPRT

In sum, the overall effect of incongruency found independently of proficiency is an indicator that automatic processing observed previously for native speakers or, occasionally, for highly proficient learners is blocked when readers are confronted with discourse relations posing an interpretive problem that can, nonetheless, be solved (as opposed to ungrammaticality issues, which have to do with phenomena not possible in a certain language). As far as linguistic and discursive competence allows to do so, non-standard situations are salient for and detected by users of a language. The fact that in SPRT C1 speakers' behavior resembles slightly more the behavior of B1 speakers suggests a different impact of the connective (now excluded from the computations) for C1 and L1 speakers and, thus, a different approach to revising, adjusting and, eventually, correcting an initially recovered assumption by those two groups.

A more detailed analysis of the time-course of implausibility-solving is provided along the next two sections. In § 8.3 results obtained for between-conditions comparisons at the critical regions building the discourse relation—the first discourse segment, the connective and the second discourse segment—are presented and discussed. Processing results for the disambiguation region—the last two words of the second discourse segment, that is, the area where the mismatch is detected—are provided in § 8.4.

8.3. *Discourse segments and connectives in plausible versus implausible causal relations*

The global slowdown effect of implausibility found for an utterance word and a conceptual-meaning word specially in late processing stages and independently of proficiency is visible in the data obtained for the between-conditions comparisons of the times needed to read the DS1, the connective *por tanto* and the DS2.

8.3.1. Total Reading Time (TRT)

As in TRT for an average utterance word and a conceptual-meaning word, a proficiency-independent slowdown effect of implausibility was found also for the three functional regions of the critical utterances:

	DP1Ca DS1	PICa DS1	Diff. in ms	Diff. in %	Effect magnitude
L1	255.76	300.78	45.01	17.60	large
C1	335.69	401.53	65.84	19.61	large
B1	350.35	451.15	100.80	28.77	very large

Table 71. TRT – Plausible vs. implausible causal relation at DS1

	DP1Ca Conn	PICa Conn	Diff. in ms	Diff. in %	Effect magnitude
L1	315.39	437.06	121.67	38.58	very large
C1	435.65	611.22	175.58	40.30	very large
B1	450.38	559.95	109.57	24.33	very large

Table 72. TRT – Plausible vs. implausible causal relation at connective

	DP1Ca DS2-conn	PICa DS2-conn	Diff. in ms	Diff. in %	Effect magnitude
L1	235.40	313.79	78.39	33.30	very large
C1	353.41	432.76	79.35	22.45	very large
B1	357.68	445.68	88.00	24.60	very large

Table 73. TRT – Plausible vs. implausible causal relation at DS2

In global processing, slight differences in terms of effort magnitudes between participant groups are seen only at the DS1. Further divergences between groups can be suggested, however, if a closer look is taken to the effects of implausibility at the connective and DS2, or to absolute reading times of the connective.

More effortful processing of the incongruent condition—all effects are always large or very large—independently of proficiency allows for a series of suggestions:

- all participants try to[136] search for a context to accommodate the assumptions recovered from the utterance;
- accommodation-driven interpretation comes at an extra cost, i.e., is effortful, thus blocking automatic processing;
- the mismatch between contextual assumptions and the procedural meaning of a causal connective is already detected at an intermediate level of proficiency of an L2.

In general, the presence of a connective indicates that the relevance of one of the segments *depends* on how the other segment is interpreted (Blakemore 1987). This is a crucial tenet in our study (see also variable 4 in chapter 9 for the adversative connective *sin embargo* 'however'). Similar to English *therefore* discussed by Blakemore (1987, 2002), the specific processing instruction of *por tanto* constrains the relevance of the first discourse segment "by indicating that it is relevant as a premise for the deduction of the proposition [it] introduces" (Blakemore 1987: 84 on *therefore*, see also §2 here). In the incongruent utterances, the mental representation derived from the conclusion stated in the DS2 by the causal reading forced by *por tanto* clashes with mind-stored background assumptions

[136] The use of the verb *try* here is important. As will be shown below, we hypothesize that this endeavor is abandoned at a given point by the less proficient group. In other words, while an effort to accommodate the meaning extracted from the utterance to mind-stored assumptions is made by them incipiently, we argue that such process is not fully completed.

accessed to form the context for utterance interpretation. This slows down processing, as shown by the significantly longer TRT for all regions. Processing becomes, thus, more effortful due to the need to readjust—to accommodate—an assumption recovered from the utterance to make it fit into the cognitive context available to the interlocutor. Data of more effortful processing in the mismatch condition also serve as a further confirmation of the rigidity of procedural meaning. In our utterances, the interpretive instructions coded by *por tanto* impose forward causal linking of the representations arising from processing the discourse segments in the search for relevance. Since instructions are always rigid and must necessarily be satisfied for interpretation to be performed (Escandell Vidal & Leonetti 2011), the bigger the clash between procedural and conceptual meaning, the higher the cognitive effort needed to arrive to a relevant mental representation (see the discussion of congruency effects on utterances connected with *sin embargo* in chapter 9).

Concerning the DS1, which represents the premise of the causal relation, the large versus very large effects of incongruency suggest an L1/C1 ←→ B1 processing pattern. In light of these data the DS1 seems to be an "effort hotspot" specially for B1 speakers when the utterance is incongruent. This is in line with capacity models suggesting working-memory constraints to be at the basis of non-native-like performance of L2 speakers. As a consequence of these constrains, contents are not maintained in the memory buffer by L2 speakers but need to be re-inspected to accomplish their integration into a mental representation. Compared to B1 speakers, the L1 and C1 group also dwell longer on the incongruent cause, but to a lesser extent:

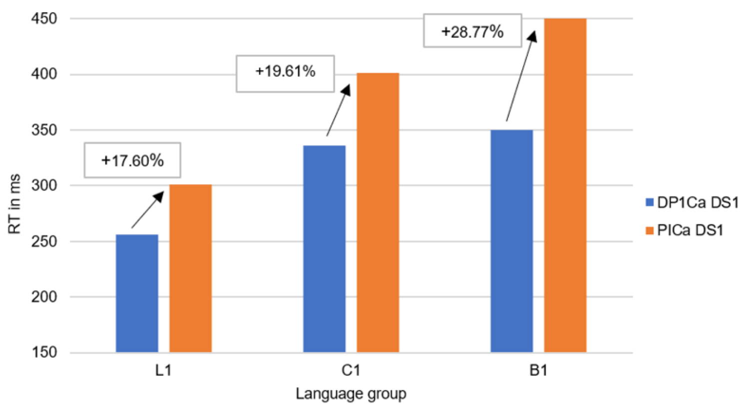

Figure 28. C8. TRT – Condition percentage effects **at DS1** by language group

As for the connective, *por tanto* is more effortful in the incongruent condition independently of proficiency, implausibility leading to very large effect magnitudes for all participants. Accommodation, thus, seems to take place at the procedural meaning device as well. Independent of their Spanish competence, participants seem to detect that the mismatch is caused by the connective. A more fine-grained observation of the reading times of the connective in both conditions by language group, however, points again towards potentially different processing strategies:

	L1-C1 at Conn		C1-B1 at Conn		L1-B1 at Conn	
	Diff. in ms	Diff. in %	Diff. in ms	Diff. in %	Diff. in ms	Diff. in %
DP1Ca	120.25	38.13	14.74	3.38	134.99	42.80
PICa	174.16	39.85	-51.28	-8.39	122.89	28.12

Table 74. Effects of language proficiency at connective by condition

As reflected in the table, in the plausible condition, TRT for the connective directly correlates with proficiency. Compared to L1 processing, in plausible utterances the connective is over 38% and 42% more effortful for C1 and B1 speakers respectively, and only a trivial effect of L2-proficiency degree is found (with B1 speakers dwelling only 3.38% more time on *por tanto* than C1 speakers). By contrast, in implausible utterances an infrequent pattern is found: B1 speakers need over 28% more time to read the connective than the L1 group (559.95 ms vs. 437.06 ms, over 28%), but over 8% less than C1 speakers (559.95 ms vs. 611.22 ms). In addition, both C1 and L1 speakers exhibit larger effects of implausibility than B1 speakers:

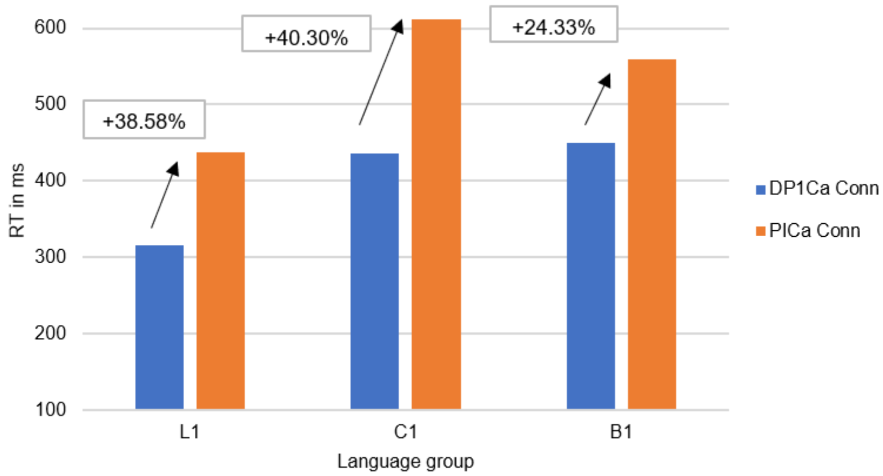

Figure 29. C8. TRT – Condition percentage effects **at connective** by language group

While effects are very large for all groups, this closer look at within-groups comparisons seems to indicate that, in TRT, the mismatch between conceptual assumptions and procedural meaning has a higher global impact on the connective itself for the two most proficient groups. Finally, while in the congruent condition it is B1 learners who differ the most from native speakers, in incongruent relations it is the C1 group who shows the greatest distance as to (at least data-driven) native-like performance.

Once more, the B1/L1 versus C1 distribution that arises from the data must be re-interpreted into a pattern of three places for discussions to find theoretical underpinning. Two possible interpretations become available. Firstly, it could be claimed that the mismatch comes at so big an effort for B1 readers that processing is abandoned at some point, arguably due to a cognitive overload that blocks full interpretation. As a result, very low relative TRT are obtained. However, since B1 speakers exhibit the highest processing costs in TRT of an utterance and a conceptual-meaning word (see § 8.1.1 and 8.2.1), this explanation does not seem to find support in further parameters. In light of these facts, we suggest that the connective is *not* be the main confirmation or mismatch-solving area for B1 speakers, either because they deploy inferential processes aimed at utterance interpretation by focusing on the other functional regions, i.e., the discourse segments; or because they adopt a strategy of effort distribution among *all* critical regions, which might be taken as an indicator of less controlled (re-)processing. In any case, the strategy followed by B1 speakers is clearly non-nativelike.

A look at the effects of plausibility on the DS2 should bring further insight into these hypotheses. At the DS2 plausibility brings about again very large effects for all participant groups. However, if percentage differences are observed, the most accentuated slowdown effect of incongruency is found now for native speakers: 33.30%, 22.45% and 24.60% for L1, C1 and B1 readers respectively (see table 73 above). C1 and B1 speakers, in turn, perform similarly. These data seem to confirm that readers apply different cognitive strategies to handle mismatches depending on proficiency. While for B1 readers condition effects arise at almost all AOIs to a similar extent, C1 and L1 readers hold on specific “hotspots” during global processing. In TRT, the L1 group seems to distribute processing along the connective and the DS2; the C1 group, in turn, focuses mainly on the procedural guide.

More fine-grained explanations for these patterns can be found by inspecting the timed mismatch resolution provided in FPRT and SPRT for the areas just discussed.

8.3.2. First-Pass Reading Time (FPRT)

During the construction of an initial assumption, large immediate effects of implausibility are obtained for the DS2 for L1 and B1 speakers, but not for the C1 group. In the case at issue, at first sight, the mismatch impacts early reading by B1 and L1 speakers and translates into more effortful processing of the implausible DS2:

	DP1Ca DS2-conn	PICa DS2-conn	Diff. in ms	Diff. in %	Effect magnitude
L1	189.78	213.66	23.88	12.58	large
C1	297.28	292.62	-4.67	-1.57	trivial
B1	297.33	338.40	41.07	13.81	large

Table 75. FPRT – Plausible vs. implausible causal relation at DS2

This suggests incremental processing (Just & Carpenter 1987; Traxler & Pickering 1996; Traxler et al. 1997; Pickering & Traxler 2009) for L1 and B1 readers: the interpretation of an utterance is “immediately integrated with relevant background knowledge and information provided by discourse context" (Pickering & Traxler 2009: 239). However, two questions arise from these patterns. Is incremental processing not applicable for the C1 group? Do B1 speakers perform native-like during early processing when confronted with mismatches?

Turning to the first question, data could be taken to indicate that at least for a DS2 introduced by *por tanto*, highly proficient speakers do not detect the implausibility during the construction of the assumption. Alternatively, it could be the case that the implausibility is detected early, but such detection does not translate into longer dwelling (= higher reading times) on the critical area[137]. In other words, instead of showing an immediate impact of implausibility, the mismatch could be triggering a need for re-analysis in C1 speakers. In any case, C1 performance differs from the approach taken by B1/L1 speakers.

Regarding the second question, as far as effect magnitudes or percentage effects are concerned, B1 and L1 speakers are affected very similarly by implausibility during early reading. However, as in previous discussions, those patterns are considered to respond to different motivations.

In sum, whether delayed processing for highly proficient L2 readers applies when it comes to solving mismatches at a semantic-pragmatic level (as opposed to structural implausibility as contained in syntactic mismatches), and whether B1 and L1 similar performance in early reading underlies different explanations should be confirmed, discarded and further discussed by exploring SPRT.

8.3.3. Second-Pass Reading Time (SPRT)

At the stage of re-analysis, the resulting pattern follows a L1/C1 ←→ B1 distribution. This is not immediately seen if only effect magnitudes are observed but can be noted if differences in percentages are considered:

[137] Note that RT for an average utterance and an average conceptual-meaning word, small or no effects of implausibility had been found for C1 speakers in FPRT either, compared to at least medium effects for the other two groups.

	DP1Ca DS1	PICa DS1	Diff. in ms	Diff. in %	Effect magnitude
L1	73.38	124.09	50.71	69.11	very large
C1	74.37	141.12	66.75	89.75	very large
B1	62.62	142.97	80.35	128.30	very large

Table 76. SPRT – Plausible vs. implausible causal relation at DS1

	DP1Ca Conn	PICa Conn	Diff. in ms	Diff. in %	Effect magnitude
L1	99.02	214.47	115.45	116.59	very large
C1	122.05	269.74	147.69	121.00	very large
B1	94.93	207.95	113.01	119.04	very large

Table 77. SPRT – Plausible vs. implausible causal relation at connective

	DP1Ca DS2-conn	PICa DS2-conn	Diff. in ms	Diff. in %	Effect magnitude
L1	45.48	99.98	54.50	119.84	very large
C1	56.15	140.12	83.97	149.54	very large
B1	59.80	106.69	46.90	78.42	very large

Table 78. SPRT – Plausible vs. implausible causal relation at DS2

The effects of implausibility during the re-construction stage can be summarized in main four findings:

a) For B1 speakers, the implausibility has a particular impact on the re-analysis of the DS1 compared to other critical regions and to the other groups, as shown in percentage slowdown effects for the implausible condition: +128.30% for B1 readers versus +69.11% and +89.75% for L1 and C1 speakers:

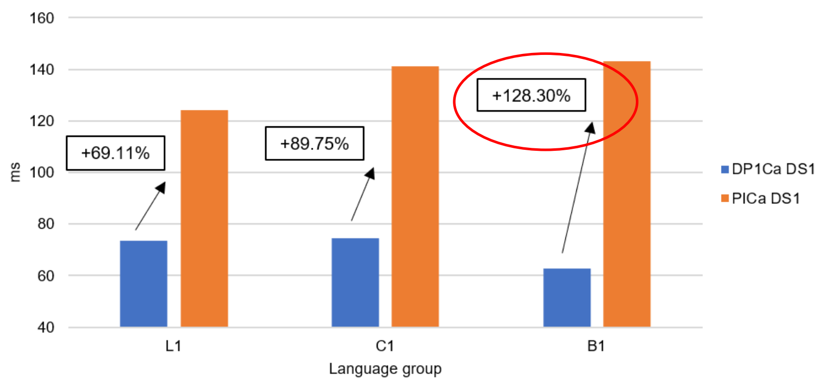

Figure 30. C8. Percentage increase in re-analysis need due to condition effects at the DS1 by group

As suggested above, we attribute this behavior to cognitive limitations leading to an overload of working memory caused by less fledged competencies in the L2.

b) The effects of implausibility at the connective are very similar for all groups: *por tanto* is re-analyzed markedly longer in the implausible condition leading to percentage effect magnitudes of implausibility between 116% and 121%.

c) For L1 and C1 speakers, the mismatch leads to very large effects during re-reading at the DS2, where they exhibit almost twice as higher effects of implausibility as B1 speakers do. A slight difference arises, however, between native and highly proficient readers if the effects at the DS2 and the connective are contrasted together. While, during the reconstruction of the assumption, implausibility leads to very similar effects for L1 speakers at both regions, the implausible condition impacts C1 speakers more strongly on the DS2 than on *por tanto*. Note that this contrasts with data obtained during early reading, where no effects of the anomalous condition had been found for the C1 group on the DS2, thus suggesting a mismatch-solving strategy during re-reading *of the consequence* by C1 speakers and, therefore, confirming our expectations that the absence of an early impact of the mismatch is due to the fact that the incongruence triggers a strategy of re-analysis with almost non-existent attempts of early integration for highly proficient L2 readers (see § 8.3.2):

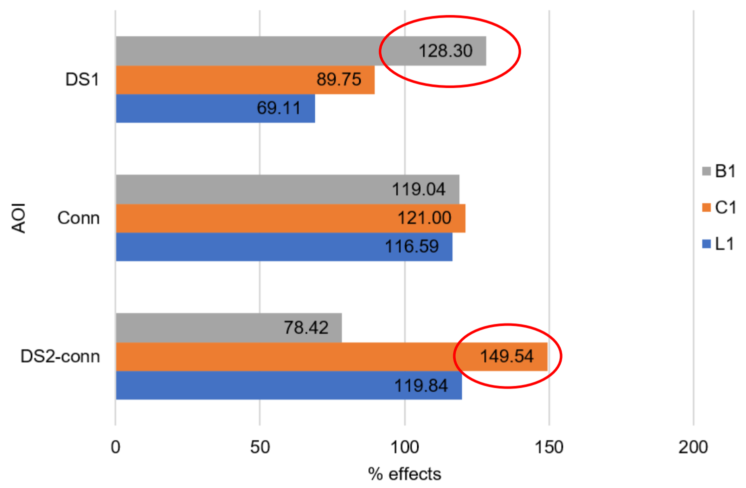

Figure 31. C8. Percentage effects of implausibility on DS1, connective and DS2 by language group during re-analysis

d) Both in the plausible and the implausible condition, considering SPRT in ms, B1 speakers re-read all three functional regions faster than C1 and/or L1 speakers (connective and DS2) or in approximately as much time as C1 speakers (DS1). Figure 32 depicts these results for the implausible condition, where the less re-analysis strategy by the B1 group compared to more proficient participants is especially conspicuous:

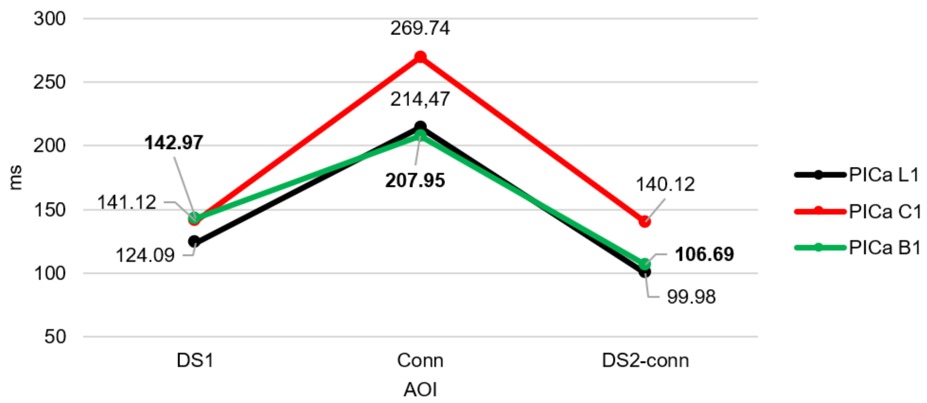

Figure 32. C8. SPRT (in ms) for the implausible condition on DS1, connective and DS2 by language group (B1 reading times are highlighted in bold)

In light of these findings, the pattern L1/C1 ←→ B1 suggested above seems to be confirmed. When there is a mismatch between the discourse segments—which, as introduced before, activate mental representations stored as representations related according to a counter-causal scheme—and the instruction encoded in *por tanto*—which obliges the reader to link both segments in a forward causal relation—, for less proficient readers the impact is particularly high on the premise. By contrast, the effects of implausibility display more clearly at the connective and the DS2 for L1 and particularly at the DS2 for C1 speakers. This is an indication of different processing strategies and motivations. We suggest that the markedly more pronounced re-reading effort registered for the B1 group at the premise of the implausible condition compared to that of plausible utterances (almost 130% more time) has its origin in the high cognitive load imposed by the mismatch. More specifically, the idea is that re-processing the premise is necessary for B1 speakers because cognitive limitations derived from insufficient proficiency and pragmatic abilities pose higher challenges for them when it comes to retaining the mental representation derived from that segment during FPRT in working memory (see § 4.5.1 and § 4.5.2) and additionally being able to process a non-matching consequence. Contrarily, advanced L2 learners and L1 speakers encounter an implausible relation and do not need a lot of re-processing of the premise comparatively. Instead, their effort concentrates on the DS2, the consequence, containing the region where the mismatch is realized, which, in addition, not only gives rise to representations clashing with procedural instructions and background assumptions, but also contravenes readers' expectations raised by the contents of the DS1 and specially by *por tanto* as to how the DS2 will be relevant to them, expectations which contribute to the derivation of explicatures and implicated premises (Wilson & Sperber 2004).

As discussed for the effects of the type of argumentative relation (study 1, § 6.3.3), here too it is illuminating that implausibility affects particularly re-reading of the DS1 for B1. The higher complexity of implausible utterances hinders B1 speakers to re-activate the information extracted from the DS1 during early processing (in FPRT of an utterance- and a conceptual-meaning word B1 learners already exhibited large implausibility effects, see tables 57 and 60) and leads to a markedly longer re-analysis of the DS1 than in congruent causal utterances, which are cognitively simpler (and in which B1 readers re-analyze both DS almost equally, see § 8.5.3 further down below).

All in all, the patterns found are conspicuous in terms of proficiency-dependent development. As shown in figure 33, re-analysis times meet at the area of the connective but differ clearly for each participant group at the DS1 and the DS2, the former being re-processed notably more as proficiency decreases and the latter leading to higher re-analysis for the most proficient groups, particularly for C1 speakers. The figure also shows how C1 processing moves in a path towards native-like processing. The pattern-lines run in parallel to those of native-speakers, and, in contrast, cross with patterns found for the less proficient group:

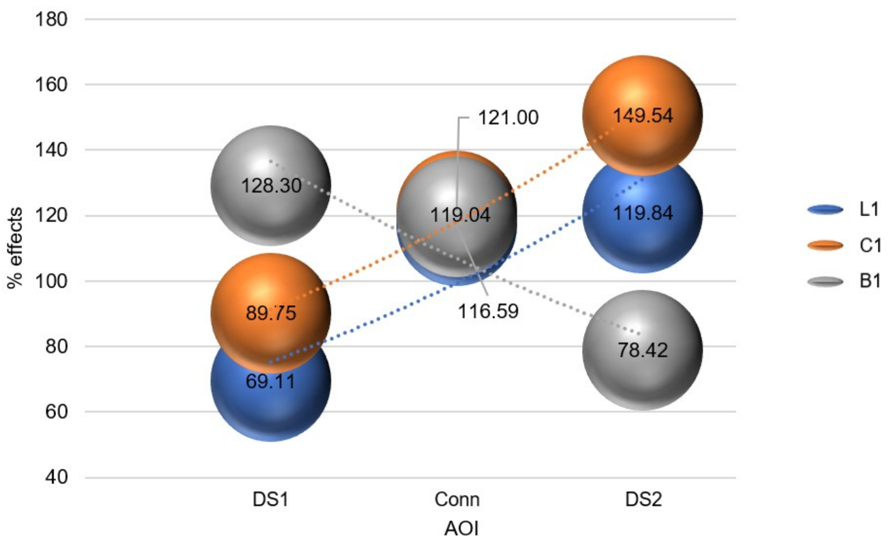

Figure 33. C8. Percentage condition effects on DS1, connective and DS2 by language group during re-analysis (SPRT)

Finally, considerations on shallowness are suggested to apply to B1 behavior here too, albeit with some nuances. Rather than shallower *processing*, we claim that B1 speakers perform according to a pattern of condition-independent shallower *re-processing*. This is visible if re-analysis times are observed for practically all critical regions, both in plausible and in implausible causality:

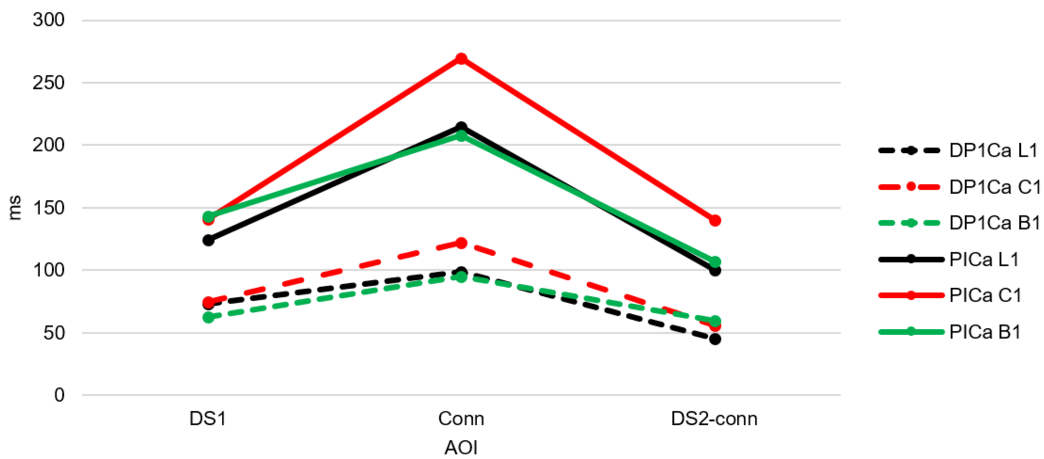

Figure 34. C8. Predicted mean SPRT on DS1, connective and DS2 by condition by language group

As already pointed out, in three out of six critical regions, re-analysis times of B1 speakers lie below the times registered for L1 and/or C1 readers. Besides, in two further regions, B1 speakers perform at almost the same levels as C1 speakers do[138]. Note that, on the contrary, FPRT were markedly higher for B1 speakers.

Clashes like the ones at issue in this study, have a partly semantic origin, which lies at the procedural meaning *encoded* by the connective, in this case *por tanto*. However, resolving the mismatch triggered by the clash between contextual assumptions and procedural instructions is done by *inference*, and, therefore, affects pragmatic labor (cf. Escandell Vidal et al. 2011). The same can in fact be argued for reconstructing any complex discourse relation, even if no incongruency is involved: connectives are, after all, constraints to inferential processes and their semantic contribution within utterances leads to inferentially derived assumptions that would not have arisen in the absence of the connective (Martín Zorraquino & Portolés 1999; Portolés 2001[1998]). Thus, the shallower pattern of re-analysis that enables a distribution of the sort L1/C1 ←→ B1 is better explained by resorting to the semantics-inferential pragmatics distinction: "The way the semantics/pragmatics divide is drawn affects the construal of pragmatic competence, and our expectations from pragmatically competent L2 users" (Ifantidou 2014: 12). While B1 readers seem to invest a great amount of effort in semantics and primary pragmatic processes (Recanati 2004: 23-37), the inferential mechanisms that must be necessarily activated to accommodate an assumption to a context, i.e., secondary pragmatic processes (idem: 20-23), are not properly set in motion. Note that a similar performance was also observed in the second study, in which proficiency correlated inversely with readers' reliance on linguistic input. Conversely, when pragmatic and linguistic abilities are fully fledged, reliance on cognitive principles of communication is higher.

The re-analysis by B1 speakers, thus, is less deep than that of native speakers and highly proficient readers, and this is independent of whether the causal relation is congruent or not. Under a certain discourse-competence level, specific inference-based

[138] SPRT for an utterance and a conceptual-meaning word confirmed this: predicted mean re-analysis times for B1 speakers lie below the level of C1 speakers and are very similar to data obtained for the L1 group (see § 8.1.3 and § 8.2.3).

processes are blocked or not deployed in full. However, while in congruent causal utterances this leads to shallower processing which, we argue, results in a shallower mental representation of the utterance,[139] when an incongruency is present in the utterance B1 speakers are claimed to not even conclude processing. Specifically, their pattern of very shallow processing results in failure to carry out the required accommodation process to accept the contents of the second discourse segment "as the contextual implication most consistent with a warranty of optimal relevance" (Moeschler 1989: 180).[140] We argue that this has its origin in the fact that B1 readers fail to supply the contextual assumptions needed to derive *implicated premises* that feed and license the implicated conclusions[141]. More specifically, we suggest that B1 readers' behavior reflects that the implausible utterances are *accidentally relevant* for them (Wilson 1999) and, as a result, that they behave as *naïve optimists* (Sperber 1994; Wilson 1999; Sperber et al. 2010; Mazzarella 2016).

In Relevance Theory, the inferential part of the interpretive process embraces a series of sub-tasks (Wilson & Sperber 2004: 615):

> "a. Constructing an appropriate hypothesis about explicit content (in relevance-theoretic terms, EXPLICATURES) via decoding, disambiguation, reference resolution, and other pragmatic enrichment processes.
> b. Constructing an appropriate hypothesis about the intended contextual assumptions (in relevance-theoretic terms, IMPLICATED PREMISES).
> c. Constructing an appropriate hypothesis about the intended contextual implications (in relevance-theoretic terms, IMPLICATED CONCLUSIONS)."

Our claim is that, independent of the condition at issue, all participant groups derive the explicatures of the critical utterances. In the plausible condition, all groups also derive the implicated premises, but B1 speakers fail to look for further contextual effects, as the presence of *por tanto* would be instructing them to do. Consider the following example (65):

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[139] This could reflect for instance in poorer performance in recall or question-answering tasks.
[140] This is Moeschler's procedural definition of French *donc* ('therefore'), which also applies to *por tanto*.
[141] Zufferey (2010: 104 ff.) also applies the notions of explicature and implicature to explain the different pragmatic processes that come into play to retrieve the speaker's meaning in utterances with causal connectives depending on whether they occur in a content, a speech-act or an epistemic domain (cf. Sweetser 1990).

(65) *They run a very <u>nice</u> hotel.* Por tanto*, they have many guests.*

During the interpretive process of (65), representing a plausible causal relation, background assumptions such as 'people usually like nice things' or 'nice hotels are better frequented than ugly ones' are accessed by the readers (allegedly mainly already during FPRT). However, the forward causal connective links two segments between which the discourse relation (*p* → *q*) can be also inferred implicitly, so from a RT view its presence should trigger the search for further contextual effects. This is the case for L1 and C1 speakers (see also the discussion in chapter 7 on explicit and implicit causal relations), the latter investing a higher effort in re-analysis than the former due to more limited pragmatic abilities. By contrast, for B1 speakers the low SPRT is an indicator that the interpretive process is concluded as soon as the consequence segment has been processed as the explicit conclusion of the previous segment. The relevance threshold is interpreted differently by B1 readers, on one side, and L1/C1 readers, on the other side. This behavior may be best explained in terms of the degree of epistemic vigilance of the participant groups at issue (see § 4.5.4). L1 and C1 readers seem to be acting as sophisticated interpreters, an attitude often requiring more-effort demanding routes (Yus Ramos 2003; Padilla Cruz 2013). Specifically, their high degree of epistemic vigilance would lead them to behave as sophisticated interpreters and help them detect that further contextual information is required to infer the interpretation intended by the reader. On the contrary, the B1 group achieves *accidental relevance* (Wilson 1999) by processing the discourse relation as a mere cause-consequence succession of events, i.e., without further looking for potential additional contextual effects derived from the explication of the connective.

As concerns implausible utterances like (66):

(66) *# They run a very <u>ugly</u> hotel.* Por tanto*, they have many guests.*,

the connective, acting upon the second discourse segment, compels readers to look for mind-stored or background assumptions licensing implicated premises such as 'people like/are willing to pay for ugly things', 'ugly hotels are good frequented'. Importantly, accessing such premises is not optional: the rigid semantics of the connective triggers a process of accommodation to conclude processing once a new *ad hoc* assumption that complies with its instruction has been created. To that purpose implicated premises are indispensable. However, data suggest that, in implausible utterances, successfully deriving the implicated premises is a domain reserved to (i.e., only fully accessible for) the most proficient groups. In other words, all groups carry out successful decoding, disambiguation, reference resolution and pragmatic enrichment from the linguistic input. But when confronted with mismatches between procedures and contextual assumptions, performing processes of accommodation, building an *ad hoc* assumption that fits into the mental representations retrieved from linguistic material (both conceptual and procedural), requires a minimum degree of linguistic and discourse competence. Concerning L2 speakers, the results of the present study show that the competence threshold required to do so would be situated between an intermediate and an advanced proficiency level. To recover a communicated assumption, language users must be able to supply a context for interpretation (Sperber & Wilson 1995: 16), contexts being psychological constructs.[142] Note also that "the mental activity in which the hearer is engaged also limits the class of potential contexts from which an actual context can be chosen at any given time" (idem: 138). As a result, two reasons are adduced for the behavior of the B1 group. Firstly, the high cognitive load imposed by an activity like processing a pragmatic implausible utterance in an L2 where the mismatch is between contextual assumptions and procedural meaning could be overstraining B1 readers' working memory to supply the required contextual assumptions to carry out accommodation. Only C1 and L1 speakers succeed in mentally representing the accommodated, *ad hoc* created assumption—the implicated premises and conclusions—(for instance, that "Ugly hotels are usually well-frequented" in example (66)), which contradicts background assumptions[143]. Secondly, and as a result of cognitive overstrain,

[142] "(…) context is a psychological construct, a subset of the hearer's assumptions about the world. It is these assumptions (…) that affect the interpretation of an utterance. A context in this sense is not limited to information about the immediate physical environment or the immediately preceding utterances: expectations about the future, scientific hypotheses or religious beliefs, anecdotal memories, general cultural assumptions, beliefs about the mental state of the speaker, may all play a role in interpretation" (Sperber & Wilson 1995: 15-16)

[143] Kintsch's model of text representation (1998) also provides a good theoretical basis for these results. Texts are represented at three levels: the surface code, the textbase level—the network propositions of the

in turn derived from insufficient proficiency in the L2, B1 readers act as *naïve optimists* and stop processing *at the first relevant enough interpretation* (Wilson 1999; Sperber et al. 2010; Mazzarella 2016). Importantly, we argue that this first relevant enough interpretation is restricted to the processing that a causal relation holds between the segments.

This line of argument may pose the question as to why condition effects arise for B1 speakers too, sometimes even stronger than for L1 and C1 readers. We suggest that these differences can be attributed to accidental relevance achieved in plausible utterances and accidental relevance with cognitive overstrain in implausible utterances.

As far as research on L2 learning is concerned, data are also taken as a further indicator that the notion of shallow processing is also useful to explain deficient or not-in-depth pragmatic inferencing and does not necessarily have to be restricted the fact that "L2 processing is different because of inadequacies of the L2 grammar" (Clahsen and Felser (2006c: 120; see also § 4.5.2). For participants that have not acquired a specific degree of discourse competence, processing also seems to differ from that of native speakers (or to some extent, highly proficient learners) because of strategies focusing on certain pieces of declarative knowledge qualitatively different from those that native speakers rely on. This precludes less proficient readers to allocate processing effort in a native-like manner and to successfully derive implicated premises and, as a result, the communicated assumption. Applying non-native-like processing strategies seems thus to prevent less proficient learners from achieving a fully-fledged mental representation of the discourse relations at issue. L2 and L1 processing differ in terms of what comes out of utterance understanding, i.e., in terms of comprehension: the cognitive context brought to bear by B1 speakers in interpreting implausible utterances results in poorer mental representations, more specifically in the lack of derivation of certain contextual implications, as denote the lower re-processing times compared to the L1 and the C1 groups. In this sense, shallow (re-)processing affects both the processing route—the

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text—and the situation model—the mental model formed by the text which is "a mixture of text- and knowledge-derived propositions" (Mulder & Sanders 2012: 502). In our explanation of the results obtained, native and C1-speakers would be able to build representations at all levels both in the plausible and in the implausible conditions (albeit at a higher cost in the latter), while the less proficient group would fail to derive a fully-fledged mental model of the implausible utterances.

how—and the processing output or comprehension—the *what*. This is in line with claims assuming that the pragmatics of L2 and L1 comprehension functions in the same way and what differs is “only the logical form generated (…) and the cognitive context (the contextual assumptions) that are brought to bear during the derivation of the explicatures and implicatures” (Foster-Cohen 2000: 89).

8.4. *Disambiguation region in plausible versus implausible causal relations*

The disambiguation region comprises the two last words of each experimental utterance and is, thus, the region where participants are confronted with linguistic material that complies with their expectations generated by the content of the first discourse segment and the instruction of *por tanto*; or, on the contrary, deceive such expectations generating a mismatch between mind-stored assumptions and the causal instruction of the connective.

Broadly, the patterns obtained here are in line with what has been already discussed for effects of implausibility on the DS2 for the same parameters. Implausibility effects display mainly during the stage of recovery of the communicated assumption, SPRT, and endure in TRT with only slight differences between groups:

	DP1Ca	PICa	Diff. in ms	Diff. in %	Effect magnitude
L1	238.50	305.76	67.26	28.20	very large
C1	357.92	435.44	77.52	21.66	very large
B1	365.91	433.75	67.84	18.54	large

Table 79. TRT – Plausible vs. implausible causal relation at disambiguation area

And, again, contrarily to the medium effects found for B1 and L1 readers, during FPRT, C1 speakers do not seem to detect the mismatch or, as suggested above, a potential detection thereof triggers in them a re-processing strategy which leads to particularly pronounced effects of implausibility in SPRT:

	DP1Ca	PICa	Diff. in ms	Diff. in %	Effect magnitude
L1	194.37	211.83	17.46	8.98	medium
C1	306.27	304.69	-1.58	-0.52	trivial
B1	304.47	324.98	20.52	6.74	medium

Table 80. FPRT – Plausible vs. implausible causal relation at disambiguation area

	DP1Ca	PICa	Diff. in ms	Diff. in %	Effect magnitude
L1	43.91	93.74	49.83	113.48	very large
C1	51.62	130.64	79.02	153.08	very large
B1	60.86	108.19	47.33	77.77	very large

Table 81. SPRT – Plausible vs. implausible causal relation at disambiguation area

In line with the discussion for the SPRT between functional areas, implausibility affects re-analysis by the two most proficient groups specially while globally lesser effects are obtained for B1 readers. The C1 group re-reads the disambiguation area over 96% more than the B1 group; the control group re-reads it over 45% than the less proficient speakers.

Such effects precisely at the area where the discourse relation is disambiguated and the clash between mind-stored assumptions and encoded instructions arises, suggest shallower processing and, more specifically, shallower *re-processing* by B1 readers. The effect is seen in late reading: globally (as given in TRT) and during the stage where the initially constructed assumption is contrasted with the context and revised (as given in SPRT). The cognitive overload generated by the implausible causal relation hinders B1 speakers to carry out in-depth processing to accommodate the contents of the discourse segments to the instruction of the connective. In other words, as set out above in detail, it is suggested that accommodation is not concluded by B1 speakers (in contrast to the other groups). Specifically, no implicated premises are derived from the implausible utterance which precludes B1 readers to derive further contextual assumptions.

So far, condition effects have been discussed for the critical regions of plausible and implausible causal relations marked by the connective *por tanto*. The next two sections provide within-conditions comparisons of the first versus the second discourse segment of each condition. Results will be provided of global (TRT), early (FPRT) and late (SPRT) processing for implausible utterances. For plausible utterances, data were already provided in the discussion of causality versus counter-argumentation (chapter 6). These have been only slightly adjusted to the predicted values for the mixed-effects model computed for this specific variable. As a result, while figures differ slightly from those obtained for the first variable, the effect magnitudes are identical. Data are therefore displayed in a summarized form here and the discussion is related specifically to plausibility effects).

8.5. *Causes and consequences in plausible causal relations*

8.5.1. Total Reading Time (TRT)

Global processing data as given by TRT for the plausible condition show conspicuous proficiency-effects. Only data for the two most proficient groups (L1 and C1 speakers) give account of a cognitive differentiation of the cause and the consequence of causal utterances marked by *por tanto*:

	DS1	DS2-conn	Diff. in ms	Diff. in %	Effect magnitude
L1	255.76	235.40	-20.36	-7.96	medium
C1	335.69	353.41	17.72	5.28	medium
B1	350.35	357.68	7.33	2.09	trivial

Table 82. TRT – DS1 vs. DS2 in plausible causal relations

Note that, however, the pattern obtained is the opposite, with C1 readers processing the consequence longer than the cause of the utterance and L1 readers showing the converse pattern. Nonetheless, it is suggested that both groups seize the procedural semantics of *por tanto*.

Native speakers make use of the instruction of the connective to differentiate between functional areas of the utterance in terms of discourse units: in total, the consequence (DS2) is processed by them almost 8% faster than the cause (DS1). This already suggests that the L1 group benefits from the processing instruction a) to speed-up processing of the DS2, at least as far as global processing is concerned; b) to differentiate between utterance segments carrying a different discourse status. The consequences of processing *por tanto* seem to be, thus, quantitative as well as qualitative. As will be set out below, the fact that the DS2 is globally processed faster than the cause indicates, furthermore, that the consequence is not an attentional hotspot for native speakers, thus suggesting processing normality, which is expected for a plausible, rule-conform discourse relation.

C1 speakers also show differentiated processing of the discourse segments. This suggests a development towards native-like processing. This nuancing takes place, however, in the opposite direction: *por tanto* does not reduce processing costs of the conclusion as it does for L1 speakers, but leads to more effortful processing of the DS2. What we suggest here, as discussed in the first study (chapter 6), is that a spillover of the instruction of *por tanto* on the DS2 might be at the origin of the higher TRT registered on that region for the C1 group.

Finally, B1 speakers do not differentiate between the cause and the consequence of a causal utterance in global terms during reading. This may be attributable to shallow processing that leads to a blurring of discourse-semantic distinctions and to a different, clearly non-nativelike processing strategy. Data from FPRT and SPRT shed further light onto this pattern.

8.5.2. First-Pass Reading Time (FPRT)

The patterns obtained for the stage of construction of an initial assumption from the linguistic material of the utterance largely coincide with the patterns just seen in TRT in terms of the qualitative leap conceptual/procedural meaning.

For this comparisons data suggest an immediate effect of the connective for the most proficient groups, in the sense that procedural meaning of *por tanto* deploys its effects already during this early processing stage and leads L1 and C1 readers to approach the consequence segment in a different manner than the cause. This effect is particularly strong for C1 readers, for whom (as put forth in chapter 6) we claim markedly conscious processing of the connective that spills over the subsequent region, i.e., the DS2:

	DS1	DS2-conn	Diff. in ms	Diff. in %	Effect magnitude
L1	182.38	189.78	7.40	4.06	small
C1	261.45	297.28	35.83	13.71	large
B1	287.34	297.33	10.00	3.48	trivial

Table 83. FPRT – DS1 vs. DS2 in plausible causal relations

Data result in a proficiency-dependent pattern of the form L1/C1/B1 and distributes as discussed in the first study (chapter 6):

1. Native speakers process the discourse segments in a differentiated manner already during the construction of an initial assumption. That the effect magnitude in this comparison is only small may be attributed to the sort of discourse relation at issue: in causal relations, the content of the discourse segments and the discourse marker make the consequence segment highly expectable (see also chapter 7).
2. C1 speakers also process the procedural semantics of the connective in what is taken as an indicator of a development towards native-like processing. The connective, however, seems to exert a delayed effect for the C1 group, reducing DS2 reading times only slightly and leading to higher FPRT at the DS2 compared to the DS1. This is a pattern where C1 speakers move away from the B1 group, yet not exhibiting a fully native-like pattern.
3. B1 speakers, finally, do not differentiate cause and consequence cognitively during early reading. This is attributed to shallow rather than automatic processing.

8.5.3. Second-Pass Reading Time (SPRT)

During re-analysis, as given by SPRT, the assumption communicated in the utterance is reconstructed. It at this stage that readers integrate the representations derived from the utterance during early reading into entertained contextual assumptions. SPRT confirm the findings just discussed for TRT and FPRT: only native and highly-proficient speakers carry out a clearly nuanced processing of the cause and the consequence of the utterance. This results in a pattern L1/C1 ←→B1:

	DS1	DS2-conn	Diff. in ms	Diff. in %	Effect magnitude
L1	73.38	45.48	-27.90	-38.02	very large
C1	74.37	56.15	-18.22	-24.50	very large
B1	62.62	59.80	-2.82	-4.51	small

Table 84. SPRT – DS1 vs. DS2 in plausible causal relations

8.6. *Causes and consequences in implausible causal relations*

8.6.1. Total Reading Time (TRT)

The global processing effort (TRT) of implausible utterances marked by *por tanto* registered for the three groups of the present study denotes a pattern already seen for the plausible condition. In the discussions between conditions (see particularly 8.3.1), the most proficient groups showed larger slowdown effects of implausibility at the connective region than the B1 group. This might already indicate that, as proficiency increases, in cases of mismatches between procedural meanings and contextual assumptions, accommodation processes are performed by focusing on the procedural expression, i.e., on the linguistic material encoding the instruction that causes the mismatch. This would give rise to a pattern of the sort L1/C1 versus B1, which is confirmed by looking at processing differences within discourse segments in implausible utterances:

	DS1	DS2-conn	Diff. in ms	Diff. in %	Effect magnitude
L1	300.78	313.79	13.01	4.33	small
C1	401.53	432.76	31.23	7.78	medium
B1	451.15	445.68	-5.47	-1.21	trivial

Table 85. TRT – DS1 vs. DS2 in implausible causal relations

Data confirm flatter processing by less proficient speakers and a stronger nuancing of areas of interest for highly proficient and native speakers. B1 speakers do not rely more on either one of the two discourse segments when processing an implausible causal utterance, which suggests less controlled processing than for C1 and L1 readers. Inability to accommodate the implausible utterance is adduced as a further argument for the lack of discursive differentiation between discourse segments by the B1 group, since absolute processing times at the connective as reported in between-conditions analyses discussed in § 8.3.1 above are lower for B1 than for C1 readers. Again, our claim is that, in an implausible condition, B1 speakers are subject to a cognitive overload and stop or abandon inferencing at some point. By contrast, both L1 and C1 learners differentiate between discourse segments. Two further facts should be highlighted from these data so far:

1. Discourse-segment effects go in the same direction for C1 and L1 readers (slowed-down reading of the DS2) but are larger for C1 (medium versus small effect magnitudes). This suggests a tendency towards native-like performance, which, however, still manifests as *more conscious* processing for the C1 group. This pattern has been recurrently seen throughout data discussed so far.
2. Contrarily to what occurred in the plausible condition, when confronted with implausibility in causal utterances, L1 speakers need more time to process the DS2 than the DS1. The implausibility is clearly detected by this group and, as a result, the facilitating effect of *por tanto* seen in plausible utterances vanishes here (see § 8.5.1). Non-compliance with the expectations triggered by the meaning of connective translates into more effortful processing of the DS2, where the mismatch arises. This becomes even more visible if the stages of construction and reconstruction of the communicated assumption are considered separately.

8.6.2. First-Pass Reading Time (FPRT)

Independent of proficiency, the processing strategies observed for the initial stage of construction of an implausible causal relation differ from those observed in plausible utterances (see § 8.5.2). When early processing of the DS1 and the DS2 are contrasted, data give rise to a L1/C1/B1 pattern:

	DS1	DS2-conn	Diff. in ms	Diff. in %	Effect magnitude
L1	176.69	213.66	36.97	20.92	very large
C1	260.57	292.62	32.05	12.30	large
B1	307.79	338.40	30.61	9.94	medium

Table 86. FPRT – DS1 vs. DS2 in implausible causal relations

It is argued that processing for this comparison responds to different motivations or strategies for each group:

1. L1 speakers show a very large slowdown effect at the consequence (almost 21%). This is expectable: L1 readers detect the mismatch at this stage and process both segments in a differentiated manner. The DS1 is still plausible at this stage (participants cannot detect the mismatch while reading the DS1 yet), but at the DS2, mismatch effects deploy. As a result, processing it is markedly more costly than processing the causal segment. First accommodation processes seem to take place at this stage already in the case of participants with a fully-fledged discursive competence. Data reported for FPRT at the plausible condition (only small discourse-segment effects had been found versus very large effects here, see § 8.5.2) confirm this claim.

2. C1 speakers process both discourse segments in a nuanced manner. However, since the effects found are very similar to those reported for the same comparison in the plausible condition (large effects of 13.71% vs. 12.30% here, see § 8.5.2), at this stage, it cannot be yet claimed that longer dwelling on the DS2 is due to the fact that they detect the mismatch.

3. The B1 group shows more moderate effects, but seems to be affected by implausibility during early reading, since a) the DS2 is more effort-demanding than the DS1; and b) medium effects are reported that contrast to the absence of effects found for the same comparison at the plausible condition (§ 8.5.2). Put in relation

with data reported for C1 speakers, however, the question arises of whether B1 speakers are really performing native-like at this stage. We claim that the key to

answering it—and also to gain further insight into C1 processing for this comparison—is to be found at the stage of re-analysis.

With the exception of native-speakers processing, data from first-pass reading are not conclusive of how the L2 groups of the study behave. From a methodological viewpoint, thus, this may suggest that other indicators (eye-tracking parameters) are better suited to shed light on higher-order processes as accommodation, in particular when dealing with participants whose discourse competence is not native-like.

8.6.3. Second-Pass Reading Time (SPRT)

Considering re-analysis patterns, discourse-segment effects are found for the L1 and B1 group, with both groups needing less re-analysis for the consequence than for the cause of implausible utterances:

	DS1	DS2-conn	Diff. in ms	Diff. in %	Effect magnitude
L1	124.09	99.98	-24.11	-19.43	large
C1	141.12	140.12	-1.01	-0.71	trivial
B1	142.97	106.69	-36.27	-25.37	very large

Table 87. SPRT – DS1 vs. DS2 in implausible causal relations

Again, instead of suggesting an B1/L1 ←→ pattern, different strategies are claimed to underlie the performance of each group:

1. The L1 closes up the accommodation process of the assumption derived from the utterance to a suitable, *ad hoc* created mental context by revisiting the DS1, i.e., the segment containing the premise for the conclusion stated in the DS2. This points to in-depth processing of the mismatch and to ongoing accommodation processes.

2. B1 speakers apparently follow a re-processing strategy similar to that of L1 speakers. However, they follow a strategy of markedly longer revisiting the DS1 in the

   plausible condition (§ 8.5.3), arguably due to working memory limitations, which makes them move away from L1-like performance. In addition, the fact that they process the DS2 faster than C1 speakers and the DS1 in as much time as them is taken as a further indicator of *shallow re-processing*. Shallow re-processing may be attributed to the high cognitive load of accommodation for speakers at a B1 proficiency level and would result in failure to carry out accommodation and, thus, to achieve contextual effects.
3. The C1 group, finally, seems not to re-analyze any segment longer than the other. However, put in relation with SPRT for the plausible condition (very large slowdown effects at the DS2, § 8.5.3), data show, firstly, that the facilitation effect of the connective in plausible causal relations vanishes here. As just set out above, this is also the case for L1 speakers. Secondly, implausibility leads C1 readers to re-analyze the DS2 markedly longer, which results in a balanced re-analysis of both discourse segments during higher-order processing. Note also that in the between-conditions comparisons, the largest implausibility effects and absolute reading times at the connective in the implausible condition had been found precisely for the C1 group. This might suggest that C1 speakers try to perform accommodation by dwelling in *por tanto* and, as a consequence, that in higher-order cognitive operations, such as solving mismatches between procedural meaning and contextual assumptions, highly proficient speakers rely on *explicit* processing instructions (i.e., the connective). In sum, for both C1 and L1 speakers *por tanto* has a weaker effort-constraining effect at this stage, but the fact that C1 readers focus on the DS2 and L1 readers on the DS1 to carry out/conclude accommodation differentiates both groups. Taken together, the C1 group seems to be half-ways between clearly non-native and native-like processing.

8.7. *Closing discussion*

From the results discussed so far, a series of findings at different levels can be highlighted:

1. Implausibility effects are seen throughout all parameters and regions for all participant groups. What is non-standard, is noticed and has a cognitive reflection, leading to more effortful processing. Effects are systematically very large, with only few exceptions. As concerns global utterance processing (§ 8.1 and § 8.2), the mismatch impacts early reading of the L1 and B1 groups, but not of the C1 group and is thus proficiency-dependent. However, re-analysis data reveal that the pragmatic anomaly triggers a clear strategy of re-processing for the C1 group. Additionally, even more effortful processing seen for the B1 group proves that, as concerns processing of the whole utterance, less proficient readers are markedly affected by the pragmatic mismatch throughout the whole process. Analyses for a conceptual-meaning word confirm this.

   While mismatch is costly and the hardest inferential work for utterance interpretation is undertaken mainly during late processing by all readers, looking at the three functional areas of the causal discourse relations at issue confirm different strategies which are proficiency dependent. Taken together, the B1 group invests much time in processing the causal segment. This is particularly manifest during the re-processing stage and is attributed to cognitive limitations due to more limited discourse and linguistic competencies and leading to an overstrain of working memory. By contrast, L1 and C1 speakers focus on the connective and on the consequence segment to solve the mismatch.
2. Inferencing seems to lie at the basis of utterance processing and to be at the root of differences found particularly between the B1 readers and more proficient learners in terms of reading times. B1 speakers have lower absolute reading times than C1 speakers in the plausible and implausible condition during re-analysis. While semantic decoding and primary pragmatic processed can be considered to be performed by all groups, lower processing times for the B1 group suggest shallow processing—specifically, as discussed above—shallow *re*processing leading to non-

recovery of the implicated premises of the utterance in the implausible condition. This suggests a strong link between pragmatic and linguistic competence. Limited linguistic abilities leading to cognitive overstrain would preclude less proficient readers to fully deploy pragmatic abilities—which they should already bring from their experience as language users in their L1 (inferential procedures are not learnt in an L2 but are part of the processing system of communication abilities, both linguistic and non-linguistic)—needed set in motion the mechanisms required to derive implicated premises from implausible causal utterances, namely those arisen from processing the conceptual and procedural linguistic material of the utterance. As a consequence, B1 readers are considered to achieve *accidental relevance*, as opposed to relevance achieved by sophisticated interpreters. The difference between the outcome of re-processing plausible and implausible causal relations is, however, that when confronted with implausible discourse relations B1 speakers achieve accidental relevance under conditions of cognitive overstrain. This explains the strong impact of implausibility and at the same time the unexpected lower reading times obtained for them in the implausible condition.

3. Finally, the fact that the effects found in FPRT are more moderate than in SPRT and TRT suggests that resolution of pragmatic mismatches between stored assumptions and procedural instructions encoded by connectives is better treated as a higher-order pragmatic process.

As concerns cognitive distinctions of functional areas, evidence points to proficiency-dependent performance that mounds in different processing strategies.

Main differences arise between groups in the comparison of processing data obtained for the cause versus the plausible causal utterances. Patterns obtained for B1 speakers are far from being native-like, contrarily to what occurs with C1 learners. As argued in chapter 6—not only for causality, but also for counter-argumentation—speakers re-organize discourse structure and mental representations derived early during late processing (SPRT), with the exception of B1 speakers, for whom nuancing is not possible when the utterance is linked by a procedural-meaning device with weakly constraining semantics as *por tanto*[144].

Data provided for the within-condition comparisons of the DS1 and the DS2 reveal different patterns according to language and discourse competence. Such differentiation is not always given quantitatively but is anchored on theoretical assumptions on the effects of proficiency on discourse processing, and, in general, on language processing. B1 speakers process discourse segments shallowly in the sense that reading effort is undifferentiated for causes and consequences. A pattern of flat processing is never observed in L1 nor C1 reading in plausible causality. This is taken as an indicator of in-depth processing, with both participant groups seizing the procedural semantics of *por tanto* that leads them to adopt differentiated strategies to process a cause and a consequence. Processing the instruction encoded in the connective seems to be specially effort-demanding for C1 readers, as shown in the fact that total and early reading of the consequence are higher than for the cause and lead to higher effects than for L1 readers. C1 readers depart from the B1 group at this point (also in early and late processing), yet not exhibiting a fully-native-like processing strategy either. The pattern is attributed to highly conscious processing by C1 readers due to a highly developed, albeit not yet fully native-like, pragmatic and linguistic competencies.

Finally, the ability to process a cause and a consequence in a differentiated, nuanced manner is also observed for L1 and C1 readers in implausible utterances. B1 readers fail once more in carrying out a distinctive processing of the like.

In general, discourse-segment effects go in the same direction in total and early reading for C1 and L1 readers, with both groups needing longer to process the consequence. The implausibility is detected early and its segment-differentiating effect endures in total reading times, thus showing that the facilitating effect of *por tanto* seen in plausible utterances vanishes here (see § 8.5.1). Processing the DS2 is more costly than processing the DS1, and it is so particularly for C1 readers. This allows the conclusion that their approach to mismatch resolution is one of *more conscious (= more effortful) processing*, a pattern recurrently seen throughout our data. The re-processing stage is

[144] See the studies 1 and 4 (chapters 6 and 9) for results in the opposite direction when utterances are marked by *sin embargo*, whose semantics are more constraining (Murray 1995).

characterized by different performance of L1 and C1 speakers, with the C1 group re-analyzing both segments equally. Taken together, the C1 group seems to be half-ways between clearly non-native and native-like processing.

Finally, the less proficient group does not show total discourse-segment effects, in a pattern identical to that obtained for the within-comparisons in TRT in plausible causality. They do differentiate in first and second-pass reading, but effects disappear in total terms, which is taken to be a sign of a very uncontrolled strategy. Especially characteristic for this group is the fact that cognitive overstraining leads them to re-analyzing particularly the causal segment due to cognitive limitations.

9. Processing plausible versus implausible counter-argumentative relations

The fourth and last study of this work deals with the effect of pragmatic plausibility in the processing of counter-argumentative or counter-causal relations marked by the counter-argumentative connective *sin embargo* on native speakers of Spanish as control group, and non-native speakers with either an advanced (C1) or intermediate (B1) proficiency level of Spanish.

The design and general purpose of this experiment is the same as in study 3 (see chapter 8): testing how the pragmatic implausibility arisen from a clash between the instructional meaning of a connective and contextual assumptions stored as background knowledge affects discourse processing and, thus, utterance interpretation. In the present processing study, participants read pragmatically plausible and implausible counter-argumentative relations marked by the connective *sin embargo*. For the purpose of this work, an utterance is considered congruent or plausible if the assumption it conveys can be integrated by readers in entertained assumptions by activating background knowledge and without giving rise to interpretive conflicts at the inferential level. Implausible counter-argumentative utterances, in turn, convey an assumption that clashes with readers' background knowledge and, as a result, with mind-stored assumptions. In this study, the clash is triggered by the counter-argumentative connective *sin embargo*, which imposes a counter-causal reading of two discourse segments whose contents are causally related (as opposed to counter-causally) according to the mental schemata activated when they are processed. In other words, while the mental assumptions entertained by readers would lead to linking the discourse segments by means of a relation of the sort $p \rightarrow q$, the instructional meaning of *sin embargo* imposes a reading of the sort $p \rightarrow r$; $q \rightarrow \neg r$):

(67) a. *Pepe y Antonio tienen **muy mal** carácter. Sin embargo, tienen pocas discusiones.*

b. # *Pepe y Antonio tienen **muy buen** carácter. Sin embargo, tienen pocas discusiones.*

'Pepe and Antonio have a very *bad* / *#nice* character. *However*, they don't have many arguments.'

The warranty of pragmatic anomaly arises from the presence of *sin embargo*, which inevitably imposes a counter-causal reading of the content of the connected segments. Specifically, *sin embargo* compels the reader to eliminate the assumption initially derived from the first discourse segment. In addition, due to its semantics as a direct counter-argumentative device for direct counter-argumentation (Moeschler 1989; Portolés 1995; see also chapters 3 and 6) it compels the reader to activate exactly that assumption from the first utterance segment that corresponds to the opposite of the propositional contents stated in the second segment. This shows how *sin embargo* not only acts as a generator of the contextual effect of contradiction and elimination of an assumption, but also as a constraint on the context to be accessed in utterance interpretation. In (67a) above *sin embargo* indicates that the contents of its host segment contradict the premise activated from the first segment that people with a bad character get frequently involved in arguments and specifically communicates that Pepe and Antonio do not. In (67b) the propositional content corresponds to two assertions. Firstly, that Pepe and Antonio do not usually get involved in arguments; secondly, that Pepe and Antonio have a good character. However, the implicature communicated in virtue of *sin embargo* compels the reader to access an assumption with the form "people with a nice character usually get involved in arguments" that serves as an implicated premise. *Sin embargo*, thus, does not only eliminate a mental representation that might have been derived from the first discourse segment. It also creates an assumption that might not be shared by the interlocutors (Portolés 1995: 232) or, more specifically, that even stays in contradiction with a series of assumptions entertained by them. This is the case in the implausible utterances of this study. Such contradiction or clash affects contextual assumptions and the instructional meaning of the connective, and must be solved by means of inference. In a nutshell, to successfully obtain contextual effects from the utterance in the form of implicated conclusions, the assumption derived from the utterance must be accommodated to a context suitable for interpretation by creating a new *ad hoc* assumption (Escandell Vidal et al. 2011: XXIX).

In what follows, we discuss processing data on implausibility effects in counter-argumentative relations marked by *sin embargo* in an across-subject study for the three participant groups (L1, C1 and B1 learners), following the structure of the three previous chapters. The results and discussion are arranged by critical regions or areas of interest (AOI) considered and, within them, by processing measures: total reading time (TRT), first-pass reading time (FPRT) and second-pass reading time (SPRT) for all regions. Results refer always to reading times of an average word with a mean length of 6.65 characters (cf. § 5.4.4.2). Comparisons between conditions are followed by comparisons within conditions.

The first part of the chapter is devoted to between-conditions comparisons. Data are discussed first for the critical regions "Utterance", which comprises all utterance words, including the connective; and "Conceptual-meaning word", which excludes the connective (*sin embargo*). Subsequently, data obtained for the functional areas of the critical utterances are presented and discussed: "First discourse segment" (DS1 henceforth); "Connective" (*sin embargo*); "Second discourse segment" (DS2 henceforth); finally, data are discussed for the disambiguation area, corresponding to the last two words of the DS2, i.e., to the part of the utterance were the compliance or clash between mental-stored and communicated assumptions can be detected.

Within-conditions comparisons are provided subsequently for the DS1 versus the DS2 of each condition for plausible causal utterances followed by comparisons for implausible utterances.

9.1. *Average utterance word in plausible versus implausible counter-argumentative relations*

9.1.1. Total Reading Time (TRT)

Looking at the TRT needed to process an average utterance word allows us to give account of global effects of pragmatic plausibility. This critical region includes all utterance words, including the connective. Therefore, it does not discriminate between conceptual and procedural-meaning words.

In TRT, implausibility leads to large slowdown effects for the most proficient readers, whereas no effect is obtained for the B1 group:

	PPCo	PICo	Diff. in ms	Diff. in %	Effect magnitude
L1	265.94	296.22	30.28	11.39	large
C1	371.20	423.45	52.25	14.08	large
B1	425.24	411.08	-14.16	-3.33	trivial

Table 88. TRT – Average utterance word in plausible vs. implausible counter-argumentation

The pattern obtained shows that less proficient speakers do not differentiate between plausible and implausible counter-argumentative relations at a global level, contrarily to C1 and native speakers. In fact, if absolute predicted mean processing times for the B1 group are considered, implausibility even speeds up reading of an average utterance word by 14.16 ms. This result contrasts with data found so far for this parameter and critical region in the previous studies, where slowdown effects of the hypothetically more complex condition (counter-argumentation in study 1; implicit causality in study 2; implausible causality in study 3) had been registered for B1 speakers.

An explanation in terms of better performance by the B1 group is excluded and can be hardly underpinned in theories of second language learning. Certainly, B1 readers are in possession of pragmatic abilities as experienced language users of their L1 and pragmatic abilities represent a paradigmatic instance of L1 positive transfer within L2 research (Bossers 1991; Kasper 1992; Taguchi 2007, 2012; see also Cummins 1984 and chapter 4). However, this does not explain the obtained results, since the C1 and, most notably, the L1 group do show a slowdown effect of implausibility. Therefore, it is suggested that processing instances of implausible counter-argumentative relations appeals to the pragmatic processor of addressees and requires applying higher-order inferencing resources, which is cognitively highly-demanding. As a result, the less proficient group experiences a *processing breakdown* and their global processing becomes extremely shallow. This is further supported by two further facts. Firstly, the large slowdown effect obtained for L1 and C1 speakers that is taken to indicate that their pragmatic abilities allow them to detect the implausibility and to accommodate the incongruent utterance. Secondly, the absolute TRT found in the implausible condition for B1 learners, which is below the TRT found for the C1 group (411.08 ms vs. 423.45 ms).

9.1.2. First-Pass Reading Time (FPRT)

In first pass reading, a distribution of C1/L1 vs. B1 arises again, but in an opposite direction. Native speakers or readers with a sufficiently developed linguistic and pragmatic competence and are confronted with cognitively very demanding tasks, they are not affected by pragmatic implausibility during the construction of an initial assumption. Effects are only obtained for the B1 group, albeit in an unexpected direction: the implausible utterance is less effort-demanding (-5.63%) that the plausible one:

	PPCo	PICo	Diff. in ms	Diff. in %	Effect magnitude
L1	208.29	212.59	4.29	2.06	trivial
C1	296.69	303.74	7.06	2.38	trivial
B1	352.00	332.19	-19.80	-5.63	medium

Table 89. FPRT – Average utterance word in plausible vs. implausible counter-argumentation

The absence of condition effects found at this stage for the L1 and C1 groups can be explained by differences in cognitive complexity of both conditions and, specially, by the higher cognitive complexity of the implausible utterance, which makes a strong need for re-analysis expectable, instead of notable differences during the construction of an initial assumption as given in FPRT.

Processing the implausible condition is, as a matter of fact, highly complex: it implies cancelling the inference derived from the first discourse segment in virtue of the semantics of *sin embargo* and, additionally, solving a mismatch between instructions and contextual assumptions in a specific direction due to the rigid semantics of *sin embargo*. Processing a plausible counter-argumentative utterance is, by contrast, simpler. The plausible utterance complies with the laws of discourse: it is possible in the language system and the assumptions derived from it are possible and accessible in the readers' mental world. This seems to be perceived by L1 and C1 readers.

The fact that, as a result, condition differences do not arise in FPRT for the most proficient readers and demonstrates the inferential nature of accommodation of mismatches between procedural meanings and contextual assumptions (Escandell Vidal et al. 2011). We do not argue, however, that the implausibility is not detected yet. Instead, it is suggested that L1 and C1 readers' discursive competence suffices to detect the mismatch in an early stage and that, additionally, their pragmatic competence and cognitive resources allow them to set in motion a strategy of *re-processing*. The speed-up effect of implausibility obtained for B1 readers may point to shallow processing by this group. Re-analysis data are discussed subsequently that may confirm this claim.

9.1.3. Second-Pass Reading Time (SPRT)

The pattern obtained for FPRT changes markedly in terms of effect magnitudes when the re-analysis stage is considered. The resulting group-based distribution is, however, the same as in FPRT. Due to the complexity of processing a counter-argumentative implausible utterance, we argue that effects are expected mainly during this stage, but only as long as readers are able to detect the implausibility and carry out accommodation successfully.

Slowdown effects of the implausible condition are now registered for all groups, with particularly large effects for highly proficient learners and for L1 speakers:

	PPCo	PICo	Diff. in ms	Diff. in %	Effect magnitude
L1	57.63	83.49	25.86	44.86	very large
C1	74.37	119.45	45.08	60.62	very large
B1	72.92	78.37	5.45	7.48	medium

Table 90. SPRT – Average utterance word in plausible vs. implausible counter-argumentation

The results at this stage are conspicuous: L1 speakers suffer a slowdown effect when they are confronted with implausible utterances and need over 40% more time to read an average utterance word. Very large slowdown effects of implausibility (over 60%) are found for C1 speakers as well, even larger than those of L1 speakers (about 45%).

B1 speakers perform similarly in terms of the direction of the effects obtained: contrarily to what occurred in TRT and FPRT, during re-analysis, the implausible condition is more effort-demanding for them, as it is also for the other two groups.

However, the condition effect is only medium-sized (7.48%), which contrasts with the very large effects found for the L1 and C1 groups. This markedly lower need for re-analysis by B1 speakers leads to conclude that they detect the mismatch in the implausible utterances, but that the cognitive load of solving it—i.e., accommodating the contents of the discourse segments to the instruction of the connective and to a context to derive a new assumption contradicting an entertained one—is so high that processing is not concluded and breaks down.

9.2. *Conceptual-meaning words in plausible versus implausible counter-argumentative relations*

Predicted mean reading times for a conceptual-meaning word in the experimental utterances, which exclude reading times obtained for the connective, can give further insight in how plausibility affects global processing in counter-argumentative utterances. In general, the patterns found equate those just discussed for an average utterance word, with only very slight differences in TRT and in SPRT.

9.2.1. Total Reading Time (TRT)

In TRT, implausibility leads to medium and large slowdown effects for the L1 and C1 group respectively, while it speeds-up processing for the B1 group:

	PPCo	PICo	Diff. in ms	Diff. in %	Effect magnitude
L1	255.25	278.60	23.35	9.15	medium
C1	352.79	393.53	40.74	11.55	large
B1	411.54	392.90	-18.64	-4.53	small

Table 91. TRT – Conceptual-meaning word in plausible vs. implausible counter-argumentation

These data suggest very shallow global processing by the less proficient speakers again. Not only does implausibility not slow reading down globally, but it even accelerates processing by almost 5%. When only conceptual-meaning input is considered, an utterance complex to accommodate to entertained contextual assumptions is processed more quickly than normative counter-argumentation. Globally, thus, B1 readers' do not seem to behave as expected. This replicates largely results obtained for TRT for an average utterance word (§ 9.1.1), with the implausible condition leading to faster processing now (compared to trivial effects found for an average utterance word). Since the parameter "conceptual-meaning word" does not include the connective, this is taken to suggest that the connective absorbs a large amount of cognitive effort during global processing compared to the discourse segments. This will be discussed further down in the between-conditions comparisons of functional regions (§ 9.3). In sum, results point to very shallow processing of implausibility in counter-argumentation by B1 speakers, which is further supported by data from L1 and C1 readers. These two groups process an average conceptual-meaning word notably more slowly when dealing with implausible counter-argumentative relations, an effect that is even more pronounced for the C1 group (large effects amounting to 11.55% for C1 speakers versus medium effects of 9.15% for native speakers). From a theoretical viewpoint this is taken as an indication that advanced learners are already able to detect implausibility even in interaction with a complex discourse relation like counter-argumentation, but have not attained native-like mastery of the L2[145] yet.

9.2.2. First-Pass Reading Time (FPRT)

The claims just made for TRT are supported by observing FPRT data and are also in line with the above discussion for an average utterance word. In effect, data show that the two most proficient groups are not affected by implausibility yet. These results are practically identical to those obtained for FPRT for an average utterance word (§ 9.1.2). Since (medium and large) effects were obtained in TRT and since we are confronted with complex cognitive operations, this is expectable: accommodation does not seem to be

[145] It is neither suggested nor denied that ultimate attainment of native-like proficiency in terms of online performance may be possible, and this is not the purpose of the present study. For a discussion on this issue see Birdsong (1992); White/Genesee (1996); Bongaerts (1999); an overview of theoretical and empirical research on ultimate-attainment of native-like performance in an L2 can be found in Hopp (2002) and in Pagonis (2007: 19-46).

performed during the construction of the communicated assumption. Instead, a strong effect should be seen during re-analysis. Such expectations, however, clash with the speed-up effect of the implausible condition found for B1 speakers:

	PPCo	PICo	Diff. in ms	Diff. in %	Effect magnitude
L1	201.06	204.66	3.60	1.79	trivial
C1	283.18	291.23	8.05	2.84	trivial
B1	342.20	322.35	-19.85	-5.80	medium

Table 92. FPRT – Conceptual-meaning word in plausible vs. implausible counter-argumentation

9.2.3. Second-Pass Reading Time (SPRT)

As in the analysis of pragmatic implausibility in causal processing (study 3, see chapter 8), also in counter-argumentation and also for conceptual-meaning regions, the effort invested in the stage of re-analysis is the most informative indicator of how implausibility impacts processing:

	PPCo	PICo	Diff. in ms	Diff. in %	Effect magnitude
L1	54.28	73.87	19.59	36.10	very large
C1	69.54	102.13	32.60	46.88	very large
B1	69.07	70.14	1.07	1.54	trivial

Table 93. SPRT – Conceptual-meaning word in plausible vs. implausible counter-argumentation

The very large effects found for L1 and C1 speakers, who need over 45% and over 46% longer to re-analyze a conceptual-meaning word when it occurs in an implausible counter-argumentative utterance, contrast markedly with the absence of effects for the B1 group. Contrasted with data for an utterance word (see § 9.1.3 above), where the connective was included in computations and B1 speakers suffered a medium-sized slowdown effect of implausibility, the absence of effects found here indicates that the re-analysis performed by B1 speakers focuses on *sin embargo*. It also points to the fact that the implausibility is perceived, and the procedural-meaning device is processed as its origin, since it requires a comparatively stronger re-analysis than conceptual meaning areas (see also § 9.3 further down in this section for functional regions among conditions).

The line of argumentation introduced above does not change: B1 speakers seem to lack the discourse competence and language proficiency necessary to allocate enough cognitive resources to re-processing counter-argumentative implausible utterances in a way that accommodation can be performed. More specifically, they recover the utterance's assumptions schema, but fail to derive its implicated premises. This precludes them to arrive to the implicated conclusions and, thus, to the communicated assumption.

Along the next pages, results are offered for the effects of implausibility on the three functional regions of counter-argumentative operations of our study: the first and the second discourse segment (DS1 and DS2) and the connective. As in study 3, reading times are also discussed for the disambiguation region, i.e., the last two words of the DS2.

9.3. *Discourse segments and connectives in plausible versus implausible counter-argumentative relations*

In general terms, the distribution L1/C1 versus B1 speakers with a pattern of shallow processing by the latter observed so far remains valid if plausibility effects in counter-argumentative relations are considered for the TRT, FPRT and SPRT at the functional areas of the critical utterances of the present study.

9.3.1. Total Reading Time (TRT)

In TRT implausibility leads to very similar small slowdown effects at the DS1 for the two most proficient groups, whereas it accelerates processing of the DS1 for B1 speakers (implausible premises are read over 5% faster than plausible premises are). The incongruency would make a higher global processing effort expectable at all critical regions, including the premise of the utterance, i.e., the DS1. Therefore, in light of these results, very shallow processing is proposed again for the B1 group:[146]

	PPCo DS1	PICo DS1	Diff. in ms	Diff. in %	Effect magnitude
L1	267.19	278.63	11.44	4.28	small
C1	352.81	368.36	15.55	4.41	small
B1	405.51	382.48	-23.04	-5.68	medium

Table 94. TRT – Plausible vs. implausible counter-argumentation at DS1

As for the connective *sin embargo*, implausibility leads to more effortful processing of this area for all groups. However, instead of suggesting equal performance, here too data point to shallower processing by the B1 group, since only medium effects are found for them, in contrast with the very large effects found for C1 and L1 readers:

	PPCo Conn	PICo Conn	Diff. in ms	Diff. in %	Effect magnitude
L1	347.53	439.03	91.50	26.33	very large
C1	483.72	689.38	205.66	42.52	very large
B1	502.09	538.82	36.73	7.32	medium

Table 95. TRT – Plausible vs. implausible counter- argumentation at connective

The distribution pattern of less proficient versus most proficient readers is even more conspicuous when global processing effort at the consequence segment is considered:

	PPCo DS2-conn	PICo DS2-conn	Diff. in ms	Diff. in %	Effect magnitude
L1	245.44	291.14	45.70	18.62	large
C1	356.93	434.22	77.28	21.65	very large
B1	401.38	406.70	5.32	1.32	trivial

Table 96. TRT – Plausible vs. implausible counter-argumentation at DS2

[146] Note that findings were the opposite for plausibility effects in causal utterances, as discussed in chapter 8: B1 speakers exhibited very large slowdown effects of implausibility at the DS1, exceeding the effects found for the C1 and L1 group in over 10%. The DS1 was considered an effort hotspot for B1 speakers, who, in general, focused more on conceptual meaning areas (the DS1 and the DS2) during global processing. C1 and L1 group, on the contrary, tried to solve the implausibility by resorting to the causal connective *por tanto*.

At the DS2, implausibility effects vanish completely for B1 group, who process a plausible and an implausible DS2 similarly. The trivial effects obtained for them contrast strongly with the large and very large effects found respectively for L1 and C1 speakers.

Taken together, the shallow-processing thesis for the B1 group adduced under consideration of the obtained effect magnitudes is reinforced if absolute reading times are observed for all groups and compared between conditions. When utterances are plausible, processing times (TRT) correlate inversely with proficiency as expected. By contrast, when a counter-argumentative utterance contains a mismatch between the procedural-meaning device and the context, less proficient speakers read the connective and the consequence segment (the DS2) faster than C1 speakers. In summary, not only does implausibility in counter-argumentation impact B1-processing less than C1 and L1-processing (= more moderate effect magnitudes for the B1 group); it also leads B1 readers to process the implausible utterance faster than C1 readers despite their lower proficiency:

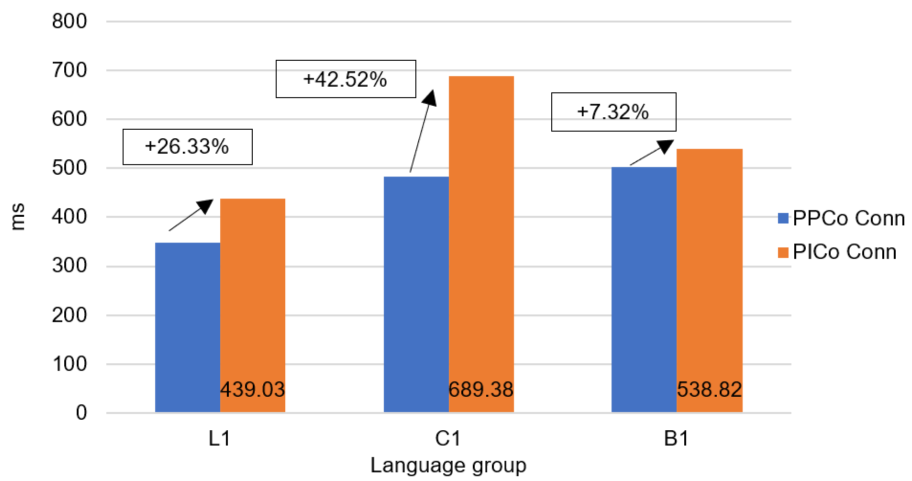

Figure 35. C9. TRT – Condition percentage effects at connective in plausible (PPCo) vs. implausible (PICo) counter-argumentative relations

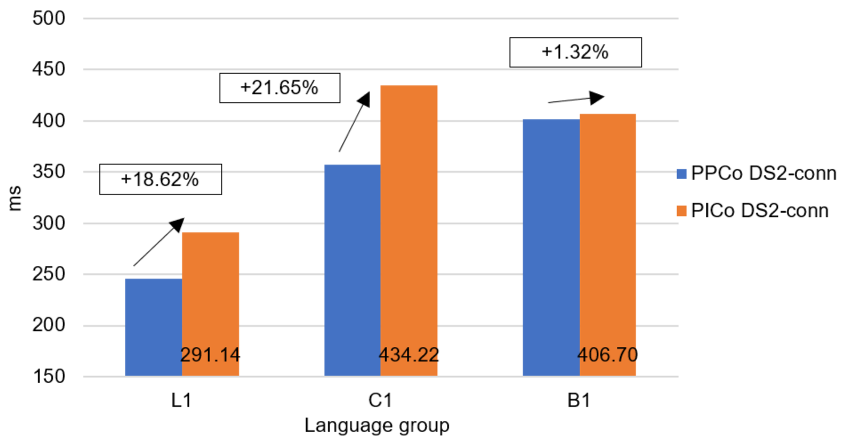

Figure 36. C9. TRT – Condition percentage effects at DS2 in plausible (PPCo) vs. implausible (PICo) counter-argumentation

From a theoretical viewpoint, this supports the pattern observed throughout data for multiple comparisons and conditions so far: while a lower processing effort by L1 speakers suggests automaticity or greater processing ease compared to L2 readers, lower processing times by B1 speakers similar to or even lower than those of native speakers indicate shallow processing. The pattern of extremely shallow processing by the less proficient group becomes particularly conspicuous in cases where they are confronted with very demanding processing tasks like in the variable at issue. C1 speakers, in turn, very often perform native-like (see effect magnitudes above and table 96) or exhibit very high processing times and implausibility effects compared not only to L1 speakers but also (and particularly) to the B1 group. This suggests in-depth processing by very advanced readers—as opposed to shallow processing by B1 speakers—, while denoting that they are still not able to carry out accommodation processes in the same manner than native speakers. As a result, a sub-pattern is suggested that complements the previously proposed pattern of L1/C1 versus B1 speakers. The new sub-pattern is based on effect differences in percentages and corresponds to a distribution L1 vs. C1 vs. B1 readers:

Indicator	AOI	Group		
Effect magnitude	DS1, Conn, DS2	L1	C1	B1
Effect differences in %	Conn, DS2	L1	C1	B1

Table 97. Processing pattern and sub-pattern group distribution according to indicator and AOI

The light gray shadowing and the discontinuous division line between L1 and C1 speakers for the indicator “effect magnitude” signal similar performance, while the discontinuous division line for the indicator “effect differences in %” signals more alike performance of these two groups compared to B1 speakers. C1 reading is however more effortful than native reading. Different degrees of L2 competence generate different outcomes. As a result, data visualization takes on a pyramidal form with the C1 group at the apex:

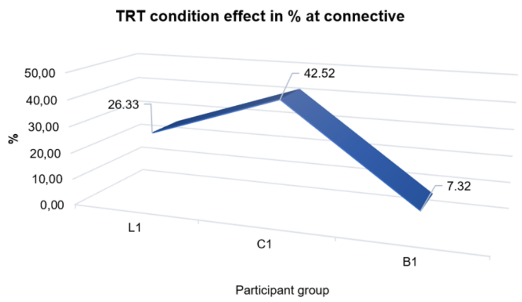

Figure 37. C9. TRT – Condition effects (%) at connective

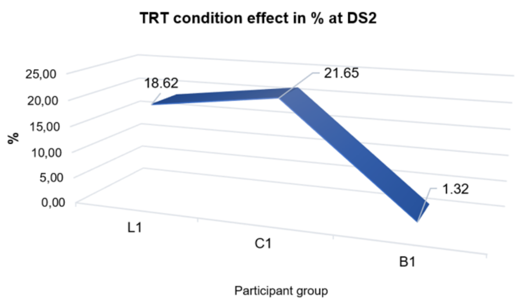

Figure 38. C9. TRT – Condition effects (%) at DS2

The analysis of the critical regions that intervene in processing and in the resolution of the incongruency, i.e., in the accommodation processes (allegedly performed only by L1 and C1 speakers) is another informative indicator about possible differences in processing patterns and strategies.

As figure 39 shows, the connective seems to be the hotspot for all readers in both conditions, but more strongly a) in the implausible condition; and b) for L1 and particularly for C1 speakers. Differences at the connectives are much more moderate for the B1 group:

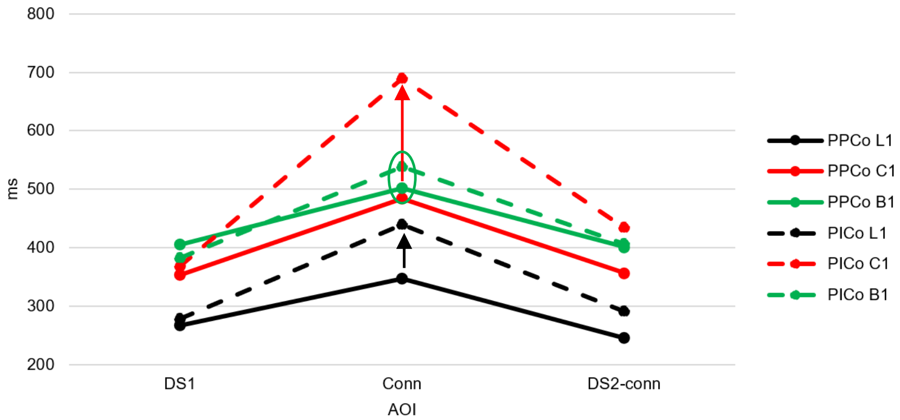

Figure 39. C9. TRT – Predicted mean for critical regions in plausible (PPCo) and implausible (PICo) counter-argumentation by language group

Processing data give rise to a pyramidal structure for all readers with *sin embargo* at the apex in both conditions. For the plausible condition in native-language processing, this is in line with previous experimental evidence showing that the adversative connective *sin embargo* is always more costly than the utterance discourse segments (see Loureda et al. 2016b and Nadal 2019). This pattern gets even more accentuated in the implausible condition as far as TRT is concerned. The pyramidal form of the resulting processing pattern is especially visible for L1 and C1 readers, with the latter exhibiting comparatively very effortful processing at *sin embargo*. While TRT is still too broad a parameter to make fine-grained assumptions on how accommodation is performed, data so far suggest that when processing is not abandoned (as is suggested for the B1 group) and speakers try to recover the communicated assumption when confronted with mismatches between procedural instructions and contextual assumptions, the connective is perceived as the area that causes the incongruency, and re-analysis focus in particular on that region. A look at the stages of construction and re-construction of the communicated assumption as reflected in FPRT and SPRT respectively provides further insight into this claim.

9.3.2. *First-Pass Reading Time (FPRT)*

Considering first-pass reading, the pattern L1/C1 versus B1 is confirmed, as shown in the plausibility effects on processing data found for the second discourse segment[147]:

	PPCo DS2-conn	PICo DS2-conn	Diff. in ms	Diff. in %	Effect magnitude
L1	189.73	199.58	9.85	5.19	medium
C1	286.06	314.94	28.88	10.10	large
B1	327.24	319.50	-7.74	-2.37	trivial

Table 98. FPRT – Plausible vs. implausible counter-argumentation at DS2

Incremental processing (Just & Carpenter 1987; Traxler & Pickering 1996; Pickering & Traxler 2009) seems to apply here for highly proficient L2 speakers particularly, but also for the L1 group, for whom implausibility slows down first-pass reading of the DS2: both groups detect an anomaly already during the stage of construction of an initial assumption and dwell longer on the DS2 in an initial attempt to integrate the assumption recovered so far with background knowledge and with context. Note that these results contrast for the C1 speakers with those found for the analysis of plausibility effects in causal relations (see chapter 8), where no early effects were found at the DS2. Performance by the C1 group was explained by arguing a late effect of the connective *por tanto*, which led to very high re-processing of the DS2 during SPRT. What is argued for the effects of implausibility in counter-argumentation during FPRT is that the more constraining semantics of *sin embargo* compared to those of *por tanto* (Murray 1995, see also Brehm-Jurish 2005 for different effects on processing of causal and counter-argumentative connectives) leads to earlier plausibility effects for the C1 group, and, to a lesser extent for the L1 group. This translates into more effortful reading of an implausible DS2 already during the first pass. Crucially, this effect is specially marked in advanced L2-learners: while native speakers also seem to realize the presence of a semantic incongruency, the impact on highly-proficient L2 participants is particularly strong and leads to notably

[147] As in the study dealing with plausibility effects in causal relations (variable 3), data from FPRT for the DS1 and the connective are not provided here, since condition effects cannot deploy before the DS2 has been reached.

more effortful processing. We suggest (see § 9.4 for the discussion on the disambiguation region) that the complexity of the incongruent DS2 detected by L1 and C1 speakers and leading to more effortful processing already during FPRT is partly overridden by the more strongly developed parsing abilities of native speakers compared to highly-proficient L2 learners. In other words, we suggest that the verb imposes syntactic restrictions as to the upcoming syntactic constituents—a direct object[148]—, and that this leads to stronger anticipation and, consequently, to speed-up effects for native speakers that override the slowdown effect of the incongruency. That C1 learners do not profit from structural constraints to the same extent as native speakers could be due to their non-native linguistic abilities, which is, however, not incompatible with a fully developed pragmatic competence.

Note that this line of argument also finds support *a contrario sensu* from data of the first study (chapter 6), in which the effects of the type of argumentative relation operationalized in the conditions "causality" versus "counter-argumentation" were analyzed. Despite the theoretical and evidence-based higher cognitive complexity of counter-argumentation (Moeschler 1989; Murray 1995, 1997; Brehm-Jurish 2005; Zunino 2017c for a state-of-the-art; see also chapter 6 for experimental evidence), no effects were found for the L1 and C1 readers for the DS2 during FPRT. This was attributed to (higher) processing automaticity, since participants were confronted with plausible, normative utterances in discourse. More specifically, the absence of effects at the DS2 in FPRT for L1 and C1 readers were attributed to the fact that the hypothetically longer processing times expectable for the consequence segment of a counter-argumentative utterance could not be found since the strong interpretive constraints imposed by *sin embargo* overrode the higher alleged complexity of counter-argumentation compared to causality. This explanation applies for the present study too: *the more constraining the instructions of a connective are, the stronger they clash with mismatching subsequent discourse*. "More constraining" must be understood here as encoding instructions that contravene readers' underlying by-default expectations of continuity (Murray 1995, 1997) and causality (Sanders 2005).

[148] In one critical stimulus, the DS2 did not present a structure 'verb + direct object' but was followed by an adjunct: (…) *cocinan muchas horas* ('…they cook long hours') (see Appendix 2).

Importantly, according to data, this seems to apply only from a certain level of proficiency onwards. In the present study, that would correspond to an advanced level in the L2 and concerns discursive competence. B1 speakers do not show as higher an early sensitivity to the mismatch (table 98 above): their interpretation of the host segment of the connective may be fragmentary, or they may not be undertaking any initial attempts to integrate it into entertained representations, which would lead to longer dwelling on it. This groups reads the implausible DS2, as concerns absolute FPRT, even faster than the plausible DS2. This is taken as an indicator of shallower initial analysis of the implausible utterances by the B1 group compared to the C1 and L1 groups (who show respectively large and medium slowdown effects of implausibility). The most proficient readers seem to have initiated an attempt to integrate the contents of the mismatching DS2 into an incipient mental model, and that is an effortful task.

In light of these results from early processing, several scenarios can be posited for the early processing stage related to the stage of re-analysis:

a) Shallower initial analysis (FPRT) will lead to very costly re-analysis (SPRT) (very effortful slowed down reading of the implausible condition). This would prove that the mismatch has been detected during early reading and triggers a re-analysis strategy. Note that a pattern of the like was seen for C1 speakers in the study on implausibility effects in causal relations (see chapter 8).
b) Shallower initial analysis (FPRT) leading to small or moderate condition effects in re-analysis (SPRT) (slightly slowed down reading of the implausible condition). This would indicate non-detection of the mismatch during early reading and inconclusive processing leading to a processing breakdown.
c) Effortful initial analysis (FPRT) also leading to large condition effects in re-analysis (slowed down reading of the implausible condition). This would also reflect mismatch detection during early reading and an accommodation strategy deployed during the stage of the re-construction of the communicated assumption, as expected, due to the inferential nature of accommodation processes.
d) Very effortful initial analysis (FPRT) leading to small or moderate condition effects in re-analysis (SPRT) (slightly slowed down reading of the implausible condition).

This would prove mismatch detection and assumption accommodation during early reading, and would speak for re-consideration or nuancing of the inferential nature of accommodation processes.

9.3.3. Second-Pass Reading Time (SPRT)

At the stage of reconstruction of a communicated assumption as given in second-pass reading times (SPRT), data show a very large slowdown effect of implausibility at all critical regions for the two most proficient groups and only at the connective for B1:

	PPCo DS1	PICo DS1	Diff. in ms	Diff. in %	Effect magnitude
L1	78.06	95.20	17.14	21.95	very large
C1	99.43	121.25	21.81	21.94	very large
B1	104.05	99.67	-4.38	-4.21	small

Table 99. SPRT – Plausible vs. implausible counter-argumentation at DS1

	PPCo Conn	PICo Conn	Diff. in ms	Diff. in %	Effect magnitude
L1	121.42	230.99	109.57	90.24	very large
C1	148.97	364.12	215.15	144.42	very large
B1	132.48	183.70	51.22	38.66	very large

Table 100. SPRT – Plausible vs. implausible counter-argumentation at connective

	PPCo DS2-conn	PICo DS2-conn	Diff. in ms	Diff. in %	Effect magnitude
L1	55.67	91.49	35.82	64.34	very large
C1	70.71	118.99	48.28	68.27	very large
B1	73.87	86.77	12.90	17.47	large

Table 101. SPRT – Plausible vs. implausible counter-argumentation at DS2

Starting with the connective region, implausibility brings about very large slowdown effects for all groups (table 100). Effects amount, however, to 38.66% for B1, compared to 90.24% and 144.42% for L1 and C1 speakers respectively.

For B1 speakers, condition effects reflect mismatch detection. That the largest effects arise for them at the connective is taken to indicate that they identify the rigid procedural meaning of *sin embargo* as a relevant area for mismatch resolution. However, two facts point to failure to performing accommodation and suggest a processing breakdown for the B1 group. Firstly, the fact that implausibility effects deploy almost only at the connective and does not involve revisiting the discourse segments to articulate the counter-argumentative relation holding between them. Secondly, the fact that absolute reading times by B1 participants are systematically lower than absolute SPRT obtained for the C1 group and even for the L1 group (at the connective). By contrast, for highly proficient L2-learners and for native speakers, mismatch effects deploy at all critical regions: the connective mainly, the DS2 and, albeit to a lesser extent, the DS1. The impact of implausibility, thus, has much less of an impact on the premise and the conclusion of the utterance when discourse competence not sufficiently developed (i.e., for B1 speakers). These findings suggest a clear L1/C1 versus B1 pattern for plausibility effects of counter-argumentative utterances that arises particularly from the generalized notably lower need for re-analysis in the implausible counter-argumentative utterance by the less proficient group.

In light of these results, the scenarios *b* and *c* described above seem to apply for our participant groups. Less proficient learners follow a path of shallow initial processing that leads to a processing breakdown during re-analysis (b). L1 and C1 readers, in turn, follow a path of effortful processing due to early mismatch detection that leads to very effortful re-analysis (c) due to the high cognitive load of accommodation when it interacts with a discourse operation implying the revision of inferences, as is the case of counter-argumentation (Blakemore 1987, 2002; Moeschler 1989), marked by a procedural meaning device with a strong semantics (Murray 1995, 1997). The processing breakdown claimed for B1 speakers finds further support in SPRT for an average utterance word and conceptual-meaning words, as previously discussed (§ 9.1.3 and § 9.2.3).

As suggested for re-analysis effects of plausibility for causal utterances marked by the connective *por tanto* (chapter 8), the processing breakdown claimed for B1 speakers is attributed to their insufficient pragmatic competence. Specifically, the cognitive context brought to bear to derive implicatures differ from those of highly proficient L2 participants and native speakers (Foster-Cohen 2000). The division of semantic and pragmatic labor during processing seems to take place differently for B1 speakers, on the one side, and for L1 and C1 speakers, on the other. The instructional meaning of *sin embargo* to process the second discourse segment as a conclusion contrary to that which would have been inferred from the first segment (*DPDE*, *s.v. sin embargo*) seems to be grasped by B1 speakers. Due to the high cognitive load of the implausible condition, however, full pragmatic inferencing seems to be hampered. Consequently, accommodation is not carried out by the B1 group and the communicated assumption is not recovered. Note that accommodation in this case refers to secondary pragmatic processes. The recovery of the explicature of the utterance is claimed not to be affected by the breakdown in processing. As mentioned in the previous chapter, in the framework of Relevance Theory inferential comprehension comprises a series of sub-tasks (Wilson & Sperber 2004: 615): constructing the explicatures of the utterances, constructing a hypothesis about the intended implicated premises and constructing an appropriate hypothesis about the intended implicated conclusions. As was found in the study of plausibility effects in causality (chapter 8), when confronted with a counter-argumentative procedural instruction that does not fit mind-stored assumptions, B1 speakers also stop processing after the recovery of the explicatures, i.e., after the construction of the enriched logical form[149]. By contrast, albeit investing a considerable effort to do so, C1 and L1 speakers successfully recover the communicated assumption, i.e., undergo the whole process of utterance interpretation and comprehension[150]. That the breakdown is more noticeable here compared to causality is due to the higher cognitive load of implausibility in interaction with counter-argumentation.

As for C1 and L1 speakers, results obtained for the area of the connective show a slowdown re-analysis effect of implausibility amounting to over 144% for the former, compared to an effect of over 90% for the latter:

[149] The experiment design cannot give account of whether only the propositional form or high-level explicatures, i.e., assumption schemata, are recovered by the B1 group. We want to suggest, however, that they do not go beyond the level of the propositional form, since failure to carry out further inferencing allows at the very least to hypothesize that propositional attitudes or speech-act descriptions are not processed.

[150] As put forth for the same comparisons in the third study (chapter 8), a line of argument can also be provided according to Kintsch's model of text representation (1998) (texts are represented at the levels of the surface code, the textbase, and the situation model). As in implausible causality, here to L1 and C1-speakers seem to be able to build representations at all levels of representation in the plausible and in the implausible conditions (albeit at a higher cost in the latter). By contrast, the B1 group seems to fail to derive a fully-fledged mental model in the implausible condition.

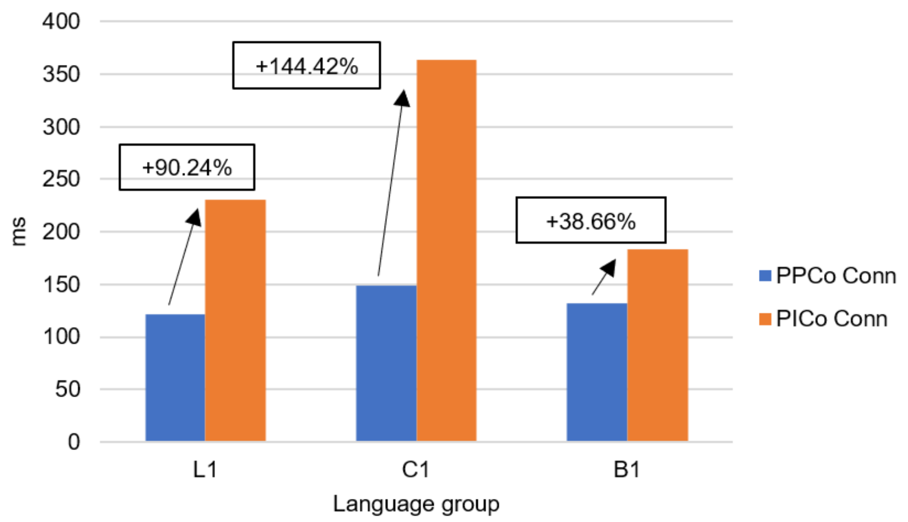

Figure 40. C9. Percentage condition effects by language group at connective during re-analysis

Mismatch resolution seems thus to be carried out by focusing on the procedural-meaning device by advanced learners particularly and, albeit less pronouncedly, also by L1 speakers. B1 readers, by contrast, exhibit comparatively lower effects of implausibility at the connective and, as already discussed, lower slowdown effects or even a speeding-up of reading at the discourse segments:

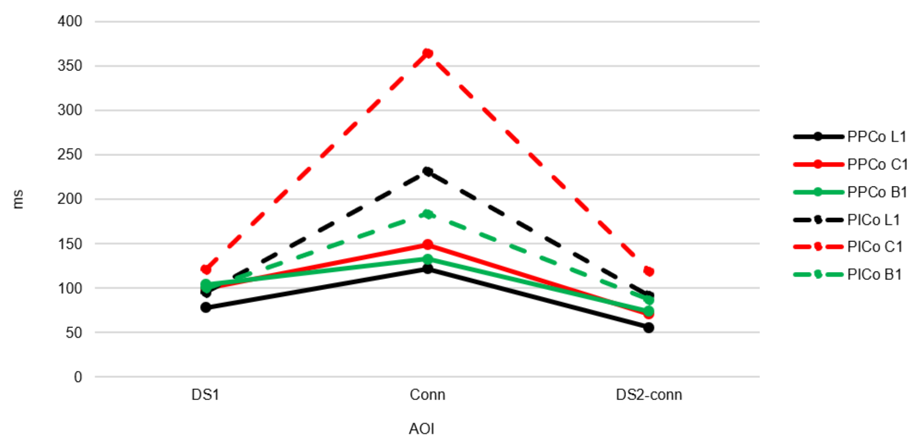

Figure 41. C9. Re-analysis patterns (SPRT) by language group and condition

The obtained pattern allows us to suggest a path towards native-like processing for C1 speakers. This finds support in the very similar implausibility re-analysis effects observed for those two groups at the areas of the discourse segments (DS1: 21.95% and 21.94%;

DS2: 64.34% and 68.27% for L1 and C1 respectively, see tables 90 and 92 above). As for the connective, the fact that C1 speakers confer special relevance to the connective during re-reading compared to L1 readers (effect magnitudes of 144.42% for C1 vs. 90.24% for L1) could point to the C1 group holding to a greater extent to the semantic level as the key for mismatch resolution, in similar terms to what was argued above for B1 speakers. However, if processing of the disambiguation region (see next section) is considered, this interpretation must be ruled out. In conclusion, results so far suggest very conscious and effortful re-processing of the connective by very advanced L2-learners, which, nonetheless, does not move them away non-native-like performance. In other words, both native and C1 speakers detect an incoherency at the connective, the area that they both re-analyze at most, but also carry out a careful re-analysis of both discourse segments. This stays in clear contrast to the pattern of markedly less re-analysis of conceptual content regions obtained for the B1 group, despite the fact that the discourse segments are the regions upon which the procedural instruction of assumption contradiction and elimination of *sin embargo* deploys and the sources for activation and recovery of mental representations.

9.4. *Disambiguation region in plausible versus implausible counter-argumentative relations*

In this condition, plausibility effects were also analyzed at the disambiguation region, which corresponds to the last two words of the second discourse segment, i.e., to the region where the mismatch can first be detected between the interpretive instructions triggered by *sin embargo* and contextual assumptions held by readers:

(x) *Jorge y Gonzalo hacen películas malas/#buenas. Sin embargo, reciben* [*muchos premios*]$_{\text{disamb}}$.
'Jorge and Gonzalo make bad/#good movies. However, they win [a lot of awards]$_{\text{disamb}}$'.

9.4.1. Total Reading Time (TRT)

Data obtained for this critical region are in line with the results discussed so far. In total reading time (TRT), that is, during global processing, effects of plausibility are only seen for the two most proficient groups:

	PPCo	PICo	Diff. in ms	Diff. in %	Effect magnitude
L1	260.05	296.15	36.10	13.88	large
C1	372.07	467.45	95.37	25.63	very large
B1	421.96	425.80	3.83	0.91	trivial

Table 102. TRT – Plausible vs. implausible counter-argumentation at disambiguation area

The performance of C1 and L1 speakers also differs to some extent. Plausibility brings about very large slowdown effects for advanced L2-learners that lead them to invest almost 26% more time to process the disambiguation area, while large slowdown effects of 13.88% are registered for L1 speakers. Again, this suggests a pattern of especially conscious and effortful processing by the C1 group in mismatches between the interpretive route imposed by *sin embargo* and previously entertained assumptions. Such pattern of very conscious processing was already argued for other variables and comparisons. What is also suggested here is that both L1 and C1 readers detect implausibility and successfully solve it—i.e., they undergo the whole interpretive process, from encoding to full pragmatic inferencing, as argued for SPRT data above—but that solving the mismatch is more costly for the highly-proficient L2 group. Specifically, we suggest that they exhibit full pragmatic competence to detect and solve problems like the one at issue, and that more effortful processing responds to differences in general linguistic abilities. In other words, pragmatic abilities of the C1 group allow for a native-like performance, while some linguistic limitations preclude them from reading in a fully native-like manner.

9.4.2. First-Pass Reading Time (FPRT)

The previous claim also applies to the stage of the initial construction of the communicated assumption. C1 speakers show again the highest slowdown effects of implausibility, followed by native speakers:

	PPCo	PICo	Diff. in ms	Diff. in %	Effect magnitude
L1	204.11	212.31	8.20	4.02	small
C1	311.13	338.25	27.13	8.72	medium
B1	352.47	344.73	-7.74	-2.19	trivial

Table 103. FPRT – Plausible vs. implausible counter-argumentation at disambiguation area

These data hold to the pattern obtained for plausibility effects during FPRT on the DS2 (see § 9.3.2, table 98) but differ slightly from them in terms of effect magnitudes. The C1 group exhibited large slowdown implausibility effects at the DS2 versus the medium effects obtained for the disambiguation region; the L1 group, in turn, exhibited medium effects at the DS2 and small effects at the disambiguation region. The line of argument stated above that the highly constraining semantics of *sin embargo* allows L1 and highly proficient L2 readers to detect the implausibility during FPRT already holds for the disambiguation region as well. On the other hand, the reduction of the impact of implausibility in this region compared to the whole second discourse segment is attributed to the ability of these two participant groups to seize the anticipatory effects of the verb, which leads to a parsing advantage for both of them. Such effect lies at the structural level: the verb anticipates a specific argument, a direct object in the present study, and affects, therefore, syntactical computations and not pragmatic processes, as does the procedural meaning. The facilitation effect on parsing brought about by the verb of the second segment for native speakers, thus, generates expectations about the upcoming constituents in structural terms and mitigates the effect of the pragmatic incongruency on the last two utterance words.

In summary, the enchainment of instructions in the utterances at issue operates at two levels. On the one hand, in virtue of its highly constraining semantics, *sin embargo* compels readers to relate the DS2 with the DS1 in a specific manner, namely by establishing a contradiction even if the content of the discourse segments points elsewhere. On the other hand, the syntactic constituents generate expectations and impose structural restrictions as to the upcoming linguistic material, i.e., as to the expectable syntactic constituents of the utterance. Both kinds of restrictions seem to affect L1 and C1 speakers very similarly in FPRT, albeit not resulting in identical condition effects. This is in line with claims about the native-like pragmatic competence of highly proficient L2-readers and their non-nativelike performance in terms of linguistic abilities.

9.4.3. Second-Pass Reading Time (SPRT)

As concerns the re-construction of the communicated assumption for the disambiguation area, group patterns are more homogenous than in early reading. Slowdown implausibility effects of at least a large magnitude are now registered for all participant groups. Such effect magnitudes are expectable during re-analysis: both accommodation and counter-argumentation imply a revision of mind-stored and initially recovered assumptions, and their combination to derive the assumption intended by the speaker:

	PPCo	PICo	Diff. in ms	Diff. in %	Effect magnitude
L1	55.88	83.67	27.79	49.73	very large
C1	60.69	128.89	68.20	112.37	very large
B1	69.13	80.67	11.54	16.69	large

Table 104. SPRT – Plausible vs. implausible counter-argumentation at disambiguation area

If effect magnitudes and percentage differences are considered, however, the following pattern and sub-patterns arise:

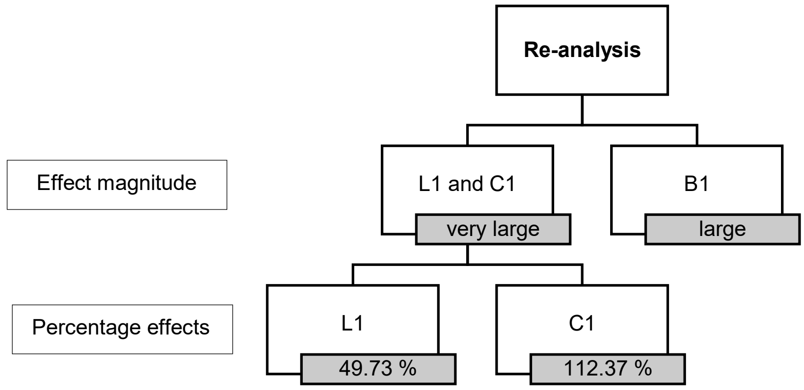

Figure 42. C9. Group-pattern distribution of condition effects during re-analysis by effect magnitude and percentage change

Effect magnitudes suggest a distribution of participant performance according to a twofold pattern of L1 and C1 versus B1 processing. Two types of results allow for that. Firstly, the comparatively weaker slowdown effects of implausibility for the B1 group (16.69% vs. 49.73% and 112.37% for L1 and C1 speakers respectively). Secondly, the fact that B1 speakers, despite their lower linguistic and pragmatic competence, exhibit the lowest absolute reading times of all participant groups (80.67 ms vs. 83.67 ms and 128.89 ms for L1 and C1 respectively). This is further proof of the fact that native and highly proficient L2 speakers accomplish accommodation, whereas the B1 group does not seem to conclude the interpretive process.

In light of the previous pattern distribution, a further distribution of results into a sub-pattern L1 versus C1 performance is proposed based on the obtained percentage differences for these two groups. This sub-pattern is not grounded on processing depth, but on processing *costs*, i.e., on the cognitive effort needed to recover a fully-fledged mental representation from implausible counter-argumentative utterances. The impact of implausibility is almost 126% larger for C1 than for L1 readers:

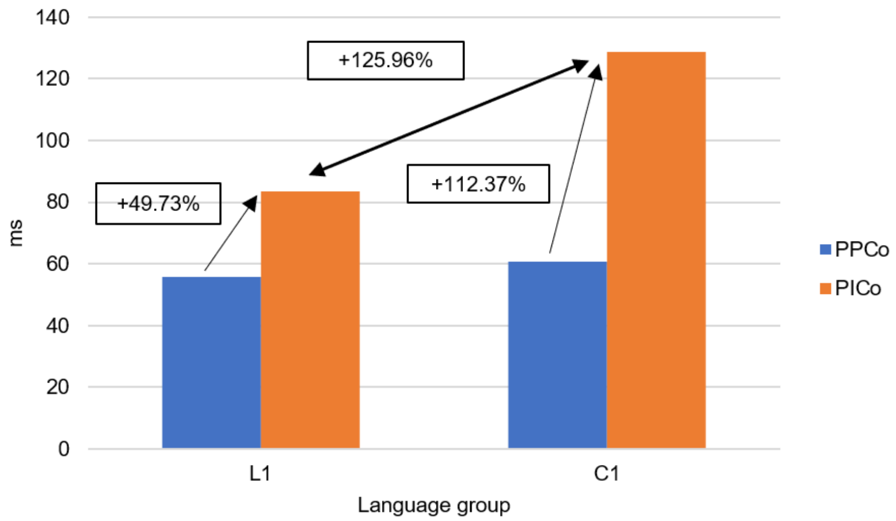

Figure 43. C9. Percentage effects of implausibility within and between L1 and C1 readers at the disambiguation region

This points once more to very conscious, effortful processing by the C1 group and supports further the tenet that their pragmatic ability is fully deployed but that it is linguistic competence what precludes fully native-like performance.

9.5. *Causes and consequences in plausible counter-argumentative relations*

9.5.1. Total Reading Time (TRT)

In pragmatically acceptable counter-argumentation, the comparison between processing times for the cause and the consequence segments gives rise to a pattern-distribution L1 ←→ L2:

	DS1	DS2-conn	Diff. in ms	Diff. in %	Effect magnitude
L1	267.19	245.44	-21.75	-8.14	medium
C1	352.81	356.93	4.13	1.17	trivial
B1	405.51	401.38	-4.13	-1.02	trivial

Table 105. TRT – DS1 vs. DS2 in plausible counter-argumentation

Globally, only native speakers process the DS1 and the DS2 of a plausible counter-argumentative utterance in a differentiated manner. This may be due to the anticipation effect of *sin embargo*, which leads L1 speakers to globally process the consequence less effortfully than the cause. Although non-native speakers exhibit higher processing costs, they do not carry out a nuanced processing of cause and consequence, which would support the argument that the procedural semantics of *sin embargo* is not seized by them globally in a fully native-like manner. An alternative explanation (see also § 6.5.1) would be that *sin embargo* is specially effort-demanding for both L2 groups and its processing continues during processing of the DS2. Early and late processing indicators may shed further light onto this issue.

9.5.2. First-Pass Reading Time (FPRT)

If only the stage of construction of the communicated assumption is considered, at the discourse segments the highest effects are also found for the C1 group followed by the B1 group (large vs. medium slowdown effects respectively at the consequence segment):

	DS1	DS2-conn	Diff. in ms	Diff. in %	Effect magnitude
L1	189.28	189.73	0.45	0.24	trivial
C1	253.30	286.06	32.75	12.93	large
B1	301.32	327.24	25.92	8.60	medium

Table 106. FPRT – DS1 vs. DS2 in plausible counter-argumentation

That native speakers allocate the same amount of effort in processing the cause and the consequence segment is explained as a result of processing automaticity. As was argued in the first study (chapter 6), what is conform to the rules of discourse is processed smoothly as far as no revision of the initially recovered assumption has to be performed, as is the case during early processing.

The strong differentiation between discourse segments reported for the C1 group and, to a less extent, by B1 readers, is suggested to be better explained in relation to the effort invested by the two non-native groups in processing the connective. As introduced in the discussion of TRT above (§ 9.6.1), it is argued that the large and medium effects found for the DS2 reflect a spillover effect of the cognitive effort needed to process *sin embargo*.

9.5.3. Second-Pass Reading Time (SPRT)

During late processing, the discourse segments are processed in a nuanced manner by all participant groups:

	DS1	**DS2-conn**	**Diff. in ms**	**Diff. in %**	**Effect magnitude**
L1	78.06	55.67	-22.39	-28.68	very large
C1	99.43	70.71	-28.72	-28.88	very large
B1	104.05	73.87	-30.18	-29.01	very large

Table 107. SPRT – DS1 vs. DS2 in plausible counter-argumentation

During the reconstruction of the communicated assumption a clear distinction is made in cognitive terms, with re-processing the DS1 being almost 30% more costly than re-processing the DS2 (see also Nadal 2019). These results are taken as indicators about the different discursive status of DS1 versus DS2 in counter-argumentation, about the expectation-generating semantics of *sin embargo* as a counter-argumentative connective and about the information given by late measures like SPRT about processing (see also chapter 6). *Sin embargo* leads to revising and eliminating a mental representation inferred from the content of the DS1, which makes more effortful processing of the DS1 expectable. However, we suggest that the differences found between discourse segments at this stage are due to the highly constraining power of counter-argumentative connectives (Murray 1995). In other words, instead of arguing very effortful re-analysis of the DS1, a facilitation effect for the DS2 is suggested[151]. When a counter-

[151] As argued previously for the first processing study in relation to counter-argumentative and causal utterances, functional areas of consistent argumentative utterances are attributed their distinctive discourse-semantic status (cause-consequence) in particular during late processing, i.e., during SPRT, and this is more markedly so as proficiency increases (recall that only trivial effects between discourse segments had been found for L1 speakers in FPRT, see § 9.5.2).

argumentative connective like *sin embargo* is provided, native speakers and non-native speakers, regardless of their proficiency, are able to carry out nuanced re-processing.

Taken together, the presence of *sin embargo* generates expectations about the upcoming discourse that are satisfied during the stage of re-analysis in plausible counter-argumentative utterances, independently of language proficiency. As a result, the DS2 is re-analyzed particularly fast. It is at this point where notable differences should arise as to the implausible conditions (see subsequent subsections).

9.6. *Causes and consequences in implausible counter-argumentative relations*

9.6.1. Total Reading Time (TRT)

The comparison between discourse members in the implausible condition shows a pattern of differentiated global processing for all groups:

	DS1	DS2-conn	Diff. in ms	Diff. in %	Effect magnitude
L1	278.63	291.14	12.51	4.49	small
C1	368.36	434.22	65.86	17.88	large
B1	382.48	406.70	24.22	6.33	medium

Table 108. TRT – DS1 vs. DS2 for implausible counter-argumentation

L1 readers process both discourse segments in similar times and show only small AOI effects. However, compared to the same comparison for plausible utterances, where they processed the DS2 in notably less time than the DS1, this result is a clear indicator that implausibility is detected and solved by L1 speakers by re-visiting the consequence rather than the causal segment (see also § 9.3.3 and § 9.5.1 above).

The C1 group shows the largest effects of discourse segments, with the consequence being processed notably longer than the cause. Again, following a pattern recurrently seen in this work, very high cognitive effort at the implausible consequence by this group is considered a result of highly conscious processing. The mismatch-resolution strategy of C1 speakers seems to be focusing on the DS2 of implausible utterances. Implausibility is in any case detected and processed by this group, as confirms the contrast of these data with TRT obtained for the between-discourse segments comparison in plausible utterances (§ 9.5.1).

Finally, B1 readers data clearly point to a pattern of extremely shallow processing which leads to a processing breakdown (see also § 9.6.3 below for the discussion of the SPRT). Firstly, the only medium-to-low slowdown effects at the DS2 (6.33%); secondly, an absolute TRT for the DS2 lower than that reported for the C1 group (434.22 ms for C1 vs 406.70 ms for B1).

9.6.2. First-Pass Reading Time (FPRT)

The threefold pattern (L1/C1/B1) just seen for TRT is maintained if data for the stage of construction of an initial assumption are considered. The comparison between cause and consequence yields a pattern in which the DS2 is more costly for all groups, albeit to a different extent:

	DS1	DS2-conn	Diff. in ms	Diff. in %	Effect magnitude
L1	183.38	199.58	16.19	8.83	medium
C1	246.98	314.94	67.95	27.51	very large
B1	282.45	319.50	37.04	13.11	large

Table 109. FPRT – DS1 vs. DS2 for implausible counter-argumentation

Slowdown effects at the consequence segments are higher for C1 speakers and the lowest effects are reported for the L1 group. Native speakers allocate more effort to the consequence segment, which argues for mismatch-detection already during FPRT (compared with the absence of effects reported for the plausible condition in § 9.5.2). The strong differentiation made by the C1 group and, to a lesser extent, by B1 readers, is explained in relation to two factors. In the case of the C1 group, the fact that they detect the mismatch during FPRT and the fact that the costs of processing *sin embargo* are partly spilled over the second segment; for the B1 group, it is suggested that only the second reason applies and that the mismatch is not detected or has just a very slight effect at this processing stage. A further indicator thereof is the fact that effort increase as to the plausible condition are the lowest among all groups (+4.51% vs. +8.59% and +14.58% for L1 and C1 readers respectively):

	DS1 vs DS2			
	PPCo		PICo	
	Diff. in %	Effect magnitude	Diff. in %	Effect magnitude
L1	0.24	trivial	8.83	medium
C1	12.93	large	27.51	very large
B1	8.60	medium	13.11	large

Table 110. FPRT – Comparison of percentage change and effect magnitudes for DS1 vs. DS2 in plausible (PPCo) and implausible (PICo) counter-argumentation

9.6.3. Second-Pass Reading Time (SPRT)

Finally, for the stage of re-construction of the communicated assumptions, a pattern of L1/C1 ←→ B1 arises:

	DS1	DS2-conn	Diff. in ms	Diff. in %	Effect magnitude
L1	95.20	91.49	-3.71	-3.90	trivial
C1	121.25	118.99	-2.26	-1.86	trivial
B1	99.67	86.77	-12.90	-12.94	large

Table 111. SPRT – DS1 vs. DS2 for implausible counter-argumentation

B1 speakers hardly re-analyze the consequence segment a) compared to the cause of the utterance; and b) compared to the other participant groups. These data reflect a strategy by the B1 group clearly diverging from the strategies followed by L1 and C1 groups. B1 speakers' re-analysis results in an imbalance between discourse segments, where the DS1 is more costly than the DS2. Suggesting the cause to be their hotspot for re-constructing the communicated assumption together with the connective would not hold, since only small effects were found for this group for the SPRT comparisons between conditions at the DS1 (see § 9.3.3); what we suggest, instead, is that some re-analysis is performed as a consequence of mismatch-detection, but that such re-analysis is not concluded to the extent that the mismatch is resolved. In other words, the DS1 is re-fixated, while the consequence segment, i.e., the DS2, is merely skimmed. This is taken to indicate very shallow, inconclusive processing for the B1 group.

In contrast with what occurred during FPRT, where all patterns of the DS1 versus DS2 in the implausible condition showed relevant effort increases (see table 110 in § 9.6.2 above), in SPRT the effects differ in terms of their magnitude:

	DS1 vs DS2			
	PPCo		PICo	
	Diff. in %	Effect magnitude	Diff. in %	Effect magnitude
L1	-28.68	very large	-3.90	trivial
C1	-28.88	very large	-1.86	trivial
B1	-29.01	very large	-12.94	large

Table 112. SPRT – Comparison of percentage change and effect magnitudes for DS1 vs. DS2 in plausible (PPCo) and implausible (PICo) counter-argumentation

On the one hand, this variability shows that performance at the stage of re-analysis is a key indicator of high-level pragmatic processes, specifically of accommodation processes triggered by a mismatch between procedural meanings and contextual assumptions. On the other hand, it makes manifest that B1 speakers stand out from the other two groups.

9.7. *Closing discussion*

When confronted with plausible and implausible counter-argumentative utterances, readers are exposed to a highly complex cognitive task. Firstly, in virtue of the rigid semantics of the counter-argumentative connective *sin embargo*, they must revise and suspend an assumption inferred from the contents of the first discourse segment. Secondly, due to the contradiction arising from the contents of the segments, which activate representations stored in world knowledge as causally related but are actually linked by means the marker of counter-causality *sin embargo*, they must perform accommodation to retrieve an assumption from the utterance as a whole. The results show so far that such a task cannot be accomplished if readers have not reached a certain linguistic and pragmatic competence. According to data, the competence needed to do so is claimed to lie at or slightly below a C1 proficiency level, but, in any case, over B1+.

The most striking and at the same time conspicuous finding of this study is the fact that B1 readers do not succeed in recovering a communicated assumption from implausible utterances, which has been argued to result in a processing breakdown for this group. This is reflected in their lower or non-existent condition effects compared to the other participant groups, despite B1 readers exhibiting the less developed pragmatic and linguistic competence. More specifically, B1 readers process implausible counter-argumentation in an extremely shallow fashion at the stage where the initial assumption should be constructed, which even results in a facilitation effect of implausibility for an average utterance and conceptual-meaning word. Very shallow processing behavior during early reading would make an immediate start of a re-activation strategy expectable that leads to notable slowdown effects in late measures. However, instead of doing so, during re-analysis B1 readers still exhibit the lowest effects or lower percentage differences of implausibility of all groups. This is a consistent finding that applies for all areas of interest and all measures and is attributed to failure to recover the implicated premises from implausible utterances due to the high cognitive load imposed by the nature of counter-argumentation and the pragmatic conflict between entertained representations and the rigid instructions of the connective.

Additionally to lower or non-existent effects of implausibility, as concerns the areas of the discourse segments and the connective, the claim of a processing breakdown for the B1 group finds further support in their absolute processing times at a number of critical regions compared to L1 and C1 readers and in their re-processing strategy focusing only on the procedural meaning device and hardly directed to re-activate the discourse segments. Taken together, thus, absolute and relative reading times, as well as effort-distribution patterns clearly move B1 readers away from nativelike-performance.

By contrast, large or very large implausibility effects are found in practically all areas of interest for the L1 and for the C1 group, whose behavior exhibits many parallelisms as concerns the areas (re-)analyzed to perform accommodation and recover the speaker's meaning. The main finding shows marked slowdown condition effects of implausibility during the re-analysis of all areas of interest. Among them, the connective and the consequence segment are particular effort hotspots. Taken together, L1 and C1 readers follow a path of effortful processing characterized by early mismatch detection that also triggers an effortful re-analysis. At the root of this behavior lies the fact mentioned above that contextual accommodation is particularly challenging for the cognitive system when it interacts with a discourse operation that implies revising inferential assumptions initially retrieved.

C1 performance departs, however, from patterns observed for the L1 group in that, as seen recurrently in the previous studies, C1 behavior is markedly more conscious and translates in particularly effortful processing. This is attributed to non-nativelike linguistic competence. By contrast, their highly developed pragmatic competence allows them to perform nativelike from the viewpoint of the strategy followed: C1 speakers dwell almost consistently on the same areas than L1 speakers during the initial construction of an assumption and the stage of accommodation. Both groups resolve the mismatch by re-visiting above all the connective, which is the mismatch-triggering device, and the DS2, but it is precisely at these regions where C1 speakers show particularly effortful reading as a result of enhanced consciousness.

While the L1 and C1 groups detect and solve incoherencies mainly at the connective, they also carry out a careful re-analysis of both discourse segments. This contrasts sharply with pattern of markedly less re-analysis of conceptual content regions of the B1 group. The discourse segments are the actual regions upon which the procedural instruction of assumption contradiction and elimination of *sin embargo* unfolds. At the same time, they are sources of mental representations, i.e., of the inputs to the accommodation mechanisms set in motion by the procedural-meaning device: instructions are rigid and act upon contents; conceptual contents are malleable and are subject to instructions encoded in the procedural-meaning devices present in the utterance at issue. Instructions act as constraints to contexts, "they impose modifications on contextual assumptions (such as adding and re-locating)" (Escandell Vidal & Leonetti 2011: 91). Contents, on the contrary, must be contextually integrated to give rise to new mental assumptions, even if this means forcing "the hearer to entertain a proposition (…) that he possibly didn't hold before" (idem) or, as in the present study, to build a new assumption that contradicts one that he did entertain. The fact that, contrarily to L1 and

C1, re-analysis of the discourse segments as activators of mental representations is very shallow at a B1 proficiency level (with even facilitation effects at the DS1 in re-analysis) is a further symptom of unfinished processing.

Cognitive overstrain due to insufficient linguistic and pragmatic competence and the high cognitive complexity of accommodating implausible counter-argumentative utterances are suggested to be at the basis of failure to recover a communicated assumption for the B1 group. As concerns interpretive processes, in this study, B1 readers are considered to achieve accidental irrelevance from implausible utterances, thus behaving again as naïvely optimistic addressees: they restrict themselves to linguistically encoded meanings, are not able to retrieve an acceptable interpretation, and communication fails (Wilson 1999). On the contrary, L1 and C1 speakers is clearly behave as sophisticated interpreters.

As concerns micro-strategies as found in within-conditions comparisons L2 also departs from L1 performance. In early reading, data point to a distribution L1-C1-B1, which underlies different reasons, discursive differentiations between causes and consequences are suggested to be due to early mismatch detection (L1), to a spillover effect of the connective (B1) or to both factors (C1). By contrast, late processing bundles together again L1 and C1 speakers and differentiates them more from B1 speakers. This is expectable if claims put forth so far are considered. While L1 and C1 devote re-analysis to accommodation, B1 speakers are suggested to detect the mismatch at that stage, albeit not deeply, so that accommodation remains unconcluded.

Finally, in line with results obtained for the previous studies, in particular study 3, here too the fact that the effects found in FPRT are consistently smoother than in SPRT and TRT invites to treat processes aimed at solving pragmatic mismatches between stored assumptions and procedural instructions encoded by connectives as higher-order pragmatic process.

10. Conclusions and perspectives

As set out in the introduction, the main aim of this work was exploring how communicative competence and the procedural meaning of the causal and counter-argumentative connectives *por tanto* and *sin embargo* interact and influence processing. The processing data gathered by means of an eye-tracking study and presented along the last four chapters have provided us with evidence that allows for conclusions on processing patterns applicable for Spanish as a foreign language and for conclusions as to how L2 processing can be investigated with a view to expand or revise theoretical approaches. The latter, we argue, may be extrapolated to languages other than Spanish.

The conclusions of this work and the perspectives for future research concern three levels: the participants, the object of study and the methodology.

10.1. *Conclusions*

10.1.1. Main participant-related findings

In general, results show that discourse relations are approached differently in cognitive terms depending on an individual's degree of linguistic and pragmatic competence. Most frequently, the patterns obtained point to a direct correlation between proficiency and degree of nativelikeness in L2 performance, both in the strategies deployed, and in the effort allocated in processing of causality and counter-argumentation and resolution of pragmatic mismatches. Data have pointed to different patterns:

1. **L1 versus C1 versus B1**. This pattern points to different performance for native, highly proficient and intermediate speakers of Spanish. When processing can be modelled according to this distribution, native speakers' processing is characterized by effortlessness and automaticity, and, arguably, by processing efficiency; C1 processing is highly conscious and very effortful; B1 processing is either shallow or highly effortful than for the C1 and the L1 group. Interestingly, despite clear

proficiency differences between the two experimental groups, this is the less frequent pattern according to the gathered data.

2. **L1/C1 versus B1**. In this pattern distribution, C1 participants are attributed a nativelike or nearly nativelike performance. As a result, their approach to the given discourse phenomenon at issue presents visible traits of automaticity. By contrast, B1 speakers either show shallow processing (which translates in a very low processing effort) or very effortful processing (which reflects in very high processing times). In both cases, B1 performance is systematically attributed to cognitive overstrain due to capacity limitations when performing certain tasks compared to the other participant groups.

3. **L1/B1 versus C1**. Where processing data give rise to this pattern distribution, native and B1 speakers show similar condition effects. This pattern has been thus qualified to anchor data on theoretical claims on and features of L2 processing, also under consideration that the development of discursive and linguistic competence are usually correlated. Specifically, we have proposed to re-arrange this twofold pattern according to an L1-C1-B1 distribution. The L1 group is further on claimed to show automatic processing, very effortful processing is again attributed to C1 readers due to enhanced consciousness, and a conspicuous pattern of processing shallowness for B1 readers. The fact that highly proficient speakers sometimes show stronger condition effects or even more effortful processing than B1 readers is one of the most interesting findings of this study. It points to a developmental V-shaped pattern of pragmatic competence in which highly proficient non-native speakers undergo a phase of enhanced consciousness in task-solving, here specifically in the resolution of pragmatic mismatches and in how they cognitively manage the recovery of different contextual effects.

Taken together, these three patterns can be summarized as follows:

	Pattern traits	Pattern motivations
L1	Effortless, ballistic, automatic processing	Very high task-familiarity, fully native proficiency in Spanish, procedural knowledge operates
	Conscious processing	Ability to detect anomalies in discourse, anomaly-resolution strategy, search for relevance, behavior as sophisticated interpreters
C1	Effortless, ballistic, automatic processing	Very high task-familiarity, nativelike abilities to approach discourse phenomena
	Very conscious processing	Highly developed pragmatic competence but still operating cognitive limitations derived from non-nativelike task-familiarity and linguistic competence When confronted with mismatches: attitude of sophisticated understanding (thus nativelike)
B1	(Very) Shallow processing	Attitude of naïve optimism: • Cognitive limitations leading to a sketchy representation (accidental relevance) • Processing breakdown (accidental irrelevance) Failure to: • Execute expectation-triggering instructions of the connective • (Fully) integrate mentally derived assumptions in a sole representation • Look for contextual effects beyond the main instruction of the connective • Set in motion inferential mechanisms to accomplish accommodation
	Very conscious processing	Low task-familiarity, cognitive overstrain due to limited capacity to carry out processing of certain discourse relations in the L2

Table 113. Proficiency-dependent pattern traits and pattern motivations

10.1.2. Main findings related to the object of study

In relation to the phenomena under study, operationalized in four experimental variables with two conditions each, results can be summarized in the following general findings:

1. **Feasibility and relevance in discourse overrides discursive differences from a certain degree of communicative competence on.** What is feasible in a language and follows the rules of discourse and communication is processed normally, as far as a minimum degree of discursive and linguistic competence is given. Feasibility overrides potential differences as to the type discourse relations at issue and the explication of procedural guides that add to the mental representations and the

schemata they activate (studies 1 and 2). As a result, instead of approaching causality and counter-argumentation, or explicit and implicit causality as two tasks, highly competent individuals perceive them as one: processing normative and relevant utterances.

2. **Accommodation processes are effortful from a certain degree of communicative competence on.** As far as individuals possess enough discursive and linguistic competence, pragmatic implausibility (studies 3 and 4) leads to abnormal processing (i.e., deviating from performance when confronted with plausible utterances). It triggers cognitively demanding (accommodation) processes resulting in particularly effortful processing. Nonetheless, triggered by their search for relevance, such extra effort seems to pay off, with participants being capable of recovering communicated assumptions.

3. **Relevance-oriented processing is strongly influenced by discourse-structural features or is less sophisticated when communicative competence is insufficient.** When pragmatic and linguistic competence are not sufficiently developed, relevance and discourse feasibility do not seem to offset the higher cognitive complexity of some discourse relations (counter argumentation > causality, study 1) and of the absence of processing instructions (implicit > explicit causality, study 2). Discourse-structural considerations seem thus to play a major role in utterance processing for less proficient individuals. As concerns the resolution of mismatches at the pragmatic level, lack of pragmatic and linguistic competence results in a very low degree of epistemic vigilance as to the information provided and in less proficient individuals behaving as *naïve optimists* (Sperber 1994; Wilson 1999; Sperber et al. 2010; Padilla Cruz 2013). In complex tasks (here, accommodating an implausible causal utterance, study 3), *accidental relevance* is retrieved from utterances, so that the first-reached interpretation is accepted, despite not being the interpretation intended by the speaker. In highly complex tasks (here, accommodating an implausible counter-argumentative utterance, study 4), however, less proficient speakers seem to restrict to the code or, at the most, to the explicature level. The outcome thereof is *accidental*

irrelevance: the reader fails to recover an assumption at all and, as a result, communication fails.

Related with the theory-driven scale of complexity of the phenomena under study suggested in chapter 2 (figure 5, here as figure 44):

+ complex

Implausible counter-argumentation

Implausible explicit causality

Plausible implicit causality? / Plausible counter-argumentation?

Plausible explicit causality

- complex

Figure 44 (5). Suggested theory-driven scale of complexity of the phenomena under study

data call for qualification. It should be clear that the notion of "complexity" does not exclusively relate to processing costs, but also, and importantly, to processing outcomes. This is in line with a relevance-oriented view of communication where optimal relevance arises as a trade-off of effort and benefits. As far as non-native processing is concerned, lower reading times can even be a better indicator of higher task complexity, since they reflect an abandonment of the search for relevance by the speaker. Two scales of complexity for the phenomena investigated here are thus suggested depending on proficiency:

<table>
<tr><th>L1</th><th>C1</th><th>B1</th></tr>
<tr><td colspan="2" rowspan="2">Implausible counter-argumentation</td><td>Implausible counter-argumentation</td></tr>
<tr><td>Implausible causality</td></tr>
<tr><td colspan="2">Implausible causality</td><td>Plausible counter-argumentation /</td></tr>
<tr><td colspan="2">Plausible counter-argumentation</td><td>Implicit causality</td></tr>
<tr><td colspan="2">Implicit causality</td><td>Plausible explicit causality</td></tr>
</table>

Table 114. Data-based proficiency-dependent scale of complexity of the phenomena under study

10.1.3. Main methodological findings

The independent variables and eye-tracking parameters selected in this work have provided us with a finding that can be anchored in a theory of verbal communication and shed further light into how the human mind proceeds in its path towards recovering a communicated assumption. The highest condition effects of processes which are inferential in nature, most notably the resolution of pragmatic mismatches, arise consistently during second-pass reading. This suggests that accommodation performed to solve a conflict between stored assumptions and the rigid semantics of connectives are best treated as *higher-order cognitive processes*. From the other side of the coin, this is in line with evidence available from reading research that second-pass reading (and, though more coarsely-grained, total reading time) are particularly good indicators for examining how processes take place that go beyond semantic encoding and the construction of an initial representation of utterances.

A further methodological finding concerns how the selection of participant groups can impact data interpretation. Gathering data from two groups at different proficiency levels in their L2 has provided us with a picture on developmental aspects of the L2 learning process. As a result, we have determined some thresholds from which certain discourse phenomena are or are not handled in a nativelike manner. That aside, the constellation L1-C1-B1 has specially led us to *qualifying processing data* where the B1 group apparently behaves nativelike while departing from C1 processing. This claims for gathering data along several points of the learning process. Only so can the researcher be confident of how to put in relation evidence about L2 and native performance.

10.2. *Perspectives for future research*

One of the main motivations of this work was contributing to alleviate the scarcity of experiment-based evidence on L2 processing of phenomena that go beyond the sentence-level. Many questions, however, remain unanswered and others have arisen along the road and represent perspectives and opportunities for follow-up research.

10.2.1. Perspectives concerning the participants of the study

The selection of the study's participant group allowed us to obtain insight into how learners at different stages of the learning process approach different discursive phenomena and, more specifically, how they handle procedural meanings. The still incipient panorama of increasingly data-based L2 research and theorizing would benefit, on the one side, from longitudinal studies; on the other side, from studies focusing on participant features other than/additional to their L2-proficiency level: expertise in a certain field, abroad-experience, education level, and many others.

As concerns our findings, further work should be conducted that deepens into the underlying causes of and that may lead to a phenomena-related systematization of the pattern of *automatic* versus *highly conscious* versus *shallow processing* recurrently observed along this work. To that purpose, participants should be confronted with (the features of) procedural-meaning devices operationalized in further phenomena of verbal communication. In particular, experimental research should deepen into the interaction of cognitive principles of communication and features of linguistic expressions, most notably procedural meanings, with a view to systematize the relationship between both at different developmental stages of communicative competence in an L2.

10.2.2. Perspectives concerning the object of study

Precisely with the purpose of finding systematicity into L2 processing patterns, further studies are needed in which participants are further confronted with the features of procedural-meaning devices.

More evidence is needed from processing studies on discourse markers other than the ones dealt with in this study and ranging from further connectives operating at the argumentative level or belonging to other categories.

Equally, further variables should be considered. Specifically, to our knowledge, the interaction between non-entertained assumptions and causality-driven versus relevance-driven processing remains uninvestigated in second language processing, and could be pursued in a follow-up study of L2 performance during processing of implicit plausible and implausible causal utterances.

10.2.3. Perspectives on methodological approaches

With a view to obtaining converging evidence leading to especially robust findings, eye-tracking data like those gathered for this study can be complemented with data obtained in other experimental paradigms that also dig into processing or by means of methodologies reflecting more conscious or additional cognitive processes. Among them, offline tests, like judgment or (free or forced-choice) completion tasks, and comprehension tests could be illuminating for nuancing the results of the present study. Tasks designed to measure reaction times could also shed more light on the proficiency-dependent time-course of processing of discourse relations and mismatch resolution.

All in all, the findings presented and discussed in this work, and potential works to come, can lead to further data-based theoretical refinement on processing in a second language and, ultimately, generate a transfer between, literally, the laboratory and the classroom.

Appendices

Appendix 1 – Norming test

The norming test was performed online on a computer with the survey software *LimeSurvey*. Participants were sent a link and carried out the test remotely. The test was untimed. This appendix contains the instructions and questions given to the participants in Spanish as given to the participants. English translations are provided underneath.

Survey in Spanish
Gracias por aceptar rellenar esta breve encuesta. Con tu participación estás haciendo una contribución muy valiosa a mi trabajo de investigación.

Tu tarea es valorar **en una escala de 1 a 5** si una serie de frases son adecuadas, como verás a continuación. La encuesta **tiene 30 frases** y dura unos **8-10 minutos**.

Por favor, rellena esta información personal. Se tratará de forma confidencial y solo para fines científicos

Marca tu nivel de formación:
Educación Secundaria
Módulo de formación profesional (o similar, en curso o concluido)
Educación universitaria (en curso o concluida)
Doctorado (en curso o finalizado)

Introduce tu edad:

Marca tu sexo:
Femenino
Masculino

AHORA COMENZARÁS LA ENCUESTA

¿Qué te parece esta frase?

[Critical utterance]

Totalmente aceptable
Bastante aceptable
Ni aceptable ni no aceptable
Poco aceptable
Nada aceptable

De nuevo, muchas gracias por participar. Para más información sobre este y otros proyectos de investigación sobre lenguaje y cognición consulta www.hulclab.eu.

English translation

Thanks for agreeing to take this short survey. With your participation, you are doing a very valuable contribution to my research work.

Your task is evaluating in a 1 to 5-point scale if a series for sentences are acceptable, as you will now see. The survey has 30 sentences and takes about 8-10 minutes to be completed.

Please, complete the following personal information first. It will be managed confidentially and used only for research purposes.

Please, select your education level
- *Secondary education*
- *Vocational training (or similar, either in course or completed)*
- *University degree (either in course of completed)*
- *PhD (either in course of completed)'*

Please, introduce your age

Please, select your sex
- *Feminine*
- *Masculine*

THE SURVEY BEGINS NOW

How do you find this sentence?

[Critical utterance]

Fully acceptable
Rather acceptable
Neither acceptable nor unacceptable
Hardly acceptable
Not acceptable at all

Many thanks again for your participation! For further information on this and further research projects on language and cognition, please visit www.hulclab.eu

Appendix 2 – Experimental items

The ordering of the experimental items within each list does not correspond to the order in which they were read by participants, since in the actual experiment items appeared in pseudorandomized order. Items were read in Spanish. An English translation is provided underneath each item, bold and italics are only for better readability.

Item 1

Estos son José y Carmen. Viven en el centro de Madrid. En vacaciones, alquilan un piso en la playa.

Explicit / Congruent	José y Carmen tienen una familia grande. Por tanto, necesitan mucho espacio. Sus hijos no quieren compartir las habitaciones.
Implicit	José y Carmen tienen una familia grande. Necesitan mucho espacio. Sus hijos no quieren compartir las habitaciones.
Incongruent	José y Carmen tienen una familia pequeña. Por tanto, necesitan mucho espacio. Sus hijos no quieren compartir las habitaciones.
Explicit / Congruent	José y Carmen tienen una familia pequeña. Sin embargo, necesitan mucho espacio. Sus hijos no quieren compartir las habitaciones.
Incongruent	José y Carmen tienen una familia grande. Sin embargo, necesitan mucho espacio. Sus hijos no quieren compartir las habitaciones.

Cuando están de vacaciones, comen todos los días en un bar.

‘These are José and Carmen. They live in the center of Madrid. For holidays, they rent a flat by the beach.’
‘José and Carmen have a **big** family. ***Por tanto*** / Ø / # ***Sin embargo***, they need a lot of space. Their children do not want to share bedrooms.’
‘José and Carmen have a **small** family. # ***Por tanto*** / ***Sin embargo***, they need a lot of space. Their children do not want to share bedrooms.’
‘When they are on holiday, they eat in a restaurant every day.’

Item 2

Estos son Ernesto y Luisa. Están jubilados y viven solos.

Explicit / Congruent	Ernesto y Luisa tienen mala salud. Por tanto, toman muchas medicinas. Van a la farmacia todas las semanas.
Implicit	Ernesto y Luisa tienen mala salud. Toman muchas medicinas. Van a la farmacia todas las semanas.
Incongruent	# Ernesto y Luisa tienen buena salud. Por tanto, toman muchas medicinas. Van a la farmacia todas las semanas.
Explicit / Congruent	Ernesto y Luisa tienen buena salud. Sin embargo, toman muchas medicinas. Van a la farmacia todas las semanas.
Incongruent	# Ernesto y Luisa tienen mala salud. Sin embargo, toman muchas medicinas. Van a la farmacia todas las semanas.

Ahora hacen más deporte y por eso se sienten un poco mejor.

‘These are Ernesto and Luisa. They are pensioners and live on their own.’

‘Ernesto and Luisa have **bad** health. ***Por tanto*** / **Ø** / # ***Sin embargo***, they take a lot of medicines. They go to the pharmacy every week.’
‘Ernesto and Luisa have **good** health. # ***Por tanto*** / *Sin embargo*, they take a lot of medicines. They go to the pharmacy every week.’
‘They practice more sport now and because of that they feel a bit better.’

Item 3

Estas son Elisa y Mónica. Estudiaron Diseño de moda y abrieron un negocio juntas hace unos meses.

Explicit / Congruent	Elisa y Mónica diseñan bolsos bonitos. Por tanto, tienen muchos clientes. Planean vender sus productos por Internet.
Implicit	Elisa y Mónica diseñan bolsos bonitos. Tienen muchos clientes. Planean vender sus productos por Internet.
Incongruent	# Elisa y Mónica diseñan bolsos feos. Por tanto, tienen muchos clientes. Planean vender sus productos por Internet.
Explicit / Congruent	Elisa y Mónica diseñan bolsos feos. Sin embargo, tienen muchos clientes. Planean vender sus productos por Internet.
Incongruent	# Elisa y Mónica diseñan bolsos bonitos. Sin embargo, tienen muchos clientes. Planean vender sus productos por Internet.

Han publicado un catálogo nuevo en inglés y en español.

‘These are Elisa and Mónica. The studied Fashion Design and started a business together some months ago.’
‘Elisa and Mónica design **beautiful** purses. ***Por tanto*** / **Ø** / # ***Sin embargo***, they have a lot of clients. They plan to start selling their products on the Internet.’
‘Elisa and Mónica design **ugly** purses. # ***Por tanto*** / ***Sin embargo***, they have a lot of clients. They plan to start selling their products on the Internet.’
‘They have brought out a new catalogue in English and Spanish.’

Item 4

Estos son Carlos y Mario, dos policías jóvenes de Madrid.

Explicit / Congruent	Carlos y Mario practican mucho deporte. Por tanto, tienen poca grasa. Están delgados y muy en forma.
Implicit	Carlos y Mario practican mucho deporte. Tienen poca grasa. Están delgados y muy en forma.
Incongruent	# Carlos y Mario practican poco deporte. Por tanto, tienen poca grasa. Están delgados y muy en forma.
Explicit / Congruent	Carlos y Mario practican poco deporte. Sin embargo, tienen poca grasa. Están delgados y muy en forma.
Incongruent	# Carlos y Mario practican mucho deporte. Sin embargo, tienen poca grasa. Están delgados y muy en forma.

Trabajan como policías desde hace unos meses.

‘These are Carlos and Mario, two young policemen from Madrid.’
‘Carlos and Mario do **a lot of** sport. ***Por tanto*** / **Ø** / # ***Sin embargo***, they have little body fat. They are thin and in very good shape.’

‘Carlos and Mario **little** sport. # ***Por tanto*** / **Ø** / # ***Sin embargo***, they have little body fat. They are thin and in very good shape.’

‘They have been as policemen for some months.’

Item 5

Estos son Cecilia y Pedro. Están casados y viven en Madrid. Trabajan en un hospital.

Explicit / Congruent	Cecilia y Pedro tienen salarios muy bajos. Por tanto, tienen pocos ahorros. Hace años que no van de vacaciones.
Implicit	Cecilia y Pedro tienen salarios muy bajos. Tienen pocos ahorros. Hace años que no van de vacaciones.
Incongruent	# Cecilia y Pedro tienen salarios muy altos. Por tanto, tienen pocos ahorros. Hace años que no van de vacaciones.
Explicit / Congruent	Cecilia y Pedro tienen salarios muy altos. Sin embargo, tienen pocos ahorros. Hace años que no van de vacaciones.
Incongruent	# Cecilia y Pedro tienen salarios muy bajos. Sin embargo, tienen pocos ahorros. Hace años que no van de vacaciones.

Les gusta tomar el sol y dormir hasta muy tarde.

‘These are Cecilia and Pedro.
‘Cecilia y Pedro have very **low** salaries. ***Por tanto,*** / **Ø** / # ***Sin embargo*****,** they have few savings. They have not gone on holiday for years.’
‘Cecilia y Pedro have very **high** salaries. # ***Por tanto,*** / ***Sin embargo*****,** they have few savings. They have not gone on holiday for years.’
‘They enjoy sunbathing and sleeping until late.’

Item 6

Estas son Beatriz y Pilar. Son dos chicas jóvenes que se preocupan mucho por su salud.

Explicit / Congruent	Beatriz y Pilar toman comida sana. Por tanto, tienen pocas enfermedades. Van al médico muy pocas veces.
Implicit	Beatriz y Pilar toman comida sana. Tienen pocas enfermedades. Van al médico muy pocas veces.
Incongruent	# Beatriz y Pilar toman comida basura. Por tanto, tienen pocas enfermedades. Van al médico muy pocas veces.
Explicit / Congruent	Beatriz y Pilar toman comida basura. Sin embargo, tienen pocas enfermedades. Van al médico muy pocas veces.
Incongruent	# Beatriz y Pilar toman comida sana. Sin embargo, tienen pocas enfermedades. Van al médico muy pocas veces.

Los fines de semana, Pilar y Beatriz montan a caballo porque les parece muy relajante.

‘These are Beatriz and Pilar. They are two young women who worry a lot about their health.’
‘Beatriz and Pilar eat **healthy** food. ***Por tanto,*** / **Ø** / # ***Sin embargo,*** they rarely get ill. They seldom go to the doctor.’
‘Beatriz and Pilar eat **junk** food. # ***Por tanto,*** / ***Sin embargo,*** they rarely get ill. They seldom go to the doctor.’

‘On the weekends, Pilar and Beatriz go horse riding because they find it very relaxing.’

Item 7

Estos son Pepe y Luis. Tienen un bar en una zona turística de Madrid.

Explicit / Congruent	Pepe y Luis tienen muy mal carácter. Por tanto, tienen muchas discusiones. Sus clientes se quejan de su actitud.
Implicit	Pepe y Luis tienen muy mal carácter. Tienen muchas discusiones. Sus clientes se quejan de su actitud.
Incongruent	# Pepe y Luis tienen muy buen carácter. Por tanto, tienen muchas discusiones. Sus clientes se quejan de su actitud.
Explicit / Congruent	Pepe y Luis tienen muy buen carácter. Sin embargo, tienen muchas discusiones. Sus clientes se quejan de su actitud.
Incongruent	# Pepe y Luis tienen muy mal carácter. Sin embargo, tienen muchas discusiones. Sus clientes se quejan de su actitud.

Abren el bar a las cinco de la tarde y cierran a las dos.

‘These are Pepe and Luis. They have a bar in a touristic area in Madrid.’
‘Pepe and Luis have a very **bad** character. ***Por tanto,*** / **Ø** / # ***Sin embargo,*** they get involved in a lot of arguments. Their clients complain about their attitude.’
‘Pepe and Luis have a very **good** character. # ***Por tanto,*** / ***Sin embargo,*** they get involved in a lot of arguments. Their clients complain about their attitude.’
‘They open the bar at five in the evening and close at two.’

Item 8

Estos son Ricardo y Susana, una pareja joven. Han estudiado Turismo y trabajan en un pueblo de montaña.

Explicit / Congruent	Ricardo y Susana dirigen un hotel muy bonito. Por tanto, reciben muchos turistas. En verano todas las habitaciones están ocupadas.
Implicit	Ricardo y Susana dirigen un hotel muy bonito. Reciben muchos turistas. En verano todas las habitaciones están ocupadas.
Incongruent	# Ricardo y Susana dirigen un hotel muy feo. Por tanto, reciben muchos turistas. En verano todas las habitaciones están ocupadas.
Explicit / Congruent	Ricardo y Susana dirigen un hotel muy feo. Sin embargo, reciben muchos turistas. En verano todas las habitaciones están ocupadas.
Incongruent	# Ricardo y Susana dirigen un hotel muy bonito. Sin embargo, reciben muchos turistas. En verano todas las habitaciones están ocupadas.

Dentro de cinco meses, quieren construir una piscina en el jardín del hotel.

‘These are Ricardo and Susana, a young couple. They studied Tourism and work in a village in the mountains.’
‘Ricardo and Susana run a very **nice** hotel. ***Por tanto,*** / **Ø** / # ***Sin embargo,*** they receive a lot of guests. In summer, all rooms are booked.’
‘Ricardo and Susana run a very **ugly** hotel. # ***Por tanto*** / ***Sin embargo,*** they receive a lot of guests. In summer, all rooms are booked.’
‘In five months, they want to make a swimming pool in the garden of the hotel.’

Item 9

Estos son Mikka y Anna, una pareja de Finlandia. Viven en Buenos Aires y van mucho a la playa.

Explicit / Congruent	Mikka y Anna tienen la piel muy clara. Por tanto, utilizan mucha crema solar. En verano nunca se queman.
Implicit	Mikka y Anna tienen la piel muy clara. Utilizan mucha crema solar. En verano nunca se queman.
Incongruent	# Mikka y Anna tienen la piel muy bronceada. Por tanto, utilizan mucha crema solar. En verano nunca se queman.
Explicit / Congruent	Mikka y Anna tienen la piel muy bronceada. Sin embargo, utilizan mucha crema solar. En verano nunca se queman.
Incongruent	# Mikka y Anna tienen la piel muy clara. Sin embargo, utilizan mucha crema solar. En verano nunca se queman.

Algunos veranos, Mikka y Anna van de vacaciones a Uruguay.

'These are Mikka and Anna, a couple from Finnland. They live in Buenos Aires and go a lot to the beach.'
'Mikka and Anna have very **fair** skin. ***Por tanto,*** / **Ø** / # ***Sin embargo,*** they use a lot of sun cream. In summer, they never get a sunburn.'
'Mikka and Anna have very **tanned** skin. # ***Por tanto,*** / ***Sin embargo,*** they use a lot of sun cream. In summer, they never get a sunburn.'
'Some summers, Mikka and Anna go to Uruguay on holiday.'

Item 10

Estos son Andrea y Juan. Son abogados y también dan clase en un máster universitario.

Explicit / Congruent	Andrea y Juan ofrecen clases excelentes. Por tanto, tienen muchos alumnos. Su clase tiene lugar en el aula más grande de la universidad.
Implicit	Andrea y Juan ofrecen clases excelentes. Tienen muchos alumnos. Su clase tiene lugar en el aula más grande de la universidad.
Incongruent	# Andrea y Juan ofrecen clases aburridas. Por tanto, tienen muchos alumnos. Su clase tiene lugar en el aula más grande de la universidad.
Explicit / Congruent	Andrea y Juan ofrecen clases aburridas. Sin embargo, tienen muchos alumnos. Su clase tiene lugar en el aula más grande de la universidad.
Incongruent	# Andrea y Juan ofrecen clases excelentes. Sin embargo, tienen muchos alumnos. Su clase tiene lugar en el aula más grande de la universidad.

Andrea enseña Derecho Internacional y Juan enseña Historia del Derecho.

'These are Andrea and Juan. They are lawyers and also lecture in a university master's degree.'
'Andrea and Juan offer **excellent** lectures. ***Por tanto,*** / **Ø** / # ***Sin embargo,*** they have a lot of students. Their lecture takes place in the biggest university aula.'
'Andrea and Juan offer **boring** lectures. # ***Por tanto,*** / ***Sin embargo,*** they have a lot of students. Their lecture takes place in the biggest university aula.'
'Andrea teaches International Law and Juan teaches Law History.'

Item 11

Estos son Javier y Marta. Son amigos y están en el último curso de la carrera de Filosofía.

Explicit / Congruent	Javier y Marta leen muchos libros. Por tanto, saben muchas cosas. En los exámenes obtienen buenos resultados.
Implicit	Javier y Marta leen muchos libros. Saben muchas cosas. En los exámenes obtienen buenos resultados.
Incongruent	# Javier y Marta leen pocos libros. Por tanto, saben muchas cosas. En los exámenes obtienen buenos resultados.
Explicit / Congruent	Javier y Marta leen pocos libros. Sin embargo, saben muchas cosas. En los exámenes obtienen buenos resultados.
Incongruent	# Javier y Marta leen muchos libros. Sin embargo, saben muchas cosas. En los exámenes obtienen buenos resultados.

Les gusta el rock. Por eso en verano van a varios festivales de música.

'These are Javier and Marta. They are friends and are in the last year of their degree in Philosophy.'
'Javier and Marta read **a lot of** books. ***Por tanto,*** / **Ø** / # ***Sin embargo,*** they know a lot of things. They get good marks in the exams.'
'Javier and Marta read **few** books. # ***Por tanto,*** / ***Sin embargo,*** they know a lot of things. They get good marks in the exams.'
'They like rock. That is why in summer they go to several music festivals.'

Item 12

Estos son Víctor y Rafael. Estudiaron guitarra en Madrid y tienen un grupo de música rock.

Explicit / Congruent	Víctor y Rafael componen canciones buenas. Por tanto, venden muchos discos. Tienen un club de fans muy grande.
Implicit	Víctor y Rafael componen canciones buenas. Venden muchos discos. Tienen un club de fans muy grande.
Incongruent	# Víctor y Rafael componen canciones malas. Por tanto, venden muchos discos. Tienen un club de fans muy grande.
Explicit / Congruent	Víctor y Rafael componen canciones malas. Sin embargo, venden muchos discos. Tienen un club de fans muy grande.
Incongruent	# Víctor y Rafael componen canciones buenas. Sin embargo, venden muchos discos. Tienen un club de fans muy grande.

El año que viene van a dar conciertos en varias ciudades de España y de Francia.

'These are Víctor and Rafael. They studied guitar in Madrid and have a rock band.'
'Víctor and Rafael compose **good** songs. ***Por tanto,*** / **Ø** / # ***Sin embargo,*** they sell a lot of records. Their fan club is very big.'
'Víctor and Rafael compose **bad** songs. # ***Por tanto,*** / ***Sin embargo,*** they sell a lot of records. Their fan club is very big.'
'Next year they will give concerns in several towns in Spain and France.'

Item 13

Estos son Carlos y Maite. Están casados y viven en Bilbao. Les encanta la buena comida y son unos excelentes cocineros.

Explicit / Congruent	Carlos y Maite preparan recetas difíciles. Por tanto, cocinan muchas horas. Les gusta mucho la cocina tradicional.
Implicit	Carlos y Maite preparan recetas difíciles. Cocinan muchas horas. Les gusta mucho la cocina tradicional.
Incongruent	# Carlos y Maite preparan recetas fáciles. Por tanto, cocinan muchas horas. Les gusta mucho la cocina tradicional.
Explicit / Congruent	Carlos y Maite preparan recetas fáciles. Sin embargo, cocinan muchas horas. Les gusta mucho la cocina tradicional.
Incongruent	# Carlos y Maite preparan recetas difíciles. Sin embargo, cocinan muchas horas. Les gusta mucho la cocina tradicional.

En verano, pasan las vacaciones en ciudades y pueblos con buenos restaurantes.

‘These are Carlos and Maite. They are married and live in Bilbao. They love good food and are excellent cooks.’
‘Carlos and Maite prepare **difficult** recipes. ***Por tanto,*** / Ø / # **Sin embargo,** they cook for many hours. They love traditional cuisine.’
‘Carlos and Maite prepare **easy** recipes. # ***Por tanto,*** / **Sin embargo,** they cook for many hours. They love traditional cuisine.’
‘In summer, they spend their holidays in cities and towns that have good restaurants.’

Item 14

Estas son Laura y Sofía. Trabajan en un hotel de cuatro estrellas en Barcelona.

Explicit / Congruent	Laura y Sofía tienen mucho dinero. Por tanto, compran muchas joyas. Conocen las mejores tiendas de la ciudad.
Implicit	Laura y Sofía tienen mucho dinero. Compran muchas joyas. Conocen las mejores tiendas de la ciudad.
Incongruent	# Laura y Sofía tienen poco dinero. Por tanto, compran muchas joyas. Conocen las mejores tiendas de la ciudad.
Explicit / Congruent	Laura y Sofía tienen poco dinero. Sin embargo, compran muchas joyas. Conocen las mejores tiendas de la ciudad.
Incongruent	# Laura y Sofía tienen mucho dinero. Sin embargo, compran muchas joyas. Conocen las mejores tiendas de la ciudad.

Les encantan los anillos de oro con diseños originales.

‘These are Laura and Sofía. They work in a four-star hotel in Barcelona.’
‘Laura and Sofía have **a lot of** money. ***Por tanto,*** / Ø / # ***Sin embargo,*** they buy a lot of jewelry.’
‘Laura and Sofía have **little** money. # ***Por tanto,*** / ***Sin embargo,*** they buy a lot of jewelry.’
‘They love gold rings with original designs.’

Item 15

Estos son Jorge y Gonzalo. Han estudiado en una escuela de cine de Madrid.

Explicit / Congruent	Jorge y Gonzalo hacen películas buenas. Por tanto, reciben muchos premios. Las revistas de cine han publicado varios artículos sobre ellos.
Implicit	Jorge y Gonzalo hacen películas buenas. Reciben muchos premios. Las revistas de cine han publicado varios artículos sobre ellos.
Incongruent	# Jorge y Gonzalo hacen películas malas. Por tanto, reciben muchos premios. Las revistas de cine han publicado varios artículos sobre ellos.
Explicit / Congruent	Jorge y Gonzalo hacen películas malas. Sin embargo, reciben muchos premios. Las revistas de cine han publicado varios artículos sobre ellos.
Incongruent	# Jorge y Gonzalo hacen películas buenas. Sin embargo, reciben muchos premios. Las revistas de cine han publicado varios artículos sobre ellos.

Su próximo proyecto es un vídeo publicitario para una empresa de moda.

'These are Jorge and Gonzalo. The studied at a film school in Madrid.'
'Jorge and Gonzalo shoot **good** movies. ***Por tanto,*** / Ø / # ***Sin embargo,*** they win a lot of awards. Film magazines have published some articles about them.'
'Jorge and Gonzalo shoot **bad** movies. # ***Por tanto,*** / ***Sin embargo,*** they win a lot of awards. Film magazines have published some articles about them.'
'Their next project is an advertising video for a fashion company.'

Item 16

Estos son Emilio y Pedro. Son hermanos y por las noches, salen hasta muy tarde y beben mucho.

Explicit / Congruent	Emilio y Pedro tienen amigos conflictivos. Por tanto, tienen muchos problemas. Sus padres están preocupados por ellos.
Implicit	Emilio y Pedro tienen amigos conflictivos. Tienen muchos problemas. Sus padres están preocupados por ellos.
Incongruent	# Emilio y Pedro tienen amigos responsables. Por tanto, tienen muchos problemas. Sus padres están preocupados por ellos.
Explicit / Congruent	Emilio y Pedro tienen amigos responsables. Sin embargo, tienen muchos problemas. Sus padres están preocupados por ellos.
Incongruent	# Emilio y Pedro tienen amigos conflictivos. Sin embargo, tienen muchos problemas. Sus padres están preocupados por ellos.

Faltan mucho a clase. Por eso sacan notas muy malas.

'These are Emilio and Pedro. They are siblings and at night they go out until very late and drink a lot.'
'Emilio and Pedro have problematic friends. ***Por tanto,*** / Ø / # ***Sin embargo,*** they have a lot of troubles. Their parents are worried about them.'
'Emilio and Pedro have responsible friends. # ***Por tanto,*** / ***Sin embargo,*** they have a lot of troubles. Their parents are worried about them.'
'They skip a lot of classes. That is why the get very bad marks.'

Item 17

Estos son David y Héctor. Son dos jóvenes actores españoles de televisión.

Explicit / Congruent	David y Héctor hacen series divertidas. Por tanto, tienen muchos seguidores. Han rodado varios anuncios de televisión juntos.
Implicit	David y Héctor hacen series divertidas. Tienen muchos seguidores. Han rodado varios anuncios de televisión juntos.
Incongruent	# David y Héctor hacen series aburridas. Por tanto, tienen muchos seguidores. Han rodado varios anuncios de televisión juntos.
Explicit / Congruent	David y Héctor hacen series aburridas. Sin embargo, tienen muchos seguidores. Han rodado varios anuncios de televisión juntos.
Incongruent	# David y Héctor hacen series divertidas. Sin embargo, tienen muchos seguidores. Han rodado varios anuncios de televisión juntos.

Trabajan siempre en sitios diferentes. Por eso tienen que viajar mucho.

‘These are David and Héctor. They are two young television actors.’
‘David and Héctor make **funny** series. ***Por tanto,*** / Ø / # ***Sin embargo,*** they have many fans. They have shot several TV advertisements together.’
‘David and Héctor make **boring** series. # ***Por tanto,*** / ***Sin embargo,*** they have many fans. They have shot several TV advertisements together.’
‘They always work in different places. That is why they have to travel so much.’

Item 18

Estas son Elsa y Martina. Han abierto una tienda de alimentos frescos en el mercado de su ciudad.

Explicit / Congruent	Elsa y Martina venden productos excelentes. Por tanto, ganan mucho dinero. Toda la gente del barrio conoce su tienda.
Implicit	Elsa y Martina venden productos excelentes. Ganan mucho dinero. Toda la gente del barrio conoce su tienda.
Incongruent	# Elsa y Martina venden productos malos. Por tanto, ganan mucho dinero. Toda la gente del barrio conoce su tienda.
Explicit / Congruent	Elsa y Martina venden productos malos. Sin embargo, ganan mucho dinero. Toda la gente del barrio conoce su tienda.
Incongruent	# Elsa y Martina venden productos excelentes. Sin embargo, ganan mucho dinero. Toda la gente del barrio conoce su tienda.

En invierno quieren abrir otra tienda en un pueblo cercano.

‘These are Elsa and Martina. They opened a fresh food store in the market of their hometown.’
‘Elsa and Martina sell **excellent** products. ***Por tanto,*** / Ø / # ***Sin embargo,*** they earn a lot of money. Everyone in the neighborhood knows their store.’
‘Elsa and Martina sell **bad** products. # ***Por tanto,*** / ***Sin embargo,*** they earn a lot of money. Everyone in the neighborhood knows their store.’

Item 19

Estas son Valeria y Adriana. Han estudiado Arte en una prestigiosa escuela de Milán.

Explicit / Congruent	Valeria y Adriana pintan cuadros preciosos. Por tanto, hacen muchas exposiciones. Son unas artistas muy conocidas en España y Latinoamérica.
Implicit	Valeria y Adriana pintan cuadros preciosos. Hacen muchas exposiciones. Son unas artistas muy conocidas en España y Latinoamérica.
Incongruent	# Valeria y Adriana pintan cuadros horribles. Por tanto, hacen muchas exposiciones. Son unas artistas muy conocidas en España y Latinoamérica.
Explicit / Congruent	Valeria y Adriana pintan cuadros horribles. Sin embargo, hacen muchas exposiciones. Son unas artistas muy conocidas en España y Latinoamérica.
Incongruent	# Valeria y Adriana pintan cuadros preciosos. Sin embargo, hacen muchas exposiciones. Son unas artistas muy conocidas en España y Latinoamérica.

Quieren organizar una exposición en un museo de su ciudad.

'These are Valeria and Adriana. They have studied Art at a prestigious school in Milan.'
'Valeria and Adriana make **beautiful** paintings. ***Por tanto,*** / Ø / # ***Sin embargo,*** they have a lot of exhibitions. They are very well-known artists in Spain and Latin America.'
'Valeria and Adriana make **horrible** paintings. # ***Por tanto,*** / ***Sin embargo,*** they have a lot of exhibitions. They are very well-known artists in Spain and Latin America.'
'They want to organize an exhibition in a museum in their hometown.'

Item 20

Estos son Daniel y Rosa. Viven en una casa con un gran jardín en un pueblo del sur de España.

Explicit / Congruent	Daniel y Rosa tienen muchas plantas. Por tanto, gastan mucha agua. En su pueblo llueve solamente en primavera.
Implicit	Daniel y Rosa tienen muchas plantas. Gastan mucha agua. En su pueblo llueve solamente en primavera.
Incongruent	# Daniel y Rosa tienen pocas plantas. Por tanto, gastan mucha agua. En su pueblo llueve solamente en primavera.
Explicit / Congruent	Daniel y Rosa tienen pocas plantas. Sin embargo, gastan mucha agua. En su pueblo llueve solamente en primavera.
Incongruent	# Daniel y Rosa tienen muchas plantas. Sin embargo, gastan mucha agua. En su pueblo llueve solamente en primavera.

En la planta baja de la casa tienen una sauna y una mesa de billar.

'These are Daniel and Rosa. They live in a house with a big garden in a village in the South of Spain.'
'Daniel and Rosa have many plants. ***Por tanto,*** / Ø / # ***Sin embargo,*** they consume a lot of water. In their village, it only rains in spring.'
'Daniel and Rosa have few plants. # ***Por tanto,*** / ***Sin embargo,*** they consume a lot of water. In their village, it only rains in spring.'
'In their ground floor of their house they have a sauna and a billiard table.'

Appendix 3 – Discarded item sets after norming study*

*Items (a) and (b) were used as practice items.

(a) *Alicia y Olga sacan notas muy* ***malas****. Por tanto, repiten muchos exámenes.*
Alicia y Olga sacan notas muy ***malas****. Repiten muchos exámenes.*
 # Alicia y Olga sacan notas muy ***buenas****. Por tanto, repiten muchos exámenes.*
Alicia y Olga sacan notas muy ***buenas****. Sin embargo, repiten muchos exámenes.*
 # Alicia y Olga sacan notas muy ***malas****. Sin embargo, repiten muchos exámenes.*

'Alicia and Olga get very bad/good marks. *Por tanto*/*Sin embargo*, they repeat a lot of exams.'

(b) *Marta y Francisco venden ropa* ***cara****. Por tanto, ganan mucho dinero.*
Marta y Francisco venden ropa ***cara****. Ganan mucho dinero.*
 # Marta y Francisco venden ropa ***barata****. Por tanto, ganan mucho dinero.*
Marta y Francisco venden ropa ***barata****. Sin embargo, ganan mucho dinero.*
 # Marta y Francisco venden ropa ***cara****. Sin embargo, ganan mucho dinero.*

'Marta and Francisco sell expensive/cheap clothes. *Por tanto*/*However*, they earn a lot.'

(c) *Alex y Sonia traducen textos* ***difíciles****. Por tanto, trabajan muchas horas.*
Alex y Sonia traducen textos ***difíciles****. Trabajan muchas horas.*
 # Alex y Sonia traducen textos ***fáciles****. Por tanto, trabajan muchas horas.*
Alex y Sonia traducen textos ***fáciles****. Sin embargo, trabajan muchas horas.*
 # Alex y Sonia traducen textos ***difíciles****. Sin embargo, trabajan muchas horas.*

'Alex and Sonia translate difficult/easy texts. *Por tanto*/*However*, they work long hours.'

(d) *Lucía y Paula hacen rutas* ***largas****. Por tanto, caminan muchas horas.*
Lucía y Paula hacen rutas ***largas****. Caminan muchas horas.*
 # Lucía y Paula hacen rutas ***cortas****. Por tanto, caminan muchas horas.*
Lucía y Paula hacen rutas ***cortas****. Sin embargo, caminan muchas horas.*
 # Lucía y Paula hacen rutas ***largas****. Sin embargo, caminan muchas horas.*

'Lucía and Paula make long/short routes. *Por tanto*/*However*, they walk for many hours.'

(e) *Elena y Blanca tienen puestos* ***importantes****. Por tanto, trabajan muchas horas.*
Elena y Blanca tienen puestos ***importantes****. Trabajan muchas horas.*
 # Elena y Blanca tienen puestos ***bajos****. Por tanto, trabajan muchas horas.*
Elena y Blanca tienen puestos ***bajos****. Sin embargo, trabajan muchas horas.*
 # Elena y Blanca tienen puestos ***importantes****. Sin embargo, trabajan muchas horas.*

'Elena and Blanca have important/low jobs. *Por tanto*/*However*, they work long hours.'

(f) *Bilbao y Lisboa tienen un tráfico* ***intenso****. Por tanto, tienen mucha contaminación.*
Bilbao y Lisboa tienen un tráfico ***intenso****. Tienen mucha contaminación.*
 # Bilbao y Lisboa tienen un tráfico ***calmado****. Por tanto, tienen mucha contaminación.*
Bilbao y Lisboa tienen un tráfico ***calmado****. Sin embargo, tienen mucha contaminación.*
 # Bilbao y Lisboa tienen un tráfico ***intenso****. Sin embargo, tienen mucha contaminación.*

'Bilbao and Lisbon have intense/calmed traffic. *Por tanto*/*However*, they are very polluted.'

(g) *Noemí y Raquel tienen empleados* ***amables****. Por tanto, tienen muchos pedidos.*
Noemí y Raquel tienen empleados ***amables****. Tienen muchos pedidos.*
 # Noemí y Raquel tienen empleados ***antipáticos****. Por tanto, tienen muchos pedidos.*
Noemí y Raquel tienen empleados ***antipáticos****. Sin embargo, tienen muchos pedidos.*
 # Noemí y Raquel tienen empleados ***amables****. Sin embargo, tienen muchos pedidos.*

'Noemí and Raquel have friendly/unfriendly employees. *Por tanto*/*However*, they get many orders.'

(h) *Ricardo y Antonio hacen cursos de fotografía muy* ***buenos****. Por tanto, aprenden muchas técnicas.*
Ricardo y Antonio hacen cursos de fotografía muy ***buenos****. Aprenden muchas técnicas.*
 # Ricardo y Antonio hacen cursos de fotografía muy ***malos****. Por tanto, aprenden muchas técnicas.*
Ricardo y Antonio hacen cursos de fotografía muy ***malos****. Sin embargo, aprenden muchas técnicas.*
 # Ricardo y Antonio hacen cursos de fotografía muy ***buenos****. Sin embargo, aprenden muchas técnicas.*

'Ricardo and Antonio make very good/bad photography courses. *Por tanto*/*However*, they learn many techniques.'

(i) *Alberto y Antonio estudian* ***muchas*** *horas. Por tanto, tienen poco tiempo libre.*
Alberto y Antonio estudian ***muchas*** *horas. Tienen poco tiempo libre.*
 # Alberto y Antonio estudian ***pocas*** *horas. Por tanto, tienen poco tiempo libre.*
Alberto y Antonio estudian ***pocas*** *horas. Sin embargo, tienen poco tiempo libre.*
 # Alberto y Antonio estudian ***muchas*** *horas. Sin embargo, tienen poco tiempo libre.*

'Alberto and Antonio study for many/few hours. *Por tanto*/*However*, they have little spare time.'

(j) *Lola y Adrián tienen un trabajo* ***difícil****. Por tanto, sufren mucho estrés.*
Lola y Adrián tienen un trabajo ***difícil****. Sufren mucho estrés.*
 # Lola y Adrián tienen un trabajo ***fácil****. Por tanto, sufren mucho estrés.*
Lola y Adrián tienen un trabajo ***fácil****. Sin embargo, sufren mucho estrés.*
 # Lola y Adrián tienen un trabajo ***difícil****. Sin embargo, sufren mucho estrés.*

'Lola and Adrián have a difficult/an easy job. *Por tanto*/*However*, they are under a lot of stress.'

Appendix 4 – Distractors

Distractors reflect temporal relations marked by the temporal conjunction "cuando" ('when') followed either by a verb in the past imperfect (a) or by a verb in present (b); conditional relations marked by the conjunction "si" ('if') or the coordinating conjunction "y" ('and'). Distractors from each set were distributed across the five experimental lists according to a Latin-Square design. English translations are provided below each item set.

(a) *María es una hija maravillosa. Cuando vivía con sus padres, hacía todas las compras.*
María es una hija maravillosa. Cuando sus padres están ocupados, hace todas las compras.
María es una hija maravillosa. Si sus padres están ocupados, hace todas las compras.
María es una hija maravillosa. Sus padres están ocupados y hace todas las compras.

'María is a wonderful daughter. a) When she lived at her parents', she used to do all the courses.
b) When her parents are busy, she does all the courses.
c) If her parents are busy, she does all the courses.
d) Her parents are busy and she does all the courses.

(b) *Fernando es un tenista fantástico. Cuando tenía 20 años, ganaba todos los partidos.*
Fernando es un tenista fantástico. Cuando juega con sus amigos, gana todos los partidos.
Fernando es un tenista fantástico. Si juega con sus amigos, gana todos los partidos.
Fernando es un tenista fantástico. Juega con sus amigos y gana todos los partidos.

'Fernando is a great tennis player. a) When he was 20, he used to win every match.
b) When he plays against his friends, he wins every match.
c) If he plays against his friends, he wins every match.
d) He plays against his friends and wins every match.

(c) *Diego es un gran bailarín. Cuando era pequeño, todos querían bailar con él.*
Diego es un gran bailarín. Cuando va a una discoteca, todos quieren bailar con él.
Diego es un gran bailarín. Si va a una discoteca, todos quieren bailar con él.
Diego es un gran bailarín. Va a una discoteca y todos quieren bailar con él.

'Diego is a great dancer. a) When he was a child, everyone wanted to dance with him.
b) When he goes to a disco, everyone wants to dance with him.
c) If he goes to a disco, everyone wants to dance with him.
d) He goes to a disco and everyone wants to dance with him.

(d) *Martín es un político excelente. Cuando era joven, todos los escuchaban.*
Martín es un político excelente. Cuando va a un debate, todos lo escuchan.
Martín es un político excelente. Si va a un debate, todos lo escuchan.
Martín es un político excelente. Va a un debate y todos lo escuchan.

'Martín is an excellent politician. a) When he was young, everyone used to listen to him.
b) When he goes to a debate, everyone listens to him.
c) If he goes to a debate, everyone listens to him.
d) He goes to a debate and everyone listens to him.

Appendix 5 – Verification items

Verification items, in bold and italics marking, appeared always after critical items in the condition +causal +plausible + connective and were distributed across the five experimental lists as follows:

List 1

After item 1

(*José y Carmen tienen una familia grande. Por tanto, necesitan mucho espacio. Sus hijos no quieren compartir las habitaciones*.)

José y Carmen tienen hijos. (‘José and Carmen have kids’) (TRUE)

After item 6:

(*Beatriz y Pilar toman comida sana. Por tanto, tienen pocas enfermedades. Van al médico muy pocas veces*.)

Beatriz y Pilar están enfermas con frecuencia. (‘Beatriz and Pilar are often sick’) (FALSE)

After item 11:

(*Javier y Marta leen muchos libros. Por tanto, saben muchas cosas. En los exámenes obtienen buenos resultados.*)

Javier y Marta estudian en la Universidad. (‘Javier and Marta go to University’) (TRUE)

After item 16:

(*Emilio y Pedro tienen amigos conflictivos. Por tanto, tienen muchos problemas. Sus padres están preocupados por ellos.*)

Emilio y Pedro son hermanos (‘Emilio and Pedro are siblings’) (TRUE)

List 2

After item 5:

(*Cecilia y Pedro tienen salarios muy bajos. Por tanto, tienen pocos ahorros. Hace años que no van de vacaciones.*)

Cecilia y Pedro tienen mucho dinero. (‘Cecilia and Pedro have a lot of money’) (FALSE)

After item 10:

(*Andrea y Juan ofrecen clases excelentes. Por tanto, tienen muchos alumnos. Su clase tiene lugar en el aula más grande de la universidad*.)

Andrea y Juan son profesores y abogados (‘Andrea and Juan are both lecturers and lawyers’) (TRUE)

After item 15:

(*Jorge y Gonzalo hacen películas buenas. Por tanto, reciben muchos premios. Las revistas de cine han publicado varios artículos sobre ellos.*)

Jorge y Gonzalo trabajan como modelos ('Jorge and Gonzalo work as models') (FALSE)

After item 20:

(*Daniel y Rosa tienen muchas plantas. Por tanto, gastan mucha agua. En su pueblo llueve solamente en primavera.*)

La casa de Daniel y Rosa tiene jardín ('Daniel and Rosa's place has a garden') (TRUE)

List 3

After item 4:

(*Carlos y Mario practican mucho deporte. Por tanto, tienen poca grasa. Están delgados y muy en forma.*)

Carlos y Mario están gordos ('Carlos and Mario are fat') (FALSE)

After item 9:

(*Mikka y Anna tienen la piel muy clara. Por tanto, utilizan mucha crema solar. En verano nunca se queman.*)

Mikka y Anna van a la playa con frecuencia ('Mikka and Anna often go to the beach') (TRUE)

After item 14:

(*Laura y Sofía tienen mucho dinero. Por tanto, compran muchas joyas. Conocen las mejores tiendas de la ciudad.*)

Laura y Sofía son profesoras en un colegio ('Laura and Sofía work as school teachers') (FALSE)

After item 19:

(*Valeria y Adriana pintan cuadros preciosos. Por tanto, hacen muchas exposiciones. Son unas artistas muy conocidas en España y Latinoamérica.*)

Valeria y Adriana hacen esculturas ('Valeria and Adriana make sculptures') (FALSE)

List 4

After item 3:

(*Elisa y Mónica diseñan bolsos bonitos. Por tanto, tienen muchos clientes. Planean vender sus productos por Internet.*)

Elisa y Mónica venden muchos bolsos ('Elisa and Mónica sell a lot of bags') (TRUE)

After item 8:

(*Ricardo y Susana dirigen un hotel muy bonito. Por tanto, reciben muchos turistas. En verano todas las habitaciones están ocupadas*.)

En verano, es muy fácil encontrar habitaciones libres en el hotel de Ricardo y Susana ('In the summertime it is very easy to find vacant rooms in Ricardo and Susana's hotel') (FALSE)

After item 13:

(*Carlos y Maite preparan recetas difíciles. Por tanto, cocinan muchas horas. Les gusta mucho la cocina tradicional.*)

Los platos que preparan Carlos y Maite son fáciles ('The recipes that Carlos and Maite prepare are easy') (FALSE)

After item 18:

(*Elsa y Martina venden productos excelentes. Por tanto, ganan mucho dinero. Toda la gente del barrio conoce su tienda.*)

Elsa y Martina tienen una perfumería ('Elisa and Martina have a perfumery') (FALSE)

List 5

After item 2:

(*Ernesto y Luisa tienen mala salud. Por tanto, toman muchas medicinas. Van a la farmacia todas las semanas*.)

Ernesto y Luisa compran medicamentos con frecuencia ('Ernesto and Luisa often buy drugs') (FALSE)

After item 7:

(*Pepe y Luis tienen muy mal carácter. Por tanto, tienen muchas discusiones. Sus clientes se quejan de su actitud.*)

Pepe y Luis son personas muy simpáticas. ('Pepe and Luis are very kind people') (FALSE)

After item 12:

(*Víctor y Rafael componen canciones buenas. Por tanto, venden muchos discos. Tienen un club de fans muy grande*.)

Víctor y Rafael hacen buena música. ('Víctor and Rafael make good music') (TRUE)

After item 17:

(*David y Héctor hacen series divertidas. Por tanto, tienen muchos seguidores. Han rodado varios anuncios de televisión juntos.*)

David y Héctor son directores de cine. ('David and Héctor are movie directors') (FALSE)

Appendix 6 – Output of the Generalized Additive Models (GAM)

Appendix 6A – Output of the GAM: Predicted values

(AOI = area of interest; Cond. = condition; Part. group = participant group; RT = reading time [in milliseconds]; WD = word/ CI = confidence interval; ref. cat. = reference category [intercept]; DS1 = first discourse segment; DS2-conn = second discourse segment excluding the connective; Conn = connective; DS1+DS2-conn = average conceptual-meaning word; Utterance = average utterance word)

Sub-analysis 1 – Causality (DP1Ca) versus counter-argumentative (PPCo) discourse relations

Predicted values

Total Reading Time

AOI	Condition	Part. group	Observed RT	Observed letters/WD	Predicted RT	Predicted RT (CI lower)	Predicted RT (CI upper)	Specified letters/WD	Difference from ref. cat.
DS1+DS2-conn (Intercept)	DP1Ca	L1	239.04	6.19	245.14	222.44	267.84	6.65	0
DS1	DP1Ca	L1	251.49	6.07	257.15	234.2	280.11	6.65	12.01
DS2-conn	DP1Ca	L1	233.4	6.42	235.99	213.29	258.69	6.65	-9.15
Conn	DP1Ca	L1	341.39	8	318.37	295.15	341.59	6.65	73.23
Utterance	DP1Ca	L1	248.92	6.38	253.06	230.46	275.67	6.65	7.92
DS1+DS2-conn	PPCo	L1	248.92	6.1	255.8	233.23	278.37	6.65	10.66
DS1	PPCo	L1	261.28	5.92	268.24	245.33	291.15	6.65	23.1
DS2-conn	PPCo	L1	242.65	6.39	245.75	222.91	268.59	6.65	0.61
Conn	PPCo	L1	403.68	10	348.57	321.41	375.72	6.65	103.43
Utterance	PPCo	L1	264.48	6.52	266.54	244.13	288.95	6.65	21.4
DS1+DS2-conn	DP1Ca	C1	335.18	6.18	346.37	315.49	377.26	6.65	101.23

DS1	DP1Ca	C1	320.29	6.03	333.36	302.29	364.43	6.65	88.22
DS2-conn	DP1Ca	C1	350.75	6.45	354.22	323.31	385.13	6.65	109.08
Conn	DP1Ca	C1	458.09	8	439.45	408.21	470.68	6.65	194.31
Utterance	DP1Ca	C1	355.75	6.4	362.5	331.72	393.28	6.65	117.36
DS1+DS2-conn	PPCo	C1	341.49	6.12	352.03	321.06	382.99	6.65	106.89
DS1	PPCo	C1	339.24	5.95	351.26	320.18	382.34	6.65	106.12
DS2-conn	PPCo	C1	348.47	6.38	355.22	324.27	386.16	6.65	110.08
Conn	PPCo	C1	542.11	10	485.55	451.12	519.98	6.65	240.41
Utterance	PPCo	C1	366.48	6.54	370.48	339.68	401.27	6.65	125.34
DS1+DS2-conn	DP1Ca	B1	342.44	6.18	354.87	326.33	383.42	6.65	109.73
DS1	DP1Ca	B1	339.63	6.05	351.34	322.63	380.05	6.65	106.2
DS2-conn	DP1Ca	B1	347.53	6.4	357.93	329.24	386.61	6.65	112.79
Conn	DP1Ca	B1	476.39	8	455.79	426.66	484.93	6.65	210.65
Utterance	DP1Ca	B1	354.81	6.37	364.67	336.12	393.23	6.65	119.53
DS1+DS2-conn	PPCo	B1	393	6.06	410.02	381.42	438.62	6.65	164.88
DS1	PPCo	B1	388.16	5.92	403.98	375.24	432.73	6.65	158.84
DS2-conn	PPCo	B1	392	6.33	400.83	372.14	429.52	6.65	155.69
Conn	PPCo	B1	554.11	10	503.58	471.08	536.08	6.65	258.44
Utterance	PPCo	B1	413.01	6.48	424.07	395.5	452.64	6.65	178.93

First-Pass Reading Time

AOI	Condition	Part. group	Observed RT	Observed letters/WD	Predicted RT	Predicted RT (CI lower)	Predicted RT (CI upper)	Specified letters/WD	Difference from ref. cat.
DS1+DS2-conn (intercept)	DP1Ca	L1	197.1	6.19	200.5	182.6	218.41	6.65	0
DS1	DP1Ca	L1	181.63	6.07	184.6	166.49	202.71	6.65	-15.9
DS2-conn	DP1Ca	L1	189.93	6.42	190.03	172.11	207.95	6.65	-10.47
Conn	DP1Ca	L1	236.11	8	212.57	194.03	231.11	6.65	12.07

Utterance	DP1Ca	L1	203.54	6.38	204.81	186.98	222.64	6.65	4.31
DS1+DS2-conn	PPCo	L1	195.9	6.1	201.84	184.02	219.65	6.65	1.34
DS1	PPCo	L1	184	5.92	189.98	171.9	208.05	6.65	-10.52
DS2-conn	PPCo	L1	189.19	6.39	189.88	171.86	207.89	6.65	-10.62
Conn	PPCo	L1	272.46	10	210.81	184.04	237.58	6.65	10.31
Utterance	PPCo	L1	207.44	6.52	208.3	190.6	225.99	6.65	7.8
DS1+DS2-conn	DP1Ca	C1	280.55	6.18	290.94	266.55	315.34	6.65	90.44
DS1	DP1Ca	C1	250.63	6.03	261.95	237.41	286.5	6.65	61.45
DS2-conn	DP1Ca	C1	295.37	6.45	297.25	272.83	321.68	6.65	96.75
Conn	DP1Ca	C1	331.72	8	309.42	284.58	334.26	6.65	108.92
Utterance	DP1Ca	C1	295.27	6.4	301.61	277.29	325.93	6.65	101.11
DS1+DS2-conn	PPCo	C1	274.47	6.12	283.78	259.32	308.23	6.65	83.28
DS1	PPCo	C1	243.71	5.95	254.07	229.52	278.61	6.65	53.57
DS2-conn	PPCo	C1	280.45	6.38	285.51	261.05	309.96	6.65	85.01
Conn	PPCo	C1	382.57	10	320	288.45	351.55	6.65	119.5
Utterance	PPCo	C1	293.12	6.54	296.68	272.35	321.01	6.65	96.18
DS1+DS2-conn	DP1Ca	B1	294.88	6.18	305.74	283.18	328.3	6.65	105.24
DS1	DP1Ca	B1	278.89	6.05	289.12	266.43	311.81	6.65	88.62
DS2-conn	DP1Ca	B1	289.36	6.4	296.95	274.27	319.62	6.65	96.45
Conn	DP1Ca	B1	373.96	8	352.94	329.76	376.13	6.65	152.44
Utterance	DP1Ca	B1	307.74	6.37	314.87	292.31	337.43	6.65	114.37
DS1+DS2-conn	PPCo	B1	328.63	6.06	342.95	320.35	365.55	6.65	142.45
DS1	PPCo	B1	287.33	5.92	301.88	279.16	324.6	6.65	101.38
DS2-conn	PPCo	B1	320.95	6.33	327.82	305.15	350.49	6.65	127.32
Conn	PPCo	B1	411.93	10	354.44	324.2	384.68	6.65	153.94
Utterance	PPCo	B1	343.32	6.48	351.84	329.27	374.41	6.65	151.34

Second-Pass Reading Time

AOI	Condition	Part. group	Observed RT	Observed letters/WD	Predicted RT	Predicted RT (CI lower)	Predicted RT (CI upper)	Specified letters/WD	Difference from ref. cat.
DS1+DS2-conn (Intercept)	DP1Ca	L1	41.93	6.19	44.15	29.22	59.07	6.65	0
DS1	DP1Ca	L1	69.86	6.07	71.84	56.7	86.98	6.65	27.69
DS2-conn	DP1Ca	L1	43.47	6.42	45.37	30.44	60.29	6.65	1.22
Conn	DP1Ca	L1	105.28	8	104.61	89.28	119.93	6.65	60.46
Utterance	DP1Ca	L1	45.38	6.38	47.88	33.04	62.72	6.65	3.73
DS1+DS2-conn	PPCo	L1	53.02	6.1	53.52	38.71	68.32	6.65	9.37
DS1	PPCo	L1	77.28	5.92	77.62	62.52	92.72	6.65	33.47
DS2-conn	PPCo	L1	53.46	6.39	55.31	40.27	70.35	6.65	11.16
Conn	PPCo	L1	131.23	10	131.28	113.56	149	6.65	87.13
Utterance	PPCo	L1	57.04	6.52	58.01	43.34	72.68	6.65	13.86
DS1+DS2-conn	DP1Ca	C1	54.63	6.18	55.04	34.88	75.19	6.65	10.89
DS1	DP1Ca	C1	69.66	6.03	70.73	50.41	91.04	6.65	26.58
DS2-conn	DP1Ca	C1	55.38	6.45	56.37	36.19	76.54	6.65	12.22
Conn	DP1Ca	C1	126.36	8	128.66	108.24	149.08	6.65	84.51
Utterance	DP1Ca	C1	60.48	6.4	60.62	40.56	80.69	6.65	16.47
DS1+DS2-conn	PPCo	C1	67.02	6.12	67.76	47.54	87.99	6.65	23.61
DS1	PPCo	C1	95.52	5.95	96.52	76.2	116.84	6.65	52.37
DS2-conn	PPCo	C1	68.03	6.38	69.12	48.91	89.32	6.65	24.97
Conn	PPCo	C1	159.54	10	159.03	136.6	181.45	6.65	114.88
Utterance	PPCo	C1	73.37	6.54	73.54	53.46	93.61	6.65	29.39
DS1+DS2-conn	DP1Ca	B1	47.57	6.18	48.66	30.04	67.27	6.65	4.51
DS1	DP1Ca	B1	60.74	6.05	61.54	42.78	80.3	6.65	17.39
DS2-conn	DP1Ca	B1	58.18	6.4	60.32	41.58	79.06	6.65	16.17
Conn	DP1Ca	B1	102.43	8	101.57	82.48	120.66	6.65	57.42

Utterance	DP1Ca	B1	47.07	6.37	49.39	30.76	68.01	6.65	5.24
DS1+DS2-conn	PPCo	B1	64.37	6.06	66.52	47.86	85.18	6.65	22.37
DS1	PPCo	B1	100.83	5.92	101.44	82.65	120.23	6.65	57.29
DS2-conn	PPCo	B1	71.05	6.33	72.39	53.65	91.13	6.65	28.24
Conn	PPCo	B1	142.18	10	142.61	121.42	163.8	6.65	98.46
Utterance	PPCo	B1	69.69	6.48	71.92	53.28	90.56	6.65	27.77

Sub-analysis 2 – Implicit causality (DP0Ca) versus explicit causality (DP1Ca)

Predicted values

Total Reading Time

AOI	Condition	Part. group	Observed RT	Observed letters/WD	Predicted RT	Predicted RT (CI lower)	Predicted RT (CI upper)	Specified letters/WD	Difference from ref. cat.
DS1+DS2-conn (Intercept)	DP0Ca	L1	236.46	6.19	243.84	223.88	263.79	6.65	0
DS1	DP0Ca	L1	236.32	6.06	243.48	223.23	263.72	6.65	-0.36
DS2-conn	DP0Ca	L1	254.07	6.46	253.1	233	273.2	6.65	9.26
Utterance	DP0Ca	L1	236.46	6.19	243.84	223.88	263.79	6.65	0
DS1+DS2-conn	DP1Ca	L1	239.04	6.19	245.52	225.53	265.5	6.65	1.68
DS1	DP1Ca	L1	251.49	6.07	255.97	235.74	276.19	6.65	12.13
DS2-conn	DP1Ca	L1	233.4	6.42	234.01	213.97	254.06	6.65	-9.83
Utterance	DP1Ca	L1	248.92	6.38	252.92	233.06	272.79	6.65	9.08
DS1+DS2-conn	DP0Ca	C1	333.41	6.18	342.8	316.02	369.57	6.65	98.96
DS1	DP0Ca	C1	324.45	6.06	329.83	302.78	356.88	6.65	85.99
DS2-conn	DP0Ca	C1	349.97	6.47	350.62	323.72	377.52	6.65	106.78

Utterance	DP0Ca	C1	333.41	6.18	342.8	316.02	369.57	6.65	98.96
DS1+DS2-conn	DP1Ca	C1	335.18	6.18	348.01	321.22	374.79	6.65	104.17
DS1	DP1Ca	C1	320.29	6.03	332.3	305.32	359.27	6.65	88.46
DS2-conn	DP1Ca	C1	350.75	6.45	352.79	325.94	379.65	6.65	108.95
Utterance	DP1Ca	C1	355.75	6.4	363.94	337.27	390.62	6.65	120.1
DS1+DS2-conn	DP0Ca	B1	355.84	6.17	370.09	345.15	395.03	6.65	126.25
DS1	DP0Ca	B1	359.88	6	369.58	344.46	394.7	6.65	125.74
DS2-conn	DP0Ca	B1	369.72	6.54	374.09	349.07	399.1	6.65	130.25
Utterance	DP0Ca	B1	355.84	6.17	370.09	345.15	395.03	6.65	126.25
DS1+DS2-conn	DP1Ca	B1	342.44	6.18	354.97	330.11	379.83	6.65	111.13
DS1	DP1Ca	B1	339.63	6.05	349.63	324.6	374.66	6.65	105.79
DS2-conn	DP1Ca	B1	347.53	6.4	355.18	330.17	380.2	6.65	111.34
Utterance	DP1Ca	B1	354.81	6.37	363.97	339.14	388.8	6.65	120.13

First-Pass Reading Time

AOI	Condition	Part. group	Observed RT	Observed letters/WD	Predicted RT	Predicted RT (CI lower)	Predicted RT (CI upper)	Specified letters/WD	Difference from ref. cat.
DS1+DS2-conn (Intercept)	DP0Ca	L1	184.69	6.19	190.04	172.82	207.25	6.65	0
DS1	DP0Ca	L1	171	6.06	174.59	157.13	192.05	6.65	-15.45
DS2-conn	DP0Ca	L1	189.77	6.46	187.55	170.2	204.89	6.65	-2.49
Utterance	DP0Ca	L1	184.69	6.19	190.04	172.82	207.25	6.65	0
DS1+DS2-conn	DP1Ca	L1	197.1	6.19	200.29	183.05	217.53	6.65	10.25
DS1	DP1Ca	L1	181.63	6.07	181.61	164.16	199.05	6.65	-8.43
DS2-conn	DP1Ca	L1	189.93	6.42	187.99	170.69	205.29	6.65	-2.05
Utterance	DP1Ca	L1	203.54	6.38	204.83	187.68	221.97	6.65	14.79
DS1+DS2-conn	DP0Ca	C1	268.24	6.18	277.56	254.3	300.82	6.65	87.52

DS1	DP0Ca	C1	248.94	6.06	254.22	230.73	277.71	6.65	64.18
DS2-conn	DP0Ca	C1	289.3	6.47	288.78	265.41	312.14	6.65	98.74
Utterance	DP0Ca	C1	268.24	6.18	277.56	254.3	300.82	6.65	87.52
DS1+DS2-conn	DP1Ca	C1	280.55	6.18	291.17	267.9	314.44	6.65	101.13
DS1	DP1Ca	C1	250.63	6.03	259.79	236.37	283.22	6.65	69.75
DS2-conn	DP1Ca	C1	295.37	6.45	294.99	271.66	318.31	6.65	104.95
Utterance	DP1Ca	C1	295.27	6.4	301.73	278.55	324.91	6.65	111.69
DS1+DS2-conn	DP0Ca	B1	297.27	6.17	309.38	287.74	331.02	6.65	119.34
DS1	DP0Ca	B1	283.76	6	290.79	269	312.57	6.65	100.75
DS2-conn	DP0Ca	B1	307.33	6.54	310.3	288.6	332.01	6.65	120.26
Utterance	DP0Ca	B1	297.27	6.17	309.38	287.74	331.02	6.65	119.34
DS1+DS2-conn	DP1Ca	B1	294.88	6.18	305.24	283.67	326.81	6.65	115.2
DS1	DP1Ca	B1	278.89	6.05	286.56	264.85	308.27	6.65	96.52
DS2-conn	DP1Ca	B1	289.36	6.4	294.45	272.74	316.15	6.65	104.41
Utterance	DP1Ca	B1	307.74	6.37	314.66	293.12	336.21	6.65	124.62

Second-Pass Reading Time

AOI	Condition	Part. group	Observed RT	Observed letters/WD	Predicted RT	Predicted RT (CI lower)	Predicted RT (CI upper)	Specified letters/WD	Difference from ref. cat.
DS1+DS2-conn (Intercept)	DP0Ca	L1	51.77	6.19	53.4	41.99	64.8	6.65	0
DS1	DP0Ca	L1	65.32	6.06	68.13	56.54	79.73	6.65	14.73
DS2-conn	DP0Ca	L1	64.29	6.46	64.99	53.51	76.47	6.65	11.59
Utterance	DP0Ca	L1	51.77	6.19	53.4	41.99	64.8	6.65	0
DS1+DS2-conn	DP1Ca	L1	41.93	6.19	44.76	33.33	56.19	6.65	-8.64
DS1	DP1Ca	L1	69.86	6.07	73.6	62.02	85.17	6.65	20.2
DS2-conn	DP1Ca	L1	43.47	6.42	45.41	33.97	56.84	6.65	-7.99

Utterance	DP1Ca	L1	45.38	6.38	47.76	36.38	59.13	6.65	-5.64
DS1+DS2-conn	DP0Ca	C1	65.17	6.18	64.99	49.54	80.45	6.65	11.59
DS1	DP0Ca	C1	75.51	6.06	75.08	59.43	90.72	6.65	21.68
DS2-conn	DP0Ca	C1	60.67	6.47	61.37	45.84	76.9	6.65	7.97
Utterance	DP0Ca	C1	65.17	6.18	64.99	49.54	80.45	6.65	11.59
DS1+DS2-conn	DP1Ca	C1	54.63	6.18	56.46	40.99	71.94	6.65	3.06
DS1	DP1Ca	C1	69.66	6.03	71.81	56.23	87.39	6.65	18.41
DS2-conn	DP1Ca	C1	55.38	6.45	57.23	41.74	72.71	6.65	3.83
Utterance	DP1Ca	C1	60.48	6.4	61.96	46.55	77.38	6.65	8.56
DS1+DS2-conn	DP0Ca	B1	58.57	6.17	60.2	45.84	74.57	6.65	6.8
DS1	DP0Ca	B1	76.12	6	77.94	63.49	92.4	6.65	24.54
DS2-conn	DP0Ca	B1	62.39	6.54	63.12	48.72	77.51	6.65	9.72
Utterance	DP0Ca	B1	58.57	6.17	60.2	45.84	74.57	6.65	6.8
DS1+DS2-conn	DP1Ca	B1	47.57	6.18	49.21	34.91	63.51	6.65	-4.19
DS1	DP1Ca	B1	60.74	6.05	62.31	47.92	76.7	6.65	8.91
DS2-conn	DP1Ca	B1	58.18	6.4	59.99	45.61	74.38	6.65	6.59
Utterance	DP1Ca	B1	47.07	6.37	48.88	34.57	63.19	6.65	-4.52

Sub-analysis 3 – Plausible causal relations (DP1Ca) versus implausible causal relations (PICa)

Predicted values

Total Reading Time

AOI	Condition	Part. group	Observed RT	Observed letters/WD	Predicted RT	Predicted RT (CI lower)	Predicted RT (CI upper)	Specified letters/WD	Difference from ref. cat.
DS1+DS2-conn (Intercept)	DP1Ca	L1	239.04	6.19	244.13	216.55	271.71	6.65	0
DS1	DP1Ca	L1	251.49	6.07	255.76	227.92	283.6	6.65	11.63
DS2-conn	DP1Ca	L1	233.4	6.42	235.4	207.82	262.98	6.65	-8.73
Conn	DP1Ca	L1	341.39	8	315.39	287.31	343.47	6.65	71.26
disamb	DP1Ca	L1	233.68	6.51	238.5	211.19	265.8	6.65	-5.63
Utterance	DP1Ca	L1	248.92	6.38	251.84	224.36	279.32	6.65	7.71
DS1+DS2-conn	PICa	L1	288.29	6.1	300.47	272.97	327.97	6.65	56.34
DS1	PICa	L1	288.83	5.93	300.78	272.93	328.62	6.65	56.65
DS2-conn	PICa	L1	308.98	6.41	313.79	286.3	341.28	6.65	69.66
Conn	PICa	L1	458.03	8	437.06	408.93	465.2	6.65	192.93
disamb	PICa	L1	299.59	6.5	305.76	278.5	333.02	6.65	61.63
Utterance	PICa	L1	308.89	6.31	317.74	290.36	345.11	6.65	73.61
DS1+DS2-conn	DP1Ca	C1	335.18	6.18	347.49	310.65	384.32	6.65	103.36
DS1	DP1Ca	C1	320.29	6.03	335.69	298.66	372.72	6.65	91.56
DS2-conn	DP1Ca	C1	350.75	6.45	353.41	316.56	390.26	6.65	109.28
Conn	DP1Ca	C1	458.09	8	435.65	398.48	472.81	6.65	191.52
disamb	DP1Ca	C1	354.73	6.57	357.92	321.04	394.8	6.65	113.79
Utterance	DP1Ca	C1	355.75	6.4	363.13	326.4	399.86	6.65	119
DS1+DS2-conn	PICa	C1	408.14	6.09	422.46	385.82	459.11	6.65	178.33
DS1	PICa	C1	381.97	5.93	401.53	364.74	438.33	6.65	157.4

DS2-conn	PICa	C1	422.99	6.35	432.76	395.9	469.63	6.65	188.63
Conn	PICa	C1	632.51	8	611.22	573.65	648.79	6.65	367.09
disamb	PICa	C1	420.67	6.4	435.44	398.58	472.3	6.65	191.31
Utterance	PICa	C1	431.13	6.29	442.76	406.09	479.42	6.65	198.63
DS1+DS2-conn	DP1Ca	B1	342.44	6.18	353.91	319.72	388.11	6.65	109.78
DS1	DP1Ca	B1	339.63	6.05	350.35	315.99	384.72	6.65	106.22
DS2-conn	DP1Ca	B1	347.53	6.4	357.68	323.34	392.02	6.65	113.55
Conn	DP1Ca	B1	476.39	8	450.38	415.59	485.17	6.65	206.25
disamb	DP1Ca	B1	357.79	6.47	365.91	331.64	400.18	6.65	121.78
Utterance	DP1Ca	B1	354.81	6.37	363.28	329.08	397.49	6.65	119.15
DS1+DS2-conn	PICa	B1	433.51	6.1	450.78	416.42	485.13	6.65	206.65
DS1	PICa	B1	432.58	5.92	451.15	416.64	485.66	6.65	207.02
DS2-conn	PICa	B1	431.75	6.41	445.68	411.46	479.91	6.65	201.55
Conn	PICa	B1	576.82	8	559.95	525.15	594.75	6.65	315.82
disamb	PICa	B1	419.76	6.55	433.75	399.48	468.02	6.65	189.62
Utterance	PICa	B1	445.47	6.3	462.73	428.46	497.01	6.65	218.6

First-Pass Reading Time

AOI	Condition	Part. group	Observed RT	Observed letters/WD	Predicted RT	Predicted RT (CI lower)	Predicted RT (CI upper)	Specified letters/WD	Difference from ref. cat.
DS1+DS2-conn (Intercept)	DP1Ca	L1	197.1	6.19	199.03	180.83	217.24	6.65	0
DS1	DP1Ca	L1	181.63	6.07	182.38	164	200.76	6.65	-16.65
DS2-conn	DP1Ca	L1	189.93	6.42	189.78	171.57	207.99	6.65	-9.25
Conn	DP1Ca	L1	236.11	8	215.7	197.17	234.23	6.65	16.67
disamb	DP1Ca	L1	192.26	6.51	194.37	176.35	212.39	6.65	-4.66
Utterance	DP1Ca	L1	203.54	6.38	203.53	185.39	221.67	6.65	4.5
DS1+DS2-conn	PICa	L1	202.31	6.1	209.48	191.33	227.63	6.65	10.45

DS1	PICa	L1	170	5.93	176.69	158.3	195.07	6.65	-22.34
DS2-conn	PICa	L1	211.54	6.41	213.66	195.51	231.8	6.65	14.63
Conn	PICa	L1	240.81	8	221.8	203.24	240.36	6.65	22.77
disamb	PICa	L1	208.62	6.5	211.83	193.84	229.82	6.65	12.8
Utterance	PICa	L1	215.97	6.31	220.15	202.08	238.22	6.65	21.12
DS1+DS2-conn	DP1Ca	C1	280.55	6.18	290.29	265.15	315.43	6.65	91.26
DS1	DP1Ca	C1	250.63	6.03	261.45	236.19	286.71	6.65	62.42
DS2-conn	DP1Ca	C1	295.37	6.45	297.28	272.13	322.44	6.65	98.25
Conn	DP1Ca	C1	331.72	8	313.03	287.68	338.37	6.65	114
disamb	DP1Ca	C1	304.98	6.57	306.27	281.1	331.44	6.65	107.24
Utterance	DP1Ca	C1	295.27	6.4	301.18	276.11	326.25	6.65	102.15
DS1+DS2-conn	PICa	C1	291.84	6.09	299.81	274.8	324.83	6.65	100.78
DS1	PICa	C1	249.19	5.93	260.57	235.46	285.68	6.65	61.54
DS2-conn	PICa	C1	289.83	6.35	292.62	267.46	317.78	6.65	93.59
Conn	PICa	C1	359.44	8	340.96	315.35	366.57	6.65	141.93
disamb	PICa	C1	299.71	6.4	304.69	279.53	329.84	6.65	105.66
Utterance	PICa	C1	308.83	6.29	315.06	290.03	340.09	6.65	116.03
DS1+DS2-conn	DP1Ca	B1	294.88	6.18	304.37	281.18	327.55	6.65	105.34
DS1	DP1Ca	B1	278.89	6.05	287.34	264.04	310.63	6.65	88.31
DS2-conn	DP1Ca	B1	289.36	6.4	297.33	274.05	320.62	6.65	98.3
Conn	DP1Ca	B1	373.96	8	354.33	330.76	377.89	6.65	155.3
disamb	DP1Ca	B1	298.17	6.47	304.47	281.23	327.71	6.65	105.44
Utterance	DP1Ca	B1	307.74	6.37	313.85	290.66	337.05	6.65	114.82
DS1+DS2-conn	PICa	B1	333.26	6.1	341.65	318.36	364.94	6.65	142.62
DS1	PICa	B1	297.74	5.92	307.79	284.4	331.18	6.65	108.76
DS2-conn	PICa	B1	331.97	6.41	338.4	315.19	361.61	6.65	139.37
Conn	PICa	B1	368.72	8	350.82	327.25	374.39	6.65	151.79
disamb	PICa	B1	317.76	6.55	324.98	301.75	348.22	6.65	125.95
Utterance	PICa	B1	341.25	6.3	349.28	326.04	372.53	6.65	150.25

Second-Pass Reading Time

AOI	Condition	Part. group	Observed RT	Observed letters/WD	Predicted RT	Predicted RT (CI lower)	Predicted RT (CI upper)	Specified letters/WD	Difference from ref. cat.
DS1+DS2-conn (Intercept)	DP1Ca	L1	41.93	6.19	45.05	25	65.11	6.65	0
DS1	DP1Ca	L1	69.86	6.07	73.38	53.09	93.67	6.65	28.33
DS2-conn	DP1Ca	L1	43.47	6.42	45.48	25.42	65.54	6.65	0.43
Conn	DP1Ca	L1	105.28	8	99.02	78.51	119.54	6.65	53.97
disamb	DP1Ca	L1	41.42	6.51	43.91	24.1	63.72	6.65	-1.14
Utterance	DP1Ca	L1	45.38	6.38	48.19	28.22	68.15	6.65	3.14
DS1+DS2-conn	PICa	L1	85.98	6.1	90.94	70.96	110.93	6.65	45.89
DS1	PICa	L1	118.83	5.93	124.09	103.8	144.39	6.65	79.04
DS2-conn	PICa	L1	97.44	6.41	99.98	80	119.96	6.65	54.93
Conn	PICa	L1	217.21	8	214.47	193.92	235.03	6.65	169.42
disamb	PICa	L1	90.97	6.5	93.74	73.98	113.51	6.65	48.69
Utterance	PICa	L1	92.92	6.31	97.44	77.56	117.31	6.65	52.39
DS1+DS2-conn	DP1Ca	C1	54.63	6.18	57.31	31.1	83.52	6.65	12.26
DS1	DP1Ca	C1	69.66	6.03	74.37	47.98	100.76	6.65	29.32
DS2-conn	DP1Ca	C1	55.38	6.45	56.15	29.92	82.38	6.65	11.1
Conn	DP1Ca	C1	126.36	8	122.05	95.54	148.57	6.65	77
disamb	DP1Ca	C1	49.75	6.57	51.62	25.37	77.88	6.65	6.57
Utterance	DP1Ca	C1	60.48	6.4	62.02	35.91	88.13	6.65	16.97
DS1+DS2-conn	PICa	C1	116.3	6.09	122.79	96.76	148.83	6.65	77.74
DS1	PICa	C1	132.78	5.93	141.12	114.95	167.3	6.65	96.07
DS2-conn	PICa	C1	133.16	6.35	140.12	113.88	166.36	6.65	95.07
Conn	PICa	C1	273.07	8	269.74	242.85	296.63	6.65	224.69
disamb	PICa	C1	120.96	6.4	130.64	104.4	156.88	6.65	85.59
Utterance	PICa	C1	122.3	6.29	127.77	101.71	153.82	6.65	82.72

DS1+DS2-conn	DP1Ca	B1	47.57	6.18	49.11	24.71	73.52	6.65	4.06
DS1	DP1Ca	B1	60.74	6.05	62.62	38.06	87.18	6.65	17.57
DS2-conn	DP1Ca	B1	58.18	6.4	59.8	35.26	84.34	6.65	14.75
Conn	DP1Ca	B1	102.43	8	94.93	69.99	119.88	6.65	49.88
disamb	DP1Ca	B1	59.62	6.47	60.86	36.38	85.34	6.65	15.81
Utterance	DP1Ca	B1	47.07	6.37	48.87	24.46	73.28	6.65	3.82
DS1+DS2-conn	PICa	B1	100.25	6.1	108.65	84.1	133.2	6.65	63.6
DS1	PICa	B1	134.84	5.92	142.97	118.28	167.66	6.65	97.92
DS2-conn	PICa	B1	99.79	6.41	106.69	82.26	131.13	6.65	61.64
Conn	PICa	B1	208.11	8	207.95	182.99	232.91	6.65	162.9
disamb	PICa	B1	102	6.55	108.19	83.71	132.66	6.65	63.14
Utterance	PICa	B1	104.22	6.3	112.86	88.38	137.34	6.65	67.81

Sub-analysis 4 – Plausible counter-argumentative relations (PPCo) versus implausible counter-argumentative relations (PICo)

Predicted values

Total Reading Time

AOI	Condition	Part. group	Observed RT	Observed letters/WD	Predicted RT	Predicted RT (CI lower)	Predicted RT (CI upper)	Specified letters/WD	Difference from ref. cat.
DS1+DS2-conn	PPCo	L1	248.92	6.1	255.25	226.76	283.75	6.65	0
DS1	PPCo	L1	261.28	5.92	267.19	238.29	296.09	6.65	11.94
DS2-conn	PPCo	L1	242.65	6.39	245.44	216.63	274.24	6.65	-9.81
Conn	PPCo	L1	403.68	10	347.53	314.93	380.12	6.65	92.28
disamb	PPCo	L1	256.08	6.46	260.05	231.63	288.46	6.65	4.8
Utterance	PPCo	L1	264.48	6.52	265.94	237.63	294.25	6.65	10.69
DS1+DS2-conn	PICo	L1	268.82	6.15	278.6	250.03	307.17	6.65	23.35

DS1	PICo	L1	268.43	6.03	278.63	249.74	307.51	6.65	23.38
DS2-conn	PICo	L1	288.28	6.39	291.14	262.38	319.89	6.65	35.89
Conn	PICo	L1	496.38	10	439.03	406.37	471.69	6.65	183.78
disamb	PICo	L1	289.97	6.48	296.15	267.74	324.56	6.65	40.9
Utterance	PICo	L1	293.09	6.57	296.22	267.82	324.61	6.65	40.97
DS1+DS2-conn	PPCo	C1	341.49	6.12	352.79	314.04	391.54	6.65	97.54
DS1	PPCo	C1	339.24	5.95	352.81	313.92	391.69	6.65	97.56
DS2-conn	PPCo	C1	348.47	6.38	356.93	318.21	395.66	6.65	101.68
Conn	PPCo	C1	542.11	10	483.72	441.9	525.55	6.65	228.47
disamb	PPCo	C1	365.1	6.45	372.07	333.51	410.63	6.65	116.82
Utterance	PPCo	C1	366.48	6.54	371.2	332.65	409.74	6.65	115.95
DS1+DS2-conn	PICo	C1	381.47	6.17	393.53	354.99	432.07	6.65	138.28
DS1	PICo	C1	355.28	6.05	368.36	329.89	406.82	6.65	113.11
DS2-conn	PICo	C1	426.26	6.4	434.22	395.48	472.95	6.65	178.97
Conn	PICo	C1	745.07	10	689.38	647.76	730.99	6.65	434.13
disamb	PICo	C1	458.9	6.49	467.45	428.88	506.01	6.65	212.2
Utterance	PICo	C1	418.04	6.58	423.45	384.89	462.01	6.65	168.2
DS1+DS2-conn	PPCo	B1	393	6.06	411.54	375.67	447.4	6.65	156.29
DS1	PPCo	B1	388.16	5.92	405.51	369.47	441.55	6.65	150.26
DS2-conn	PPCo	B1	392	6.33	401.38	365.42	437.35	6.65	146.13
Conn	PPCo	B1	554.11	10	502.09	462.71	541.47	6.65	246.84
disamb	PPCo	B1	411.95	6.36	421.96	386.03	457.89	6.65	166.71
Utterance	PPCo	B1	413.01	6.48	425.24	389.41	461.08	6.65	169.99
DS1+DS2-conn	PICo	B1	375.04	6.13	392.9	357.03	428.77	6.65	137.65
DS1	PICo	B1	365.02	6.02	382.48	346.51	418.44	6.65	127.23
DS2-conn	PICo	B1	392.83	6.33	406.7	370.79	442.61	6.65	151.45
Conn	PICo	B1	590.96	10	538.82	499.55	578.1	6.65	283.57
disamb	PICo	B1	414.27	6.36	425.8	389.99	461.6	6.65	170.55
Utterance	PICo	B1	400.07	6.55	411.08	375.29	446.88	6.65	155.83

First-Pass Reading Time

AOI	Condition	Part. group	Observed RT	Observed letters/WD	Predicted RT	Predicted RT (CI lower)	Predicted RT (CI upper)	Specified letters/WD	Difference from ref. cat.
DS1+DS2-conn (Intercept)	PPCo	L1	195.90	6.1	201.06	182.72	219.41	6.65	0
DS1	PPCo	L1	184.00	5.92	189.28	170.68	207.88	6.65	-11.78
DS2-conn	PPCo	L1	189.19	6.39	189.73	171.18	208.28	6.65	-11.33
Conn	PPCo	L1	272.46	10	225.15	204.03	246.28	6.65	24.09
disamb	PPCo	L1	201.84	6.46	204.11	185.82	222.41	6.65	3.05
Utterance	PPCo	L1	207.44	6.52	208.29	190.06	226.52	6.65	7.23
DS1+DS2-conn	PICo	L1	198.91	6.15	204.66	186.27	223.05	6.65	3.6
DS1	PICo	L1	177.66	6.03	183.38	164.79	201.98	6.65	-17.68
DS2-conn	PICo	L1	199.24	6.39	199.58	181.06	218.09	6.65	-1.48
Conn	PICo	L1	255.14	10	207.11	185.95	228.28	6.65	6.05
disamb	PICo	L1	210.09	6.48	212.31	194.02	230.61	6.65	11.25
Utterance	PICo	L1	212.62	6.57	212.59	194.31	230.87	6.65	11.53
DS1+DS2-conn	PPCo	C1	274.47	6.12	283.18	257.9	308.46	6.65	82.12
DS1	PPCo	C1	243.71	5.95	253.3	227.94	278.67	6.65	52.24
DS2-conn	PPCo	C1	280.45	6.38	286.06	260.79	311.32	6.65	85
Conn	PPCo	C1	382.57	10	333.74	306.39	361.09	6.65	132.68
disamb	PPCo	C1	308.28	6.45	311.13	285.96	336.29	6.65	110.07
Utterance	PPCo	C1	293.12	6.54	296.69	271.53	321.84	6.65	95.63
DS1+DS2-conn	PICo	C1	282.86	6.17	291.23	266.08	316.38	6.65	90.17
DS1	PICo	C1	237.33	6.05	246.98	221.88	272.08	6.65	45.92
DS2-conn	PICo	C1	311.81	6.4	314.94	289.66	340.21	6.65	113.88
Conn	PICo	C1	369.8	10	324.21	297	351.43	6.65	123.15
disamb	PICo	C1	333.7	6.49	338.25	313.09	363.42	6.65	137.19

Utterance	PICo	C1	300.44	6.58	303.74	278.58	328.9	6.65	102.68
DS1+DS2-conn	PPCo	B1	328.63	6.06	342.2	318.86	365.54	6.65	141.14
DS1	PPCo	B1	287.33	5.92	301.32	277.86	324.77	6.65	100.26
DS2-conn	PPCo	B1	320.95	6.33	327.24	303.83	350.65	6.65	126.18
Conn	PPCo	B1	411.93	10	368.44	342.74	394.13	6.65	167.38
disamb	PPCo	B1	347.43	6.36	352.47	329.08	375.85	6.65	151.41
Utterance	PPCo	B1	343.32	6.48	352	328.68	375.32	6.65	150.94
DS1+DS2-conn	PICo	B1	311.37	6.13	322.35	299.01	345.69	6.65	121.29
DS1	PICo	B1	271.57	6.02	282.45	259.05	305.86	6.65	81.39
DS2-conn	PICo	B1	311.53	6.33	319.5	296.13	342.87	6.65	118.44
Conn	PICo	B1	399.63	10	353.86	328.23	379.49	6.65	152.8
disamb	PICo	B1	337.78	6.36	344.73	321.42	368.04	6.65	143.67
Utterance	PICo	B1	327.53	6.55	332.19	308.9	355.49	6.65	131.13

Second-Pass Reading Time

AOI	Condition	Part. group	Observed RT	Observed letters/WD	Predicted RT	Predicted RT (CI lower)	Predicted RT (CI upper)	Specified letters/WD	Difference from ref. cat.
DS1+DS2-conn (Intercept)	PPCo	L1	53.02	6.1	54.28	33.9	74.66	6.65	0
DS1	PPCo	L1	77.28	5.92	78.06	57.29	98.83	6.65	23.78
DS2-conn	PPCo	L1	53.46	6.39	55.67	34.98	76.36	6.65	1.39
Conn	PPCo	L1	131.23	10	121.42	97.25	145.59	6.65	67.14
disamb	PPCo	L1	54.24	6.46	55.88	35.57	76.19	6.65	1.6
Utterance	PPCo	L1	57.04	6.52	57.63	37.42	77.84	6.65	3.35
DS1+DS2-conn	PICo	L1	69.9	6.15	73.87	53.42	94.33	6.65	19.59
DS1	PICo	L1	90.77	6.03	95.2	74.44	115.96	6.65	40.92
DS2-conn	PICo	L1	89.04	6.39	91.49	70.85	112.13	6.65	37.21

Conn	PICo	L1	241.24	10	230.99	206.76	255.22	6.65	176.71
disamb	PICo	L1	79.88	6.48	83.67	63.36	103.97	6.65	29.39
Utterance	PICo	L1	80.47	6.57	83.49	63.2	103.78	6.65	29.21
DS1+DS2-conn	PPCo	C1	67.02	6.12	69.54	41.7	97.38	6.65	15.26
DS1	PPCo	C1	95.52	5.95	99.43	71.46	127.4	6.65	45.15
DS2-conn	PPCo	C1	68.03	6.38	70.71	42.9	98.53	6.65	16.43
Conn	PPCo	C1	159.54	10	148.97	118.28	179.66	6.65	94.69
disamb	PPCo	C1	56.82	6.45	60.69	33.04	88.35	6.65	6.41
Utterance	PPCo	C1	73.37	6.54	74.37	46.72	102.02	6.65	20.09
DS1+DS2-conn	PICo	C1	98.61	6.17	102.13	74.5	129.77	6.65	47.85
DS1	PICo	C1	117.95	6.05	121.25	93.69	148.81	6.65	66.97
DS2-conn	PICo	C1	114.45	6.4	118.99	91.16	146.82	6.65	64.71
Conn	PICo	C1	375.27	10	364.12	333.63	394.61	6.65	309.84
disamb	PICo	C1	125.2	6.49	128.89	101.23	156.55	6.65	74.61
Utterance	PICo	C1	117.59	6.58	119.45	91.79	147.11	6.65	65.17
DS1+DS2-conn	PPCo	B1	64.37	6.06	69.07	43.37	94.78	6.65	14.79
DS1	PPCo	B1	100.83	5.92	104.05	78.18	129.92	6.65	49.77
DS2-conn	PPCo	B1	71.05	6.33	73.87	48.06	99.67	6.65	19.59
Conn	PPCo	B1	142.18	10	132.48	103.52	161.45	6.65	78.2
disamb	PPCo	B1	64.52	6.36	69.13	43.36	94.9	6.65	14.85
Utterance	PPCo	B1	69.69	6.48	72.92	47.24	98.59	6.65	18.64
DS1+DS2-conn	PICo	B1	63.67	6.13	70.14	44.43	95.85	6.65	15.86
DS1	PICo	B1	93.44	6.02	99.67	73.87	125.47	6.65	45.39
DS2-conn	PICo	B1	81.3	6.33	86.77	61.02	112.52	6.65	32.49
Conn	PICo	B1	191.33	10	183.7	154.84	212.57	6.65	129.42
disamb	PICo	B1	76.49	6.36	80.67	55.02	106.32	6.65	26.39
Utterance	PICo	B1	72.54	6.55	78.37	52.73	104.01	6.65	24.09

Appendix 6B – Output of the GAM: Estimated values and standard error

Sub-analysis 1 – Causality (DP1Ca) versus counter-argumentative (PPCo) discourse relations

Total Reading Time			First-Pass Reading Time			Second-Pass Reading Time		
AOI	Estimate	Std. Error	AOI	Estimate	Std. Error	AOI	Estimate	Std. Error
DS1+DS2-conn DP1Ca (Intercept)	246.55	11.60	DS1+DS2-conn DP1Ca (Intercept)	202.85	9.18	DS1+DS2-conn DP1Ca (Intercept)	44.16	7.62
DS1	12.01	10.07	DS1	-15.90	7.46	DS1	27.70	7.61
DS2-conn	-9.76	10.20	DS2-conn	-10.47	7.40	DS2-conn	1.22	7.55
Conn	73.23	10.58	Conn	12.06	7.96	Conn	60.46	7.98
Utterance	7.92	9.91	Utterance	4.31	7.34	Utterance	3.73	7.50
PPCo	10.66	11.90	PPCo	1.22	8.99	PPCo	9.37	8.72
C1	101.23	18.33	C1	90.44	14.48	C1	10.89	11.93
B1	109.73	17.30	B1	105.24	13.67	B1	4.51	11.25
DS1:PPCo	0.43	14.12	DS1:PPCo	4.05	10.46	DS1:PPCo	-3.59	10.68
DS2-conn:PPCo	-0.89	14.10	DS2-conn:PPCo	-1.48	10.44	DS2-conn:PPCo	0.57	10.66
Conn:PPCo	19.54	14.86	Conn:PPCo	-3.09	13.01	Conn:PPCo	17.30	10.97
Utterance:PPCo	2.82	13.88	Utterance:PPCo	2.15	10.28	Utterance:PPCo	0.76	10.50
DS1:C1	-25.03	17.25	DS1:C1	-13.09	12.78	DS1:C1	-12.01	13.05
DS2-conn:C1	17.00	17.17	DS2-conn:C1	16.79	12.72	DS2-conn:C1	0.11	12.99
Conn:C1	19.84	17.07	Conn:C1	6.41	12.65	Conn:C1	13.16	12.92
Utterance:C1	8.20	17.06	Utterance:C1	6.36	12.64	Utterance:C1	1.85	12.91
DS1:B1	-15.55	16.25	DS1:B1	-0.72	12.03	DS1:B1	-14.82	12.29
DS2-conn:B1	12.20	16.22	DS2-conn:B1	1.68	12.01	DS2-conn:B1	10.44	12.27
Conn:B1	27.69	16.16	Conn:B1	35.14	11.97	Conn:B1	-7.55	12.23
Utterance:B1	1.87	16.12	Utterance:B1	4.82	11.94	Utterance:B1	-3.00	12.19
PPCo:C1	-5.01	17.11	PPCo:C1	-8.50	12.67	PPCo:C1	3.35	12.94
PPCo:B1	44.49	16.08	PPCo:B1	35.87	11.91	PPCo:B1	8.49	12.16
DS1:PPCo:C1	11.81	24.35	DS1:PPCo:C1	-4.77	18.04	DS1:PPCo:C1	16.66	18.42
DS2-conn:PPCo:C1	-3.76	24.31	DS2-conn:PPCo:C1	-3.10	18.01	DS2-conn:PPCo:C1	-0.55	18.39

Conn:PPCo:C1	20.91	24.13	Conn:PPCo:C1	20.83	17.87	Conn:PPCo:C1	0.34	18.25
Utterance:PPCo:C1	-0.50	24.09	Utterance:PPCo:C1	0.08	17.84	Utterance:PPCo:C1	-0.57	18.22
DS1:PPCo:B1	-2.93	22.92	DS1:PPCo:B1	-28.48	16.98	DS1:PPCo:B1	25.64	17.34
DS2-conn:PPCo:B1	-11.35	22.94	DS2-conn:PPCo:B1	-4.85	16.99	DS2-conn:PPCo:B1	-6.37	17.35
Conn:PPCo:B1	-26.89	22.80	Conn:PPCo:B1	-32.62	16.89	Conn:PPCo:B1	5.88	17.25
Utterance:PPCo:B1	1.43	22.73	Utterance:PPCo:B1	-2.39	16.83	Utterance:PPCo:B1	3.90	17.19

Sub-analysis 2 – Implicit causality (DP0Ca) versus explicit causality (DP1Ca)

Total Reading Time			First-Pass Reading Time			Second-Pass Reading Time		
AOI	Estimate	Std. Error	AOI	Estimate	Std. Error	AOI	Estimate	Std. Error
DS1+DS2-conn DP0Ca (Intercept)	240.76	10.13	DS1+DS2-conn DP0Ca (Intercept)	188.40	8.74	DS1+DS2-conn DP0Ca (Intercept)	52.53	5.80
DS1	-0.36	7.88	DS1	-15.45	6.68	DS1	14.74	5.47
DS2-conn	9.26	7.85	DS2-conn	-2.49	6.65	DS2-conn	11.60	5.45
Utterance	0.00	7.73	Utterance	0.00	6.55	Utterance	0.00	5.38
DP1Ca	1.68	10.25	DP1Ca	10.25	8.56	DP1Ca	-8.63	6.42
C1	98.96	15.56	C1	87.52	13.62	C1	11.60	9.14
B1	126.25	14.73	B1	119.34	12.89	B1	6.81	8.66
DS1:DP1Ca	10.81	11.11	DS1:DP1Ca	-3.24	9.41	DS1:DP1Ca	14.09	7.74
DS2-conn:DP1Ca	-20.77	10.03	DS2-conn:DP1Ca	-9.81	9.35	DS2-conn:DP1Ca	-10.95	7.69
Utterance:DP1Ca	1.93	11.05	Utterance:DP1Ca	4.53	9.27	Utterance:DP1Ca	2.99	7.62
DS1:C1	-12.60	13.50	DS1:C1	-7.89	11.44	DS1:C1	-4.66	9.40
DS2-conn:C1	-1.44	13.44	DS2-conn:C1	13.70	11.39	DS2-conn:C1	-15.22	9.36
Utterance:C1	0.00	13.32	Utterance:C1	0.00	11.29	Utterance:C1	0.00	9.28
DS1:B1	-0.15	12.75	DS1:B1	-3.15	10.81	DS1:B1	3.00	8.88
DS2-conn:B1	-5.27	12.73	DS2-conn:B1	3.41	10.79	DS2-conn:B1	-8.68	8.87
Utterance:B1	0.00	12.63	Utterance:B1	0.00	10.70	Utterance:B1	0.00	8.80
DP1Ca:C1	3.53	13.36	DP1Ca:C1	3.35	11.32	DP1Ca:C1	0.11	9.31
DP1Ca:B1	-16.80	12.63	DP1Ca:B1	-14.39	10.70	DP1Ca:B1	-2.36	8.79

DS1:DP1Ca:C1	-13.56	19.08	DS1:DP1Ca:C1	-4.80	16.16	DS1:DP1Ca:C1	-8.83	13.29
DS2-conn:DP1Ca:C1	17.73	18.99	DS2-conn:DP1Ca:C1	2.41	16.08	DS2-conn:DP1Ca:C1	15.34	13.22
Utterance:DP1Ca:C1	8.53	18.85	Utterance:DP1Ca:C1	6.03	15.96	Utterance:DP1Ca:C1	2.50	13.13
DS1:DP1Ca:B1	-15.64	17.99	DS1:DP1Ca:B1	3.15	15.24	DS1:DP1Ca:B1	-18.74	12.53
DS2-conn:DP1Ca:B1	16.98	17.96	DS2-conn:DP1Ca:B1	-1.91	15.22	DS2-conn:DP1Ca:B1	18.82	12.51
Utterance:DP1Ca:B1	1.59	17.84	Utterance:DP1Ca:B1	4.88	15.11	Utterance:DP1Ca:B1	-3.32	12.42

Sub-analysis 3 – Plausible causal relations (DP1Ca) versus implausible causal relations (PICa)

Total Reading Time			First-Pass Reading Time			Second-Pass Reading Time		
AOI	**Estimate**	**Std. Error**	**AOI**	**Estimate**	**Std. Error**	**AOI**	**Estimate**	**Std. Error**
DS1+DS2-conn DP1Ca (Intercept)	242.45	14.06	DS1+DS2-conn DP1Ca (Intercept)	197.71	9.28	DS1+DS2-conn DP1Ca (Intercept)	44.66	10.22
DS1	11.63	11.23	DS1	-16.65	7.53	DS1	28.33	9.11
DS2-conn	-8.73	11.15	DS2-conn	-9.25	7.47	DS2-conn	0.43	9.04
Conn	71.26	11.81	Conn	16.67	7.89	Conn	53.97	9.57
disamb	-5.64	11.00	disamb	-4.66	7.37	disamb	-1.14	8.92
Utterance	7.70	11.07	Utterance	4.50	7.41	Utterance	3.13	8.97
PICa	56.34	14.68	PICa	10.45	8.70	PICa	45.89	11.93
C1	103.36	21.34	C1	91.26	15.13	C1	12.26	14.83
B1	109.78	20.14	B1	91.26	15.13	B1	4.06	13.98
DS1:PICa	-11.32	15.81	DS1:PICa	-16.14	10.59	DS1:PICa	4.83	12.82
DS2-conn:PICa	22.05	15.66	DS2-conn:PICa	13.43	10.49	DS2-conn:PICa	8.61	12.70
Conn:PICa	65.34	15.62	Conn:PICa	-4.34	10.46	Conn:PICa	69.56	12.66
disamb:PICa	10.93	15.44	disamb:PICa	7.01	10.35	disamb:PICa	3.94	12.52
Utterance:PICa	9.56	15.54	Utterance:PICa	6.18	10.41	Utterance:PICa	3.37	12.60
DS1:C1	-23.43	19.26	DS1:C1	-12.20	12.90	DS1:C1	-11.27	15.61
DS2-conn:C1	14.66	19.17	DS2-conn:C1	16.24	12.84	DS2-conn:C1	-1.59	15.54
Conn:C1	16.90	19.06	Conn:C1	6.07	12.77	Conn:C1	10.77	15.45
disamb:C1	16.07	19.09	disamb:C1	20.63	12.79	disamb:C1	-4.55	15.48

Utterance:C1	7.94	19.05	Utterance:C1	6.38	12.76	Utterance:C1	1.58	15.45
DS1:B1	-15.19	18.14	DS1:B1	-0.38	12.15	DS1:B1	-14.82	14.71
DS2-conn:B1	12.50	18.10	DS2-conn:B1	2.22	12.13	DS2-conn:B1	10.26	14.68
Conn:B1	25.21	18.04	Conn:B1	33.30	12.09	Conn:B1	-8.15	14.63
disamb:B1	17.63	17.98	disamb:B1	4.76	12.05	disamb:B1	12.89	14.58
Utterance:B1	1.67	17.99	Utterance:B1	4.99	12.05	Utterance:B1	-3.38	14.59
PICa:C1	18.64	18.98	PICa:C1	-0.93	12.72	PICa:C1	19.59	15.39
PICa:B1	40.53	18.03	PICa:B1	26.84	12.08	PICa:B1	13.64	14.62
DS1:PICa:C1	2.19	27.03	DS1:PICa:C1	5.74	18.11	DS1:PICa:C1	-3.56	21.92
DS2-conn:PICa:C1	-17.67	26.98	DS2-conn:PICa:C1	-27.61	18.08	DS2-conn:PICa:C1	9.87	21.88
Conn:PICa:C1	35.27	26.99	Conn:PICa:C1	22.76	18.08	Conn:PICa:C1	12.65	21.89
disamb:PICa:C1	-8.38	26.87	disamb:PICa:C1	-18.11	18.00	disamb:PICa:C1	9.59	21.79
Utterance:PICa:C1	-4.91	26.79	Utterance:PICa:C1	-1.81	17.95	Utterance:PICa:C1	-3.10	21.72
DS1:PICa:B1	15.26	25.67	DS1:PICa:B1	-0.69	17.20	DS1:PICa:B1	15.99	20.82
DS2-conn:PICa:B1	-30.91	25.56	DS2-conn:PICa:B1	12.72	17.29	DS2-conn:PICa:B1	18.81	20.92
Conn:PICa:B1	-52.63	25.55	Conn:PICa:B1	-9.65	17.12	Conn:PICa:B1	-16.08	20.71
disamb:PICa:B1	-39.95	25.43	disamb:PICa:B1	-23.78	17.04	disamb:PICa:B1	-16.15	20.62
Utterance:PICa:B1	-6.98	25.45	Utterance:PICa:B1	-8.03	17.05	Utterance:PICa:B1	1.09	20.63

Sub-analysis 4 – Plausible counter-argumentative relations (PPCo) versus implausible counter-argumentative relations (PICo)

Total Reading Time			First-Pass Reading Time			Second-Pass Reading Time		
AOI	Estimate	Std. Error	AOI	Estimate	Std. Error	AOI	Estimate	Std. Error
DS1+DS2-conn PPCo (Intercept)	259.30	14.60	DS1+DS2-conn PPCo (Intercept)	204.43	9.40	DS1+DS2-conn PPCo (Intercept)	55.05	10.46
DS1	11.94	12.02	DS1	-11.78	7.71	DS1	23.78	10.01
DS2-conn	-9.82	12.09	DS2-conn	-11.33	7.76	DS2-conn	1.39	10.07
Conn	92.27	15.20	Conn	24.09	9.82	Conn	67.14	12.58
disamb	4.80	11.88	disamb	3.05	7.62	disamb	1.60	9.89
Utterance	10.69	11.82	Utterance	7.23	7.58	Utterance	3.35	9.84

PICo	23.35	15.03	PICo	3.60	9.23	PICo	19.59	11.70
C1	97.54	22.67	C1	82.12	15.02	C1	15.26	16.39
B1	156.28	21.38	B1	141.14	14.16	B1	14.79	15.43
DS1:PICo	-11.91	17.05	DS1:PICo	-9.49	10.93	DS1:PICo	-2.46	14.19
DS2-conn:PICo	22.35	17.10	DS2-conn:PICo	6.25	10.96	DS2-conn:PICo	16.23	14.23
Conn:PICo	68.15	16.78	Conn:PICo	-21.64	10.76	Conn:PICo	89.97	13.97
disamb:PICo	12.75	16.79	disamb:PICo	4.60	10.77	disamb:PICo	8.20	13.98
Utterance:PICo	6.93	16.73	Utterance:PICo	0.70	10.73	Utterance:PICo	6.26	13.93
DS1:C1	-11.92	20.84	DS1:C1	-18.09	13.36	DS1:C1	6.12	17.35
DS2-conn:C1	13.96	20.85	DS2-conn:C1	14.21	13.37	DS2-conn:C1	-0.21	17.36
Conn:C1	38.66	20.67	Conn:C1	26.47	13.26	Conn:C1	12.29	17.21
disamb:C1	14.49	20.65	disamb:C1	24.89	13.24	disamb:C1	-10.44	17.19
Utterance:C1	7.72	20.60	Utterance:C1	6.28	13.21	Utterance:C1	1.48	17.15
DS1:B1	-17.96	19.60	DS1:B1	-29.10	12.57	DS1:B1	11.19	16.31
DS2-conn:B1	-0.34	19.66	DS2-conn:B1	-3.63	12.61	DS2-conn:B1	3.40	16.37
Conn:B1	-1.72	19.50	Conn:B1	2.15	12.50	Conn:B1	-3.73	16.23
disamb:B1	5.63	19.51	disamb:B1	7.22	12.51	disamb:B1	-1.54	16.24
Utterance:B1	3.02	19.42	Utterance:B1	2.57	12.45	Utterance:B1	0.49	16.17
PICo:C1	17.39	20.65	PICo:C1	4.45	13.24	PICo:C1	13.00	17.19
PICo:B1	-41.99	19.49	PICo:B1	-23.45	12.50	PICo:B1	-18.53	16.23
DS1:PICo:C1	-13.28	29.31	DS1:PICo:C1	-4.88	18.79	DS1:PICo:C1	-8.33	24.40
DS2-conn:PICo:C1	14.19	29.44	DS2-conn:PICo:C1	14.58	18.88	DS2-conn:PICo:C1	-0.55	24.51
Conn:PICo:C1	96.76	29.13	Conn:PICo:C1	4.06	18.68	Conn:PICo:C1	92.58	24.25
disamb:PICo:C1	41.89	29.16	disamb:PICo:C1	14.48	18.70	disamb:PICo:C1	27.41	24.28
Utterance:PICo:C1	4.59	29.12	Utterance:PICo:C1	-1.69	18.68	Utterance:PICo:C1	6.22	24.25
DS1:PICo:B1	7.51	27.75	DS1:PICo:B1	10.48	17.79	DS1:PICo:B1	-2.99	23.10
DS2-conn:PICo:B1	1.60	27.81	DS2-conn:PICo:B1	5.86	17.84	DS2-conn:PICo:B1	-4.39	23.15
Conn:PICo:B1	-12.78	27.58	Conn:PICo:B1	26.91	17.69	Conn:PICo:B1	-39.82	22.96
disamb:PICo:B1	9.72	27.58	disamb:PICo:B1	7.51	17.69	disamb:PICo:B1	2.28	22.96
Utterance:PICo:B1	-2.45	27.51	Utterance:PICo:B1	-0.65	17.64	Utterance:PICo:B1	-1.88	22.91

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