



Universiteit Utrecht

**“NEW INSIGHTS ON THE  
NATURE OF D-LINKING”**

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31<sup>st</sup> of July, 2014

**MRes in Linguistics**

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## Acknowledgments

I would like to express here my gratitude to a number of people without whom none of this would have been possible. First of all, I would like to thank Alessandro, for the unconditional love and support. You are an amazing person and you should really give yourself much more credit than I know you do. I am very, very lucky to have met you (but I will now stop with the sappy things). I would like to thank my parents, who taught me how important it is to study and to learn as many things as possible (“due gambe e due braccia ce le abbiamo tutti, è la ‘menocca’ che conta), who always supported me and my decisions, and who were ok with me quitting my job to go study linguistics (!) 900 km away from home. That must have taken some guts, ladies and gentlemen. I would also like to thank my sister, for being such an excellent role model (but now don’t get too excited).

This thesis would have not been possible without all the help and support provided by my supervisor, Dr. Pim Mak, to whom I am extremely grateful. As a syntax major, I had little to no previous knowledge of statistical methods, nor on how to properly design and run experiments. With Dr. Mak’s help, I managed to design three different experiments and analyze the resulting data. I would also like to thank Prof. Guglielmo Cinque, for accepting to be my second reader, and for being much of a mentor to me in the past four years.

Carrying out the experiments described in this thesis would have been impossible without the financial and technical support provided by the UiL OTS. In particular, I would like to thank Alex Manus for setting up the experiments, and Dr. Maaïke Schoorlemmer for making everything possible. I am especially grateful to Prof. Giuliana Giusti, for helping me find the participants and for letting me use one of Ca’ Foscari’s offices to run the experiments.

I would also like to express my gratitude to Tom, for being such a wonderful friend and for being ok with me making fun of the Koningslied (“*De W van wakker, stampot eten; Miljoenen coaches die beter weten*”). Who could ever be sad after hearing this song?), although I am apparently not allowed to say that soccer is “just a sport”. To Robert, for being such a great “European fellow”, for the insightful discussions (and last year’s constant arguing) and for using words like “beleaguered” in everyday conversation. To Anton, for being the “Asian guy at the bus stop” Tom and I will always remember, and for discussing syntax with me at 2 in the morning. To Pernelle, for her “creative” English and for always making me laugh. To Fafa, for her “let’s have some tea since we are all here in Janskerkhof. Oh, and I have some biscuits too. And chocolate”. To Mia, for being constantly “fashionably late” and for making fun of the way I say “ELiTU”. To Soyeon, Anja, Maud, Jorike, and all my other wonderful classmates, it was a pleasure meeting you all.

## Abstract

Two important challenges in the study of weak islands are the lack of an adequate definition of d-linking, and the still poorly understood nature of the principles responsible for the higher acceptability of d-linked constructions. In the present work, I address both of these issues. In particular, I argue that the notion of d-linking is better captured by assuming it to be composed of two primitives, *givenness* and *restrictiveness*. To this end, I provide the results of a linguistic acceptability questionnaire that support the soundness of such a conclusion. Following Kluender (1992, 1998), Hofmeister (2007) and Hofmeister and Sag (2010), I also explore the possibility that the higher acceptability of d-linked structures does not ensue from some peculiar syntactic property associated with d-linked constituents, but from general processing mechanisms. I therefore present the results of two additional experiments which aim to test the validity and the limits of this proposal. As these two latter experiments point out that the d-linking of constituents other than left-peripheral elements has a very local effect, I conclude by suggesting that the characteristic properties exhibited by d-linked constituents are dependent on their collocation at the left edge of the clause, and in particular on the high processing load associated with clause-initial positions.

## 1. Syntactic Movement and Island Constraints

The possibility of displacing a constituent, leaving its canonical position empty, is one of the defining and most intriguing properties of human languages. Example 1) illustrates one of the most familiar instances of these displacements: wh- interrogative clauses.

- 1) **What** did Mary think that Julie saw \_\_\_\_\_?

In (1), the wh- phrase appearing at the beginning of the clause, “what”, has been moved out of its argument position and has been raised to the left edge of the structure. The displacement of the wh- phrase, which is called “filler” or “antecedent” (Fodor, 1989; Hawkins, 1999), results in the presence of a gap in the complement position of the most embedded verb.

These displacements, which are often labelled *filler-gap dependencies (FGD)* (Hawkins, 1999), affect a wide variety of different constructions: they are most familiar in interrogative clauses and focus movement, but also characterize comparative constructions (Chomsky, 1977; Corver, 2005; Liao, 2005), and some varieties of scrambling (Ller, 1995; Sternefeld, 1994; van de Koot et al., 2010).

Filler-gap dependencies appear to be unconstrained with respect to the number of words which can appear between the filler and its gap: a filler can be found arbitrarily far from its gap position, as can be seen in 2):

- 2) a) **What** did Mary see \_\_\_\_?  
b) **What** did Mary think that Julie saw \_\_\_\_?  
c) **What** did Mary think that Charles said that Julie saw \_\_\_\_?

Long-distance dependencies thus appear to be unbounded with respect to length as defined by the number of words and syntactic nodes which linearly come in between the antecedent and its associate gap. They are however not unbounded with respect to the type of syntactic structure which can host a gap. As a matter of fact, some syntactic domains appear to be opaque for extraction. Following Ross' (1967) terminology, these domains are known as *islands*. There are a number of different island constraints: some of them are illustrated in the example below:

- 3)
- a) COMPLEX NP ISLAND  
\*What do you believe [the claim that Tina said \_\_\_\_]?
  - b) COORDINATE STRUCTURE CONSTRAINT  
\*What did John read [a novel and \_\_\_\_]?
  - c) LEFT-BRANCH ISLAND  
\*Whose did Luke borrow [\_\_\_\_ phone]?
  - d) ADJUNCT ISLAND  
\*What did you come back [because you forgot \_\_\_\_]?
  - e) SUBJECT ISLAND  
\*What do you believe that [the course about \_\_\_\_] will be canceled?

### 1.1 Weak Islands and the Notion of *D-linking*

Not all islands are equally opaque for movement. Islands come in two “flavors”: they are either *strong* or *weak*. Strong islands block extraction of *all* types of constituent. Islands like *whether*, negative<sup>1</sup>, factive, extraposition and scope islands (Cinque, 1990; Szabolcsi, 2006), on the other hand, are considered “weak” in that they selectively allow for some constituents to be extracted, provided that these constituents satisfy certain properties. The most appropriate way of characterizing what these properties may be has been the subject of an intense debate which has spanned over the last four decades, with proponents belonging to the semantics, the syntactic, the pragmatic and the language processing literature. Initially, it was proposed that the critical property responsible for successful extraction out of weak islands was *argumenthood*, as opposed to *adjuncthood*. This hypothesis stemmed from the observation that island violations are particularly severe if the extracted element is an adjunct, while they tend to be significantly weaker, and in some cases they disappear completely, if the extracted constituent is an argument (Huang, 1982; Lasnik and Saito, 1984, 1992; Chomsky, 1986). The relevant contrast is illustrated in (4):

- 4) a) Which book did John wonder [whether to read \_\_\_\_]?

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<sup>1</sup> “Inner island”, according to Cinque’s (1990) terminology.

- b) \*How did John wonder [whether to read a book \_\_\_]?

Example (4a), in which the argument wh-phrase “which book” was extracted out of an indirect question, is at least marginally acceptable in English. Question (4b), where the adjunct “how” was extracted, is markedly ungrammatical.

The *argumenthood* generalization is however confronted with a series of empirical problems. Consider for instance example (5), where the embedded direct object “what the hell” was extracted.

- 5) \*What the hell [don't you know where to buy \_\_\_]?

(Rizzi, 2000: 6)

The ungrammaticality of (5) shows that not all arguments can be successfully extracted out of weak islands; the *argumenthood* generalization therefore appears to make too strong predictions. Note that the problem with (5) is not due to a more general ban on the extraction of fillers like “what the hell”: “what the hell” is perfectly extractable in non-island domains, as can be seen in (6).

- 6) What the hell do you think that you will find \_\_\_\_\_ in that drawer?

(Rizzi, 2000: 6)

Because of this and other considerations, the *argumenthood vs adjuncthood* hypothesis was later substituted by the notion of *d(iscourse)-linking*: the idea that only wh-phrases whose variable has a range which is either presupposed or shared knowledge can be optimally extracted out of weak islands. It was in particular observed that constituents which feature a lexical restriction, such as “which men”, can systematically escape weak islands. The first to notice that these types of constituent exhibited somehow peculiar properties (for example, by disobeying superiority restrictions) was Pesetsky (1987) in his investigation of wh-in-situ and LF movement. Pesetsky labelled these special types of constituent “d(iscourse)-linked”, in reference to the fact that the range of their variable is linked to the immediate discourse: it is either given in the preceding context, or it is shared knowledge. In this respect, consider example (7):

- 7) Which courses [don't you know whether to attend\_\_\_]?

In (7), the lexical restriction “courses” suggests –and in fact implies– the existence of a set of courses from which the speaker is asking for a choice (Frazier & Clifton, 2002). According to Pesetsky (1987), this set either has to represent shared knowledge, or has to be presupposed in the discourse: if the set of courses is not pre-established, a question like (7) is pragmatically odd and presumably ungrammatical.<sup>2</sup>

The notion of d-linking was also discussed in Kroch (1989) and in Comorovski (1989), who made the influential observation that only d-linked constituents can be successfully extracted out of weak islands. This observation was later further developed by a number of different authors (cf. Rizzi, 1990; Obenauer, 1992;

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<sup>2</sup> See however sections 2 and 2.1 for a discussion on why this definition of d-linking may be inadequate.

Kiss 1993), including in particular Cinque (1990), who suggested that it is the pre-established nature of the referent of d-linked expressions which makes these constituents insensitive to island constraints.

Quite interestingly, wh-phrases appear to be maximally or minimally extractable according to their degree of discourse-linking, something which would seem to suggest that Cinque (1990) was on the right track in proposing that the property of being pre-established is what underlies d-linking effects. For example, whereas overt partitive wh- constituents like “which one of X” appear to be optimally extractable, wh-phrases like *what the hell* and *what on earth* are strongly ungrammatical if extracted across a weak island:

8) \*What on earthl [don't you know where to buy \_\_\_\_]?

According to Pesetsky (1987), these latter phrases, which he labels “aggressively non-d-linked”, are outright incompatible with a d-linked reading: the reason why one utters a question starting with an aggressively non-d-linked wh-phrase is to express absolute surprise and disconcert about all possible answers. By its own nature, the answer to an aggressively non-d-linked question is then never going to be mentioned in the preceding discourse, nor is going to be part of a pre-established set of elements. The ungrammaticality of (8) would thus follow.

The notion of d-linking may at first seem a rather intuitive and straightforward concept, yet much disagreement exists both on the best way to characterize it, and on what underlying principle(s) may be responsible for d-linking phenomena. The present research is devoted to discussing and addressing these two issues: in particular, the results of three experiments which may shed some light on these questions will be presented.

This study is organized as follows:

In the first part of this thesis (section 2), I will discuss what the most appropriate definition of d-linking should be. In particular, in section 2.1, I will present a tentative new working definition of d-linking by introducing the notions of *givenness* and *restrictiveness*. In section 2.2, I will then present the results of an acceptability judgment questionnaire, which appears to support the validity of the proposed definition.

The second, longer part of this thesis (section 3, 4, 5 and 6) will address the debate concerning the underlying principles and/or properties responsible for the higher acceptability of d-linked structures. In particular, in section 3.1 and 3.2, the syntactic account provided by Rizzi (2000), and the processing accounts proposed by Kluender (1992, 1998), Hofmeister (2007) and Hofmeister and Sag (2010) will be presented and discussed. In section 4, I will present the rationale behind the second experiment which is described in this thesis, a self-paced reading experiment, the aim of which is to study the effect of d-linking on referential expressions. The design, methods and results of this experiment will be presented in section 5. In section 6, the rationale, design, and results of a third experiment will be provided: the purpose of this third experiment is to expand on the results of experiment 2 by investigating the effect of d-linking on [+restrictive] referential expressions. In section 7, I will then discuss how the results yielded by these three experiments feed into our

investigation of what type of account can better capture d-linking effects. Finally, in section 8, I will provide some general considerations and concluding remarks.

## 2. A Formal Definition of *D-Linking*

As Hofmeister & Sag (2010) point out, a formal definition of d-linking is missing from the existing literature. In the wake of Pesestky's (1987) seminal work, the term "d-linking" has so far been taken to indicate all those wh-phrases which inquire about entities which are part of a set which is either pre-established or represents common, shared knowledge. Moreover, the prototypical "d-linked" constituent has been roughly associated with argument wh-phrases with a lexical restriction, such as "which men", whereas the prototypical non-d-linked wh-phrases have been identified with aggressively d-linked wh- fillers such as "what the hell", and bare wh-items such as "what" and "who".

One problem with this definition is that it is too vague. Consider for instance the reference to the fact that a constituent, in order to be d-linked, must be pre-established. How is the property of being pre-established attained? Does the preceding context have an exclusive role in making a given constituent pre-established, and if yes, in what ways? Furthermore, in which position does the pre-established set of entities have to be introduced in the preceding context? Are there no differences among the syntactic positions in which this set can be first merged, or will different syntactic positions correlate with different degrees of pre-establishment, and hence of d-linking? The fact that no formal answer has so far been provided to such questions suggests how difficult it is to formally test the existing definition of d-linking: one can hardly test a fundamentally incomplete notion.

Not only this definition is too vague, it also appears to be empirically inadequate. First of all, bare wh-items are not necessarily associated with a non-d-linked interpretation. Consider example (9):

- 9) a) I brought some of the objects I found on the table.
- b) What did you bring exactly?

With his utterance, speaker A is restricting the set of possible things he may have brought to the objects he found on the table. Speaker B's inquiry is then a request to further restrict this set of items. In this sense, (9) resembles d-linked questions of the type of "which men did you see?": there exists a pre-established set of elements –the objects found on the table–, out of which speaker B is asking for a choice. The fact that the set of objects which were on the table is indeed pre-established is confirmed by the grammaticality of the degree adverb "exactly": it would be pragmatically odd to request A to narrow down a bigger set to its actual members if the set in question were not pre-established. Additional evidence of the fact that the wh- word "what" in (9) is pre-established is represented by the possibility of replacing it with a "canonical" d-linked wh-phrase, without this resulting in a complete change of meaning of the sentence. In this respect, compare (9) with the example in (10): what is being asked is essentially the same thing.

- 10) a) I brought some of the objects I found on the table.  
 b) Which objects did you bring exactly?

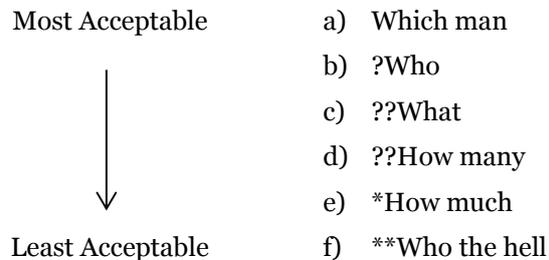
An additional, more serious problem with the existing definition of d-linking is that there need not be a preceding context for a d-linked question to be acceptable. Compare examples (11) and (12):

- 11) Which courses do you wonder [whether to take\_\_]?  
 12) \*What do you wonder [whether to take\_\_]?

(11) is an acceptable English sentence. It features an argument wh- phrase with a lexical restriction (“courses”), and it is thus standardly considered to be d-linked. Crucially, (11) is considerably more acceptable than (12), which exhibit an identical syntactic structure but differs from the preceding example in having a bare wh- filler. Yet both interrogative clauses are presented in isolation: the higher acceptability of (11) therefore cannot be said to originate from the fact that (11) is “linked to the discourse”, as, quite trivially, there is no preceding discourse to which (11) may be linked.

A related problem is represented by the fact that virtually *any* wh-phrase can be turned into a d-linked constituent by modifying the constituent itself, rather than its preceding context. In fact, a preceding context does not necessarily have to be present for these manipulations to have an effect. Consider in particular the following scale of acceptability of the extraction of different wh-phrases, as presented in Szabolcsi and Swarts (1997):

13)



Szabolcsi & Swarts (1997: 241)

In Szabolcsi and Swarts’ hierarchy, overt partitive forms like “which men” are more acceptable than bare wh-phrases. These are more acceptable than quantity wh-phrases, like “how many” and “how much”. At the bottom of the acceptability scale lie aggressively non-d-linked phrases, in the sense of Pesetsky (1987). These judgments are however far from being absolute, as shown by examples of the type of the following:

- 14) a) \*How much gas do you wonder [whether to buy \_\_\_\_ here]?  
 b) How much of the gas that you need do you wonder [whether to buy \_\_\_\_ here]?

(Rizzi, 2000:12)

In (14), the addition of the restrictive relative clause “that you need” has the effect of turning a markedly degraded sentence (14a) into an at least marginally acceptable example (14b). It thus appears that restrictive modification has the effect of transforming otherwise non-d-linked fillers into d-linked ones. Once again, this seems to question the validity of the accepted definition of d-linking: what makes (14b) grammatical is not a modification of the preceding context –which is anyway not present–, but of the filler itself.

In fact, even if a preceding context were indeed present, it would still be unclear how differences in acceptability correlate with different degrees of pre-establishment. Consider in particular example (14a). In order for such a sentence to be pragmatically felicitous, it must be the case that in any possible preceding context which can be felicitously associated with (14a), “gas” must either be mentioned or must represent shared knowledge. In this respect, observe the contrast between (15a) and (15b), where two different preceding contexts for (14a) are presented:

- 15) While driving on the highway:
- a) A: “I’m running really low on gas, I’m afraid I’ll have to stop at the next rest stop. The problem is that gas is so expensive in this region. I need at least 50 gallons to get to our destination, but I should probably just buy enough to get going for a few more kilometers, and then head to another rest stop.”  
 B: “So tell me...How much gas were you wondering whether to buy here?”<sup>3</sup>
- b) A: “I’m starving, I’m afraid I’ll have to stop at the next rest stop to buy something to eat. The problem is that everything is so expensive in this region. I am so hungry I could eat an entire triple cheeseburger, but I should probably just buy some snacks, enough to get going for a few more kilometers, and then head to another rest stop.”  
 B: #/\*“So tell me...How much gas were you wondering whether to buy here?”<sup>4</sup>

It follows that, if preceded by a context, the lexical restriction in (14a) would necessarily have to be pre-established. We would thus expect (14a) to be as grammatical as any d-linked construction, a prediction which is obviously not borne out. Also consider that the context depicted in (15a) would be equally felicitous as the preceding context for (14b). The fact that the same context could felicitously be used to introduce both (14a) and (14b) shows that it is unlikely that the ungrammaticality of (14a) stems from the fact that “gas” in (14a) is less linked to the preceding discourse than it is in (14b): the fact that both alternatives can be preceded by the very same context would make “gas” equally pre-established in both.

## 2.1 D-linking as a Composite Notion

In this section, I explore the possibility that d-linking is not the monolithic notion it has so far been taken to be, but is in fact a composite notion formed by two primitives, *givenness* and *restrictiveness*.

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<sup>3</sup> Note that, if preceded by an appropriate context, even sentences of the type of (14a) are acceptable. The role of the preceding context in making a given island-violating structure acceptable will be discussed in more detail in the following section.

<sup>4</sup> If not preceded by a sensible context, (14a) is not only pragmatically infelicitous, it is in fact simply ungrammatical.

The term *givenness* has the same meaning which is associated with the traditional definition of d-linking, as seen in Pesetsky (1987): a constituent is given if it refers to a contextually pre-established set of entities, and hence can be said to be *given*, in the sense of *salient* and *easily accessible*.

*Restrictiveness* and *restrictive* are here used as synonyms of “exact reference/referentiality”: they will be employed to describe constituents which have a precise, exact reference, as opposed to constituents which, for example, merely denote a set of entities, without picking a specific member out of it. In this sense, the contrast between [+ restrictive] and [– restrictive] entities is parallel to the one which characterizes [+ definite] and [– definite] nominal expressions: to be able to utter a definite expression like “the book”, there must exist a specific book about which the speaker is talking. When uttering a nominal expression like “a book”, on the other hand, no such presupposition is present. Indeed, the expression “a book” merely restricts the set of relevant entities to the ones which are part of the set of books, without picking out a specific member out of this latter set.

However, whereas a DP can only be either definite or indefinite, there are arguably different levels of restrictiveness, with the more restrictive expressions being the ones whose referent is more specific and hence more easily identifiable. Consider the following examples:

16) **What** did you like best?

17) **Which book** did you like best?

18) **Which of the books Erwin gave you** did you like best?

The expression “which book” in (17) is more restrictive than bare “what”, as “which books” restricts the set of entities to be considered to the set of books. The wh- phrase in (18) is however more restrictive than “which book”, as the extra information encoded in restrictive relative clause significantly restricts the set of possible books to be considered.

Note that restrictiveness is here taken to be a mere property of a given constituent (be it a canonical DP or a wh- phrase), the way definiteness is. In this sense, restrictiveness does not refer to or interact with discourse-contextual cues: the questions in (16) and (17) could have very well been preceded by a context which made clear that the entities the speaker is inquiring about are the books given by Erwin, causing “which book” and “what” to be just as restrictive as the wh- expression in (18). This is a type of “restrictiveness via context” which would however require a separate thesis to be discussed in sufficient detail and which will only be briefly touched upon in the present work.

There are several reasons why an analysis of d-linking in terms of restrictiveness seems particularly fitting. First of all, on a lexical-semantic level, there appears to be a restriction on the types of nominal expression which qualify as felicitous answers to a d-linked question. These expressions can generally never be [– restrictive], as can be seen in (19):

- 19) a) “Which books were you wondering whether to buy?”  
 b) ✓ “*The Lord of the Rings* and *the Selfish Gene*.”  
 # “Some books.”

We know that a certain degree of similarity between the filler in a question and the set of possible answers to such a question must be assumed: if the filler is a manner wh-constituent (e.g., *how?*, *with what?*), for example, all possible answers to the given question must be manner phrases. If the filler is a duration wh-constituent (e.g., *for how long?*), all possible answers will express some form of duration. Finally, if a filler is a wh- phrase like “who”, all possible replies to the question must have as referents [+ human] entities<sup>5</sup>. The restriction on the types of DP which can felicitously be used as a reply to a d-linked question would thus seem to suggest that d-linked fillers may also be restrictive.

On a syntactic level, d-linked constituents can never appear in existential constructions (Shields, 2008), just like specific DPs (Milsark, 1974). In particular, compare the pair in (20), where definite and indefinite DPs are used, with the examples in (21), where d-linked and non-d-linked fillers are contrasted:

- 20) a. There are some cows in the yard.  
 b. \* There are the cows in the yard.
- 21) We’re in trouble.  
 a. But who (the hell) is there that can help us?  
 b. \* But which person is there that can help us?

(Shields, 2008: 7)

Definite expressions can reasonably be argued to always be restrictive: once again, to be able to utter a definite expression like “the book”, for example, there must exist a specific book about which we are talking. The fact that d-linked fillers can never appear in existential constructions, exactly like definites, is then additional evidence in favor of a restrictiveness analysis of d-linked constituents.

Finally, the idea that d-linked constituents are restrictive also appears to be compatible with a language processing analysis of filler-gap dependencies, in that [+ restrictive] constituents are arguably better “equipped” to survive through island domains. In particular, restrictive constituents encode more information than non-restrictive ones. Compare “what” with “which book”: the latter wh-expression informs the comprehender that the entity about which the speaker is inquiring is a single entity (number information), and that it is a book (lexical information). The more information is encoded in a filler, the stronger the corresponding memory trace will be (Hofmeister and Sag, 2010), and hence the easier it will be to correctly retrieve such a filler at the gap site. The extra amount of information will also cause these constituents to be less sensitive to possible interference effects caused by competitor items (Van Dyke &

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<sup>5</sup> With the obvious exception, of course, of all those cases in which the agent, patient or theme of an action unexpectedly turns out to be [-human] (e.g., A: “Who knocked on the door?” B: “That was actually the dog”).

McElree, 2006, 2006; Van Dyke & Johns, 2012), as the more information is encoded in a given constituent, the more dissimilar from possible competitors this constituent becomes. [+ Restrictive] fillers can also be said to be associated with a stronger memory trace in that they trigger the search for a relevant antecedent, and are therefore associated with a higher processing load. Consider again the pair *what/which book*: when processing “which book”, the comprehender will by default assume that the presence of the lexical restriction is pragmatically felicitous, and will start searching for a relevant antecedent (in the case at hand, either a set of books or some related notion, like “bookshelf”, “library”) in the discourse. This accommodation process will lead to a more intense processing of this filler, which will thus be associated with a stronger memory trace. [+ Restrictive] constituents are thus more likely to survive across syntactic structures which are known to strain the processor’s resources, as it is the case for islands (Deane 1991; Kluender & Kutas 1993; Kluender 1991, 1998; Alexopoulou & Keller, 2007; Hofmeister & Sag, 2010). Note that this would straightforwardly capture the higher acceptability of island violations featuring a filler with a lexical restriction.

The assumption that restrictiveness is one of the primitives underlying the notion of d-linking also “takes care” of some of the issues with the current definition of d-linking, as discussed in section 2. The restrictiveness hypothesis for instance takes care of the “defeasibility” of the absence of d-linking: as pointed out in the preceding section, most *wh*-phrases can be rendered d-linked provided the right amount of restrictive nominal, prepositional or clausal modification (e.g., how much gas → how much of the gas you need). This is unexpected under a pure *givenness* analysis of d-linking, as modifying the amount of information encoded in the *wh*- filler should and does not have any effect on the preceding context. On the other hand, the defeasibility of the absence of d-linking follows if one assumes that restrictiveness is one of the primitives underlying d-linking effects: all types of modification add extra information to that already encoded in a given constituent, thereby increasing its specificity<sup>6</sup> and hence its restrictiveness.

Another particularly challenging issue with the existing definition of d-linking was represented by the fact that d-linked questions are perceived to be grammatical even if presented in isolation, i.e., if not preceded by a relevant context. If d-linking were solely a matter of being pre-established, i.e. of being *given*, no improvement in grammaticality should be observed for sentences in isolation, as these could never be *given*. If, on the other hand, d-linking is the result of two interacting forces, *givenness* and *restrictiveness*, an effect should be expected not only following manipulations of the preceding context, but also of the filler itself. More importantly, an effect would also be expected for sentences in isolation, as *givenness* would no longer be a relevant factor, but *restrictiveness* would still be.<sup>7</sup>

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<sup>6</sup> I am here using the term “specific” in the general sense of the word, i.e., as an antonym of “vague”, and not in the sense of Enç (1991), who essentially uses this term as a synonym of “pre-established”.

<sup>7</sup> In some cases, world knowledge may count as *givenness* (Pim Mak, p.c.). Consider the sentence “what were you wondering whether to have for dinner?”, which is acceptable despite being presented in isolation and despite the filler being a bare *wh*- word. This is presumably because the mention to “dinner” has the effect of restricting the set of entities which may be the referents of “what” to the set of possible foods. World knowledge (knowing that people normally have dinner, and that dinners consist of food) therefore may act similarly to how a d-linked filler like “which food” acts. The role of the context in restricting the set of possible entities to be considered will be discussed in more detail later on in this section.

A restrictiveness analysis of d-linking also captures the marked ungrammaticality of the extraction of aggressively non-d-linked fillers. According to standard accounts of d-linking, these constituents cannot be extracted out of weak-islands in that not linked to the discourse. As a sentence featuring the extraction of an aggressively-non-d-linked phrase will still be ungrammatical even if presented in isolation, discourse-linking obviously cannot be the only factor at play.

As pointed out in section 1.1., the reason why speakers use aggressively non-d-linked questions is to express utter surprise about all possible answers to the question. A speaker who were to utter a question like “what the hell didn’t you know whether to find?” would then clearly have no clue about what kind of object their interlocutor is looking for. This could equally be a pen, a wallet, an elephant or the last copy of a crochet magazine. Clearly then, wh- expressions like “what the hell” cannot have a specific referent and must thus necessarily qualify as non-restrictive.

A restrictiveness analysis of d-linking would also capture the fact that quantity wh-phrases, if not otherwise modified, seem to lie at the bottom of the acceptability scale of types of wh- extraction (see again (13)). Wh-fillers like *how much* and *how many* range over quantities, and hence over non-individuated domains. This is of course incompatible with a restrictive reading, in that restrictive constituents, to qualify as such, must necessarily range over discrete individuals.

The idea that restrictiveness underlies d-linking is also compatible with the hypothesis put forward by Szabolcsi (1998), and a number of other authors (Aoun, 1986; Cresti, 1995; Dobrovie-Sorin, 1994; Frampton, 1990 and Rullman, 1993), that d-linked fillers must necessarily range over discrete entities, and that it is this “individualhood” which positively affects the acceptability of weak island extractions. The account proposed in this thesis is however fundamentally different from that advocated by Szabolcsi *et alii*, in that the property underlying the restrictiveness primitive is a *processing* and not a *semantic* one. Under a semantic analysis, wh-constituents which range over individuals are insensitive to islands in that, unlike other fillers, they can take scope over these intervening elements. Under the analysis here proposed, on the other hand, fillers which range over discrete entities can survive weak islands because they are associated with a stronger memory trace and because the extra information they carry can be used to unequivocally pinpoint their referent, which can thus be more easily accommodated into a relevant mental representation.

Another reason why the individualhood analysis proposed by Szabolcsi and other authors differs from the one here advocated lies in the nature of the proposed variable: whereas individualhood is arguably a binary property -a given filler can either range or not range over discrete individuals, as there are no such things as “almost discrete” individuals-, restrictiveness appears to be a graded notion<sup>8</sup>.

The role of the type of filler in determining the d-linking of a constituent seems in fact to outweigh the role of a possible preceding context: questions featuring an intervening island violation can still be acceptable even if presented in isolation, but provided that the filler has a lexical restriction. An argument could then probably be made to eliminate completely the notion of givenness, in favor of a complete identification of d-linking with restrictiveness. A similar approach has for instance been adopted by Hofmeister and Sag (2010),

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<sup>8</sup> See in particular section 4.1 for a more detailed discussion on the gradability of the *restrictiveness* primitive.

who identify the source of d-linking effects in the different amount of information encoded in the various types of wh-phrase. I am however hesitant to adopt an approach this radical because of examples of the type of (22):

- 22) A: You probably noticed that there is a series of objects on the table. I need to choose ten of them and bring them to the flea market, so that I can sell them. I just don't know which ones to choose. I have some ideas, but I am not entirely sure yet.  
B: **What** were you wondering whether to bring exactly?

The use of a bare wh-word like “what” in (22) is acceptable, despite the sentence featuring an intervening weak island. This is because the preceding context – in this case, A's utterance– makes it clear that what speaker B is inquiring about is the set of objects on the table that A just mentioned, i.e., a set of discrete entities. It can be concluded that the preceding context does indeed seem to have a role in determining the acceptability of a given weak-island construction, if only by increasing the likeliness that the filler will be interpreted as being restrictive: in (22), the presence of a preceding context makes it possible for the bare “what” (22) to be interpreted as ranging over discrete individuals, the objects on the table, rather than over a non-specified set of entities. In this respect, (22) closely resembles the example in (9), in that both can be described as instances of “restrictiveness via context”.

Similar considerations seem to be at the origin of examples of the type of (23), which was originally presented in Rizzi (2000):

- 23) How many problems do you wonder how to solve?

(Rizzi, 2000: 6)

As pointed out in Rizzi (2000), one can imagine two possible contexts, and hence two different readings, for the example in (23). Under the first reading, the speaker has no particular knowledge of the set of problems mentioned: he or she is thus merely inquiring about the quantity of problems his interlocutor is unsure about how to solve. A felicitous answer to this type of question would be one simply providing the cardinality of the set of problems (e.g., “10 problems”). Under the second reading, we assume that both the speaker and his/her interlocutor are by some circumstance aware of the existence of the set of problems and its composition. A felicitous answer to (23) would then no longer be one merely providing the cardinality of the set, but one also stating their exact reference (e.g., “three problems, namely n. 3, 5 and 7”). According to Rizzi, only this latter reading is grammatical. Once again, an appropriate preceding context (or more accurately, our intuitions about what a possible context may be) can have the effect of turning an otherwise non-distinct (and thus non-restrictive) set of entities into one for which different specific members can be recognized.

## 2.2 Experiment 1: Manipulating the Restrictiveness of Wh-Constituents

If restrictiveness is indeed one of the primitive notions underlying d-linking, manipulations of the level of restrictiveness of the wh-phrase in weak island constructions should correlate with different degrees of grammaticality of the sentence itself. In particular, the prediction is that sentences with more restrictive wh-phrases will be perceived as being more acceptable than the corresponding sentences with less restrictive fillers.

In the present section, I will present the design and the results of an acceptability judgment test whose purpose was precisely to determine if this is indeed the case.

### 2.2.1 Participants

34 subjects took part in this experiment (mean age: 25, standard deviation: 2.6). All were native speakers of Italian. Linguistics students were excluded from participating in this experiment, as these are likely to be biased in their judgment of weak island constructions.

### 2.2.2 Design and methods

The experiment consisted of a linguistic acceptability judgment test. Each participant was presented with a questionnaire consisting of 42 Italian sentences, 12 of which were test items and 30 of which were fillers.

Two types of syntactic structures were tested: *whether* islands and negative islands. Both are standardly considered to be instances of weak island violations (Cinque, 1990; Kuno & Takami, 1997; Rizzi, 1990; Szabolcsi & Swarts, 1997; Szabolcsi, 2006). For each syntactic structure, six questions featuring fillers of various degrees of restrictiveness were created. In particular, I contrasted three main degrees of restrictiveness: I compared [- *restrictive*] wh-phrases with [*moderately restrictive*] and with [+ *restrictive*] ones, to determine whether the degree of restrictiveness of the filler was a significant predictor of the acceptability of the overall sentence.

The [- *restrictive*] fillers were bare wh- words of the type of “who, which” (Italian: *chi/cosa*). The [*moderately restrictive*] fillers were fillers of the type of “which book” (Italian: *quale libro*), which feature a lexical restriction but do not otherwise restrict the set of books which has to be taken in consideration. There were four types of [+*restrictive*] fillers:

- i) [+ demonstrative] fillers,  
e.g. “Quali fra questi libri”  
“*Which of these books*”
- ii) [+ numeral] fillers,  
e.g. “Quali fra quei tre libri”  
“*Which of those three books*”
- iii) [+ restrictive relative clause] fillers,  
e.g., “Quali fra i libri che Sylvie ha consigliato”  
“*Which of the books Sylvie suggested*”

- iv) [+ adjective]<sup>9</sup> fillers.  
 e.g. “Quali fra i libri di letteratura”  
 “Which of the literature books”

This experiment can be described as a study on *information*. We know that speakers rely on a variety of different types of information to process and understand language, including for instance general word knowledge, phrase-structure information, pragmatic intuitions and lexical-semantic information (Gibson & Pearlmutter, 1998; Gibson et al. 1996). The proposed experiment is an attempt to investigate how the amount of information encoded in wh- fillers correlates with the perceived unacceptability of weak-island violations.

Below is a complete test items, listing all the six degrees of restrictiveness tested:

**Table 1:** Six degrees of *restrictiveness* tested, complete paradigm;  
*Whether* island, *restriction*: “books”, *predicate*: “to buy”.

<p>1. <b>Cosa</b> ti domandi se comprare?                      What do you wonder whether to buy?</p>	<p>NOT RESTRICTIVE<sup>10</sup></p>
<p>2. <b>Quale libro</b> ti domandi se comprare?                      Which book do you wonder whether to buy?</p>	<p>MODERATELY                      RESTRICTIVE</p>
<p>3. <b>Quali fra questi libri</b> ti domandi se comprare?                      Which of these books do you wonder whether to buy?</p> <p>4. <b>Quali fra quei tre libri</b> ti domandi se comprare?                      Which of those three books do you wonder whether to buy?</p> <p>5. <b>Quali fra i libri che Sylvie ha consigliato</b> ti domandi se comprare?                      Which of the books Sylvie suggested do you wonder whether to buy?</p> <p>6. <b>Quali fra i libri di letteratura</b> ti domandi se comprare?                      Which of the literature books do you wonder whether to buy?</p>	<p>RESTRICTIVE</p>

<sup>9</sup> I am using the label [+ adjective] as an “umbrella term”, i.e., to refer to all those modifiers which can be described as being “adjective-like”, although they may not necessarily be APs (e.g., in Italian, “literature” in “literature books” is a PP).

<sup>10</sup> Note that the labels “not restrictive” and “restrictive” are merely a convenient simplification: as will be discussed in more detail in section 4.1, a given constituent cannot be absolutely restrictive or non-restrictive, but more or less restrictive as compared to some other constituent. Indeed, a wh-phrase like “what” can also be said to be restrictive, as it narrows down the set of entities to be considered to those marked as [- human].

Three lexicalizations were created for each test item by varying the content words. As adjunct and argument extraction are generally taken to exhibit different degrees of grammaticality, with adjunct extraction being perceived as considerably more degraded (Huang, 1982; Lasnik and Saito, 1984, 1992; Chomsky, 1986), only arguments were used. This ensured that different items and conditions had the same overall degree of syntactic acceptability, and hence that possible differences in their acceptability were more likely to solely be due to our manipulations of the filler. Also note that this ensures that all constituents tested were referential, (in the sense of Rizzi (1990), and thus that there was an equal potential for d-linking.

The three lexicalizations were distributed across three different lists using a latin-square procedure; each list was then pseudo-randomized to ensure that related conditions would have not appeared sequentially. Moreover, each test item was both preceded and followed by two fillers, so as to avoid the risk of participants recognizing similarities among the various test items. Following Sprouse et al. (2011), six “anchoring” items were also added on top of each questionnaire. These items were identical across all questionnaires; they were not marked as distinct from the remaining items in any way, and had to be rated for acceptability just like all other stimuli. Two of these items were strongly ungrammatical, two were perfectly grammatical, and two presented moderate grammatical violations. The purpose of these anchoring items was to pre-expose each subject to a wide range of grammatical acceptability, so as to avoid potential “false negative” or “false positive” judgments when rating the first test items.

### 2.2.3 Procedure

Participants were asked to rate each item using a 1-to-7 point Likert scale. Following Keller (1998), I adopted “descriptive” Likert scales: each degree of the scale was accompanied by a one or two-word description of what the items in that degree should have “looked like”. Below is the Likert scale which was used in this experiment, which appeared under the “instruction” section on the top of each questionnaire:

La scala

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
Malissimo	Male	Maluccio	Passabile	Accettabile	Quasi Perfetta	Perfetta

**Fig 1.** The scale= (1): Extremely bad, (2): Bad, (3): Rather bad, (4) So and so, (5) Acceptable, (6) Almost perfect, (7) Perfect.

Traditional Likert scales only provide a label for the endpoints of the scale: “1” is usually labelled as “completely unacceptable”, and “7” as “perfectly acceptable”. What the most appropriate descriptions of all other intermediate degrees may be is something which is left at the discretion of the participant, who is thus encouraged to assign whichever label he or she may find most appropriate. The problem with this practice is that participants usually have extremely different ideas on how to qualify these intermediate degrees. This can be easily tested by asking a group as small as three people to label degree 4: they will all most likely come up with different labels. For some, 4 will most likely stand for “acceptable”, for some others it will describe a degree of acceptability which is slightly more than ok, and for others it will represent a moderately degraded sentence. This situation is far from ideal, as it greatly reduces the power and the generalizability of the

experiment: it would be unfortunate if a group of participants were to rate as 5 some item that another group of participants would rate as 4, when in fact they both had in mind a similar acceptability judgment. This situation would have been particularly detrimental for the present experiment, where the object of inquiry are weak island violations. Weak island violations are standardly assumed not to be entirely grammatical and yet not to be completely unacceptable; they are thus most likely to be rated using the intermediate degrees of the Likert scale.

Participants were specifically instructed not to rate the sentences according to their grammaticality, but according to their perceived degree of *acceptability*: to explain to participants, who were all non-linguists, what “acceptability” meant, subjects were told that if they thought a given sentence was ungrammatical according to traditional grammars, but was in fact something they would either use or accept in everyday conversation, they should have rated it as acceptable. Participants were also instructed not to linger on a single sentence, but to provide, whenever possible, rapid and instinctive judgments.

#### 2.2.4 Results

All judgments which were more than two standard deviations away from the mean ratings associated with each experimental condition (4 cases, 0.9 % of the data) were excluded from further analysis.

A two-way, repeated-measures analysis of variance was first conducted on the four [+ restrictive] conditions, to determine whether there was a significant effect of the type of lexical restriction used.

*Type of island* and *type of complexity* were the two factors in the analysis: the *type of island* variable described the type of weak island tested, either a *negative island* or a *whether island*. This variable thus had two levels: *negative island* and *whether island*. *Type of complexity* had four levels, each corresponding to one of the four [+ restrictive] conditions. The four levels thus were [+numeral], [+relative clause], [+demonstrative] and [+adjective]. In other words, this analysis had a 2x4 design. The dependent variable was represented by the ratings assigned by each subject to each of the eight experimental conditions:

**Table 2:** Experiment 1, sub-design 1, Four [+ restrictive] conditions, (2x4).

		Type of Island	
		Negative Island	Whether Island
Type of Complexity	[+Numeral]	Mean Rating	Mean Rating
	[+Relative Clause]	Mean Rating	Mean Rating
	[+Demonstrative]	Mean Rating	Mean Rating
	[+Adjective]	Mean Rating	Mean Rating

The results of the ANOVA revealed a significant main effect of *type of islands*, with negative island extractions being judged as overall more acceptable than *whether* island extractions ( $F(1,33)= 5.613, p = .024$ ):

**Table 3:** mean ratings for the four [+ restrictive] conditions, as a function of the variable *type of island*.

Type of Island	Mean Ratings	Standard Error
Negative Island	6,029	,139
Whether Island	5,632	,146

There was also a significant main effect of *type of complexity* ( $F(2.2; 72.2^{11}) = 19.062, p = .000$ ). In particular, the numeral condition was judged to be the most acceptable, followed by the relative clause condition. The adjective condition was on average judged to be slightly more acceptable than the demonstrative condition, but pairwise comparisons revealed that this difference was not statistically significant.

**Table 4:** mean ratings (1-to-7 point Likert scale), as a function of the variable *type of complexity*.

Type of Complexity	Mean Ratings	Standard Error
Numeral	6,441	,084
Demonstrative	5,353	,186
Relative Clause	6,029	,151
Adjective	5,500	,169

**Table 5:** pairwise comparisons for the four [+ restrictive] options, as a function of *type of complexity*.

(I) Type of complexity	(J) Type of complexity	Mean Difference in ratings (I-J)	Standard Error	Significance
Numeral	Demonstrative	1,088*	,175	,000
	Relative Clause	,412*	,120	,010
	Adjective	,941*	,152	,000
Demonstrative	Relative Clause	-,676*	,211	,018
	Adjective	-,147	,129	1,000
Relative Clause	Adjective	,529*	,167	,020

\*= the difference is significant ( $p < .05$ , see also “significance” column).

<sup>11</sup> Sphericity was violated ( $\epsilon = .67$ ): the degrees of freedom were corrected using the Huynh-Feldt adjustment.

As the main purpose of this experiment was to determine whether the degree of restrictiveness associated with a given *wh*- phrase is a significant predictor of the acceptability of the overall question, I also conducted an analysis of variance to determine whether there was a significant difference in acceptability among the [- restrictive], [moderately restrictive] and [+ restrictive] fillers. Given that the first ANOVA showed that the four [+ restrictive] conditions were significantly different from each other<sup>12</sup>, four different ANOVAs were computed, one for each of the four possible combinations which arise by contrasting [- restrictive], [moderately restrictive] and each one of the four [+ restrictive] fillers. In other words, I compared the mean acceptability ratings associated with the following combinations of experimental conditions:

- i) [- restrictive], [moderately restrictive] and [+ restrictive, +*numeral*] fillers,  
e.g., *who/what* with *which books* and with *which of those three books*;
- ii) [- restrictive], [moderately restrictive] and [+ restrictive, +*demonstrative*] fillers  
e.g., *who/what* with *which books* and with *which of these books*;
- iii) [- restrictive], [moderately restrictive] and [+ restrictive, +*relative clause*] fillers  
e.g., *who/what* with *which books* and with *which of the books that Sylvie suggested*;
- iv) [- restrictive], [moderately restrictive] and [+ restrictive, +*adjective*] fillers  
e.g., *who/what* with *which books* and with *which of the literature books*;

This was done so as to determine whether there was a significant effect of the degree of restrictiveness of a given constituent, regardless of the type of [+ restrictive] constituent tested.

The two factors in this second analysis were *degree of restrictiveness* and, once again, *type of island*. The degree of restrictiveness variable referred to the level of restrictiveness tested: [- restrictive], [moderately restrictive] or [+ restrictive]. This variable thus had three levels. The *type of island* variable described the type of weak island tested, either a negative island or a *whether* island. This second analysis thus featured a 2x3 design, with a total of six experimental conditions for each one of the four combinations tested. The dependent variable was once again represented by the mean ratings assigned by each subject to each of the experimental conditions:

**Table 6:** Experiment 1, sub-design 2;  
3 degrees of restrictiveness (2x3).

		Type of Island	
		Negative Island	Whether Island
Degree of Restrictiveness	[- Restrictive]	Mean Rating	Mean Rating
	[Moderately Restrictive]	Mean Rating	Mean Rating
	[+ Restrictive]	Mean Rating	Mean Rating

The results of the four repeated-measures ANOVAs showed a significant effect of both *degree of restrictiveness* and *type of island*. Once again, negative islands were judged to be more acceptable than *whether* islands. As far as the degree of restrictiveness is concerned, [- restrictive] conditions were perceived

<sup>12</sup> With the sole exception of the [+ demonstrative] and [+ adjective] conditions, which appeared not to be significantly different from each other (see again the results detailed in table 5). Two separate ANOVAs were nevertheless computed for both for completeness.

as being the least acceptable conditions, and the [+ restrictive] conditions were perceived as being the most acceptable:

**Table 7:** mean ratings as a function of the variable *Degree of Restrictiveness*.

Experimental Condition	Mean Rating	Standard Error
[- restrictive]	2.2	.134
[ moderately restrictive]	4.7	.161
[+ restrictive, numeral]	6.4	.084
[+ restrictive, demonstrative]	5.35	.186
[+ restrictive, relative]	6	.151
[+ restrictive, adjective]	5.5	.169

**Table 8:** pairwise comparisons for each combination of the three degrees of complexity, as a function of the variable *degree of restrictiveness*.

(I) Degree of restrictiveness	(J) Degree of Restrictiveness	Mean Difference in ratings (I-J)	Standard Error	Significance
[-restrictive]	[moderately restrictive]	-2,471*	,245	,000
[-restrictive]	[ + restrictive, numeral]	-4,235*	,158	,000
[-restrictive]	[ + restrictive, + relative]	-3,824*	,211	,018
[-restrictive]	[+restrictive, +demonstrative]	-3,147*	,233	,000
[-restrictive]	[+ restrictive, + adjective]	-3,294*	,255	,000
[moderately restrictive]	[ + restrictive, numeral]	-1,765*	,147	,000
[moderately restrictive]	[ + restrictive, + relative]	-1,353*	,142	,000
[moderately restrictive]	[+restrictive, +demonstrative]	-,676*	,231	,018
[moderately restrictive]	[+ restrictive, + adjective]	-,824*	,181	,000

\*= the difference is significant (p. < .05, see also “significance” column).

Below are the results of the four ANOVAs. As the interaction between *degree of restrictiveness* and *type of island* was not significant for any of the combination tested (with a p. value always higher than .7), the data pertaining to the interaction variable are not reported.

**Table 9:** ANOVA results, 3 degrees of restrictiveness.

Experimental Conditions	Degree of Restrictiveness			Type of Island		
	Degrees of Freedom	F- Ratio	Significance (p)	Degrees of Freedom	F- Ratio	Significance (p value)
[- restrictive], [moderately restrictive], [+ restrictive, <i>numeral</i> ]	(1.4; 45.8) <sup>13</sup>	254.5	.000**	(1;33)	23.27	.000**
[- restrictive], [moderately restrictive], [+ restrictive, <i>demonstrative</i> ]	(2;66)	98.2	.000**	(1;33)	11.7	.002**
[- restrictive], [moderately restrictive], [+ restrictive, <i>relative clause</i> ]	(1.5; 50.4) <sup>14</sup>	180.5	.000**	(1;33)	10.7	.003**
[- restrictive], [moderately restrictive], [+ restrictive, <i>adjective</i> ]	(2; 66)	111.5	.000**	(1;33)	20.1	.000**

\*= p<.05

\*\*=p<.01

### 2.2.5 Discussion

The fact that structures containing a weak island violation were perceived to be more or less acceptable depending on the restrictiveness of the filler is evidence in favor of the soundness of our proposed definition of d-linking: the degree of restrictiveness of the wh- filler does indeed seem to be an important predictor of the acceptability of an island-violating structure.

Quite interestingly, the differences in acceptability among the four [+ restrictive] conditions appear to also be accountable in terms of the degree of restrictiveness associated with each of these expressions. In particular, it appears that the more a given phrasal modification restricts the set of entities to be considered, the more the overall weak island violation is judged to be acceptable. Consider for example the numeral condition (“which of these three books”), which was judged to be most acceptable [+ restrictive] option: out of all the [+ restrictive] conditions, the numeral one appears to be the most specific, as it restricts the entities to be considered to a set containing only three members, the three books. In this respect, the numeral condition clearly differs from conditions like the adjective and the demonstrative ones: this is because fillers like “which of the literature books” and “which of these books” do not narrow down the set of entities to be

<sup>13</sup> Sphericity was violated (epsilon= .67): the degrees of freedom were corrected using the Huynh-Feldt adjustment.

<sup>14</sup> Sphericity was violated (epsilon= .76): the degrees of freedom were corrected using the Greenhouse-Geisser adjustment.

considered as much as the numeral modifier does. Imagine standing in front of a library case filled with hundreds of books: the library case could very well contain fifty different literature books, so narrowing down the set of books to be considered by uttering something like “which of the literature books” may not be such a helpful indication after all<sup>15</sup>. The same applies to the demonstrative conditions: “which of these books” could in principle refer to all the books on the library case.

The higher acceptability of the relative clause condition (“which of the books that Sylvie suggested”) also appear to follow from a similar analysis: although it is in principle possible for someone to suggest that we should read twenty books, this is rarely going to be the case in the real world, where friends who show an interest in our reading tastes generally recommend three or four books at most. Also consider that, as the term suggests, restrictive relative clauses help in identifying the referent of the DP they modify by restricting the set of entities which needs to be considered. The implicit assumption when processing a restrictive relative clause is thus that the information encoded in the relative clause is enough to uniquely identify the referent of the DP which it modifies. This may be an additional explanation of why the relative conditions were perceived to be more acceptable than the demonstrative and the adjective ones, for which no such presupposition is present.

### 3. The Principle(s) Underlying D-Linking Effects

As highlighted in section 1.3, our understanding of d-linking is limited in two ways: not only the current definition of d-linking appears to be inadequate, there is also no consensus on what underlying principle or property is responsible for the higher acceptability of d-linked constructions. With regard to the last point, several different theories have been proposed. These range from suggesting that the underlying principle is semantic/pragmatic (cf. Cresti, 1995; Szabolcsi, 1998; Szabolcsi & Zwarts 1990, 1997), syntactic (cf. Cinque, 1990; Pesetsky, 1987, 2000; Rizzi, 1990, 2000) or related to more general, non-language-specific processing mechanisms (cf. Kluender, 1992, 1998; Kluender & Kutas, 1993; Hofmeister, 2007; Hofmeister & Sag, 2010). In this paper, I will focus on contrasting and possibly choosing between the two latter types of account: syntactic versus processing ones. With this aim, I will later present the results of two experiments I conducted which may shed some light on which account is more likely to capture d-linking effects.

I will start by reviewing some among the most credited syntactic and processing accounts of d-linking. In section 3.1, I will comment on Rizzi’s (2000) binding account, which can be seen as the natural evolution of a line of studies which dates back to at least the eighties (Pesetsky, 1987), and which takes d-linking to be a purely syntactic phenomenon. In section 3.2, on the other hand, I will present Kluender’s accessibility account, as well as Hofmeister (2007) and Hofmeister and Sag (2010)’s *informativeness* theory. Both these accounts assume d-linking not to be a syntactic process but the by-product of more general processing mechanisms and constraints underlying the formation of filler-gap dependencies.

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<sup>15</sup> In this respect, it would be interesting to test wh-phrases where the modifying adjectival phrase has the effect of restricting the set of entities to be considered to a small number of elements (e.g., *which of Mars’ moons*, as opposed to *which of Saturn’s moons*: Mars has two moons, Saturn has 62), to see whether the observed difference between the numeral and the adjective condition would disappear.

### 3.1 Rizzi (2000): A Reconstruction Account of D-linking

To account for the peculiar behavior of d-linked wh-phrases, Rizzi (2000) hypothesizes that these elements are connected to their lower copies via binding, a syntactic operation which is insensitive to island constraints.

The idea that a binding relation may be at the origin of the higher acceptability of d-linked constructions was in fact originally presented in Cinque (1990) and Rizzi (1990), who suggested that d-linked phrases bear a referential index, which allows these expressions to be connected to their trace via binding. Rizzi's (2000) account essentially follows in the footsteps of this earlier proposal, with yet some crucial differences.

An account in terms of binding was also offered by Pesetsky (1987), who suggested that the observed differences between non-d-linked and d-linked fillers are amenable to mechanical differences in their derivation: the former move whereas the latter bind.

To understand the logic behind Rizzi's (2000) account, let us start by considering a typical d-linked wh-construction:

24) Which books did you wonder [whether to buy \_\_\_\_]?

Rizzi suggests that in (24), "which books", being a DP, can enter into a chain relation with the relevant gap site by means of binding only. Binding is the syntactic relation thanks to which, for example, the pronominal element "him" in (25) can be connected to its quantified antecedent "no candidate":

25) *No candidate* knows all the people who voted for *him*

(Rizzi, 2000: 4)

Unlike standard local chains, where each copy of a displaced element must be in a minimal configuration (Rizzi, 1998) with the adjacent copies, binding is not subject to locality restrictions. This can be seen in (25): despite the presence of an intervening complex NP, a strong island, the accusative pronoun "him" can still grammatically corefer with its antecedent.

What Rizzi suggests is then to extend the notion of binding, which naturally applies to nominal expressions, so as to also cover d-linked fillers. The grammaticality of (24) would then ensue: extraction of the wh-phrase "which books" does not give rise to an island violation because the filler "which books" can be connected to its trace by means of a binding chain, which is not sensitive to intervening islands.

For Rizzi's proposal to work, there must also be a way to account for all those wh- fillers with a lexical restriction and which are DPs, and which could thus potentially bind their traces, but which are nevertheless ungrammatical if extracted out of a weak island:

26) \*How much gas [don't you know where to buy \_\_\_\_]?

To account for the ungrammaticality of (26), Rizzi resorts to the principle of *Full Interpretation* (Chomsky, 1977). Following Chomsky, Rizzi assumes that all material pied-piped by wh-movement must be returned to the extraction site at LF, so as to derive an appropriate operator-variable chain. For (26), this would be tantamount to the following LF structure:

27) \*How much x, don't you know where to buy [x gas]?

Crucially, the reconstruction of the lexical restriction “gas” in its base position leaves a bare QP in the C field at LF:

28) \*How much ~~gas~~ don't you know where to buy <how much> gas?

Being no longer a DP but a QP, “how much” can no longer be connected to its lower copy via binding, but must resort to normal chains, which are sensitive to locality constraints. The ungrammaticality of (26) thus follows.

If a *full Interpretation* account successfully manages to capture the ungrammaticality of sentences like (26), the system now appears to be too restrictive: if lexical restrictions should all reconstruct in their base position for interpretation, even fillers like “which books” in (24) would end up being transformed in a QP and hence should no longer be able to bind their lower copies. In other words, we would expect (24) to also be ungrammatical, contrary to fact.

To solve this latter issue, Rizzi (2000) suggests that the lexical restriction “books” in d-linked constructions like (24) resembles fronted topics in bearing an assumption of givenness and familiarity. This resemblance is exemplified in (29):

- 29)    **a. Topic construction:**        *The Selfish Gene*, John has read it yesterday.  
                                                  *As far as the Selfish Gene is concerned, John has read it*  
                                                  *yesterday.*
- b. D-linked construction:** Which problems don't you know how to solve?  
                                                  *As far as a given set of problems is concerned, which ones*  
                                                  *don't you know how to solve?*

In (29), both the aboutness topic in the topic construction and the lexical restriction in the wh-question act as subject of predication for their respective sentences, thereby restricting the focus of attention to “the Selfish Gene” and to a given set of problems respectively. As Rizzi (2000) notes, topics are typically licensed in the left periphery of the clause: they are either merged directly in the left periphery, and are then connected to their thematic role by binding an IP-internal *pro* (Cinque, 1990; Frascarelli, 2004), or they are merged in the IP and then moved to the left periphery via A-bar movement (Frascarelli & Hinterhoelz, 2007). Rizzi capitalizes on the resemblance between topics and d-linked wh-elements to suggest that the lexical

restriction in a sentence like (24) needs not to be reconstructed at LF for interpretation, but can, and in fact must, remain in the left periphery of the clause.

A problem with the account just described is that some *wh*- questions involving a d-linked *prepositional phrase* also appear to be grammatical. Consider for instance the Italian example in (30), which is just as grammatical as (24):

30) Di quali libri non sai se parlare ~~di quali libri~~?

Of which books don't you know whether to talk ~~of which books~~?

(Rizzi, 2000: 34)

The grammaticality of (30) is unexpected under the account just presented, in that “*di quali libri*” is a prepositional phrase, and as such it should not be able to bind its lower copy. To account for these exceptions, Rizzi suggests that d-linked prepositional phrases are turned into DPs at LF: the preposition *di* in the fronted *wh*-phrase is deleted, leaving only “*quali libri*” (which books) in its place. According to Rizzi, this deletion does not violate the requirement on the recoverability of deleted items: given that one occurrence of “*di*” is still present at the gap site, deletion of the higher *di* does not undermine the grammaticality of the structure. Crucially, the deletion of the higher *di* preposition has the effect of “shrinking” the trace of the fronted *wh*-element, as only the phrase “*which books*” is now *c*-commanded by an identical lower copy. The preposition *di* is therefore “exported out” of the trace, as can be seen in (31) (for simplicity, only the English translation is reported):

31) ~~Of~~ which book don't you know whether to talk of <which books>?

The application of these processes thus causes the fronted PP “*of which book*” to be turned into a DP. Being a DP, it is now possible for this constituent to be connected to its gap via binding, and hence in a way that does not violate locality constraints. The grammaticality of (30) then ensues.

### 3.1.1 Criticisms to Rizzi (2000)

There are several reasons why Rizzi's account seems fundamentally inadequate, both from a syntactic and a processing perspective. I will address each one in turn.

From a syntactic perspective, the claim that phrases can be selectively deleted seems unconvincing. Consider in particular the proposed PP deletion in (31): there does not seem to be any reason for the preposition *of* to be deleted other than to make the derivation work. Further confirming the *ad hoc* nature of Rizzi's proposal is the fact that this deletion does not result in any semantic contribution to the sentence: it really is just a way to make everything work. Secondly, Rizzi's proposal poses a considerable overgeneration problem: under Rizzi's analysis, there appears to be no particular restrictions weighing on the application of prepositional deletion, which can freely apply in order for the derivation not to crash. If prepositional deletion were indeed of such liberal application, however, we would expect it to apply on any kind of displaced prepositional phrase, including for instance non-d-linked prepositional fillers, whose extraction would then be predicted to

be grammatical. Following Rizzi's analysis, it would in principle be possible to counteract this undesired outcome by suggesting that prepositional deletion only occurs if the relevant PP is d-linked: if prepositional deletion is what salvages d-linked PP fillers from incurring in an island violation, it must be the case that such mechanism is not available for non-d-linked PP fillers. This brings us to a third issue with Rizzi's proposed analysis: it is unclear why the d-linking of a given prepositional filler should have any effect on whether the fronted preposition is deleted or retained at LF. Fourthly, if an argument could be made that a preposition like "di" in (31) is deleted at LF, it is unlikely that "contentful" prepositions like "under" or "behind" will undergo the same process, as these elements obviously have meaning and therefore could never qualify as dummy prepositions, as it may be the case for "di" in (30). We would thus expect any fronted PP headed by a contentful preposition to be ungrammatical in a weak island domain, contrary to fact: sentence (32), where the displaced PP is headed by the preposition "under", is for instance perfectly acceptable.

- 32) Sotto quale pila di libri [ti domandi se nascondere la lettera ~~sotto quale pila di libri~~]?  
 Under which stack of books [do you wonder whether to hide the letter ~~under~~  
~~which stack of books~~]?

A final criticism to Rizzi's account concerns the explanation the author provides to account for the ungrammaticality of the extraction of fillers like "how much gas" (see example (26)). According to Rizzi, the lexical restriction "gas" cannot remain in the left periphery but must be reconstructed in its argument position. "Gas" however does not appear to be any less akin to topics than the lexical restriction of any d-linked filler. Consider in particular the following examples:

- 33) \*How much gas don't you know where to buy \_\_\_\_?  
 34) Which books don't you know where to buy \_\_\_\_?

Just like "books" in (34), and indeed just like any aboutness topic, the restriction "gas" carries a presupposition of topicality: for a sentence like (33) to be felicitous in the discourse, "gas" must have been mentioned in the preceding text, and hence must represent knowledge which is accessible to the speaker<sup>16</sup>. Just like "books", "gas" functions as a subject of predication and as a grounding point (Givón, 1998) for the rest of the sentence, which represents its comment. In other words, there appears to be no substantial difference in topicality between "gas" in (33) and "books" in (34). If the topical nature of "books" in (34) is enough for it not to be reconstructed in the gap site, we would then expect that the same should hold for "gas" in (33).

From a processing point of view, it is unclear why the referential properties of the fronted wh- element (i.e., whether it is d-linked or non-d-linked) should have any influence on whether this constituent binds its trace or is connected to it via standard local chains. In particular, as pointed out by Chung (1994), it is difficult to imagine why the application of grammatical constraints should be influenced by the ability of the fronted wh- constituent to narrow down its domain of wh-quantification.

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<sup>16</sup> See also section 2.1.

Secondly, it is also unclear why the way a given filler is linked to its gap should have any effect on the perceived acceptability of possible intervening islands. It has been argued by a number of authors (Deane, 1991; Kluender & Kutas, 1993; Kluender, 1991, 1998; Alexopoulou & Keller, 2007; Hofmeister & Sag, 2010) that island structures strain the processor's resources over a threshold level, giving rise to a perception of unacceptability. Under this analysis, the type of syntactic relation by which a given filler is connected to the relevant gap should not really matter as long as an island intervenes between the endpoints of such a dependency: the nature of such a syntactic relation is not going to change the fact that a structure associated with above-the-threshold-processing costs, an island, represents material intervening in the dependency.

### 3.2 Kluender (1992, 1998), Hofmeister (2007), Hofmeister and Sag (2010): A Processing Analysis of D-linking

An alternative to a syntactic explanation of d-linking would be to assume that the peculiar behavior of d-linked questions can be explained in terms of the different processing load associated with these structures. This type of account has for instance been offered by Hofmeister (2007), and Hofmeister and Sag (2010). The two authors conducted several self-paced reading experiments on d-linked constructions, and observed that sentences featuring d-linked fillers are read significantly faster at the retrieval region; this processing advantage persists up to three segments after the gap site. In other words, when presented with two minimally different questions like the following:

- 35) a. BARE: Who did Albert learn whether they dismissed after the performance review?  
b. WHICH: Which employee did Albert learn whether they dismissed after the performance review?

(Hofmeister, 2007: 2)

Subject will process the tensed verb “dismissed” and subsequent regions (underlined) significantly faster when the antecedent is a d-linked wh-phrase (“WHICH” condition) rather than a bare wh- constituent (“BARE” condition). According to the authors, the fact that this effect only emerges at the gap site suggests that whichever property has the effect of lowering reading times does so by facilitating the retrieval of the fronted wh- constituent at the subcategorizing verb. In other words, d-linking positively affects the processing times associated with the *retrieval* of the displaced constituent.

Unlike Rizzi (2000), Hofmeister and Sag (henceforth, *H&S*) identify the critical principle responsible for d-linking effects not in some syntactic property but in the degree of *informativeness* of the filler phrase. Consider again the wh-constituents in example (35): the d-linked wh-phrase “which employee” encodes more information than the bare “who”. Unlike “who”, “which employee” carries a number specification, as well as information pertaining to the nature and the type of the entity about whom the speaker is inquiring. *H&S* suggest that lexically richer constituents are more likely to be retrieved correctly because their higher informativeness causes the corresponding memory trace to be more activated, leading to faster recall. Furthermore, lexical richness significantly lowers the possibility of incurring in either proactive or retroactive

interference phenomena (Van Dyke & McElree, 2006, 2011; Van Dyke & Johns, 2012): the more semantic and lexical features are associated with a given referential constituent, the easier it becomes to distinguish such element from other constituents which may be endowed with a similar array of features. Finally, as pointed out by the two authors, it is also possible that the additional lexical features may allow for a more accurate encoding of the wh-phrase, which would thus be easier to retrieve.

The idea that d-linked fillers may be easier to retrieve because they are associated with a stronger memory trace was in fact originally presented in Kluender (1992), (1998) and Kluender and Kutas (1993). Kluender et al. suggested that the higher saliency and discourse prominence associated with d-linked wh-phrases causes an increase of the activation levels of the corresponding memory trace, leading to faster recall. Not only are d-linked fillers associated with stronger memory traces, their higher salience and discourse prominence makes their corresponding referents more accessible, causing these constituents to be easier to process. This is in fact reminiscent of the notion of *forward accessibility*, as seen in Ariel (1990, 1999): the idea that the more prominent/salient a constituent is, the more this constituent will be accessible and hence easier to process.

### 3.3 Why Processing Analyses are Conceptually More Appealing than Syntactic Analyses

Kluender's (1992, 1998), Hofmeister's (2007) and Hofmeister and Sag's (2010) accounts can be described as a reductionist approach to d-linking: according to these authors, d-linked fillers can survive weak islands because they are more accessible and they bear a stronger memory trace than non-d-linked constituents. The observed differences between d-linked and non-d-linked constituents therefore do not follow from the application of some particular syntactic relation, but can be reduced to more general processing mechanisms. In this respect, their account is clearly antithetical to the one advocated by Cinque (1990), Pesetsky (1987, 2000) and Rizzi (2000), who identify the underlying cause of d-linking effects in some special application of the requirement that displaced elements must be connected to their lower copies.

A processing account of d-linking appears to be superior to a syntactic one because the latter necessarily adds a level of complexity to the system: the existence of an additional mechanism for a wh-phrase to be linked to its lower copy (binding) must be assumed. This has significant consequences for any theory of language acquisition: the more language-specific features and mechanisms are postulated, the more challenging the language learning process must be assumed to be. This problem can in principle be counteracted by assuming that these mechanisms are part of the genetic endowment of each human individual. This approach, which has often been referred to by the name of *Universal Grammar* (Chomsky, 1965) however also has its weaknesses (O'Grady, 2008, 2012; Tomasello, 2009).

Overall, reductionist approaches should be favored over domain-specific ones like Rizzi's binding account because, by Occam's razor, alternatives which require the fewest assumptions are preferred. Moreover, a reductionist approach seems to be particularly fit to describe d-linking effects: as argued above, islands are

structures which are extremely demanding for the human sentence processor. If Kluender and H&S are right in assuming that d-linked constituents are associated with a stronger memory trace and are overall more accessible than non-d-linked elements, it makes intuitive “sense” that these elements should be easier to retrieve/extract across island domains. Of course, simply because a theory seems to be intuitive, it does not mean that the theory itself is correct: this is where experimental testing comes into play. Furthermore, a reductionist approach should not simply be favored on the basis of its higher conceptual appeal: reductionist theories can only be legitimately preferred over competitor theories if the first manage to capture the same amount of empirical data that the latter do. There is in fact nothing inherently wrong with postulating thousands of domain-specific linguistic mechanisms and language biases, provided that these can be justified.

In the second part of this thesis, I explore the possibility that no additional syntactic mechanism is needed to capture d-linking effects, and that these can be accounted for solely in terms of general processing mechanisms. To this aim, I will present the results of two experiments which tested the effect of d-linking on non-left-peripheral referential expressions<sup>17</sup>, something which I believe to be a necessary step towards a better understanding of the notion of d-linking.

## 4. Rationale of Experiment 2

If a processing analysis of d-linking seems to be conceptually more appealing than a syntactic one, it is however also the case that none of the existing processing analyses allows us to confidently reject syntactic accounts in favor of a processing one, for a series of different reasons. Consider for instance Kluender’s (1992, 1998) *accessibility* hypothesis: his articles were mostly theoretical and therefore did not present any empirical evidence obtained through controlled experimentation, something which makes his proposal virtually impossible to test. A different problem characterises Hofmeister’s (2007) and Hofmeister and Sag’s (2010) accounts: the two authors did provide empirical evidence in favor of their conclusions, but the results they reported are in principle not incompatible with a syntactic analysis *à la Rizzi*. This is because all constituents tested by Hofmeister and Sag (2010) and Hofmeister (2007) were constituents which are generally assumed to be either merged or moved to the left periphery. A syntactic explanation of the observed result is thereby possible, as it could be speculated that the constituents for which Hofmeister and Sag found an effect were constituents which *bound* their gap. This result is quite paradoxical, as the processing account advocated by H&S, being reductionist, is intended to be in complete opposition to syntactic ones like the one suggested by Rizzi. To disentangle syntactic accounts like Rizzi’s from processing ones like H&S’s, it thus follows that it is necessary to test constituents which are not and which cannot in any way be suggested to be merged or moved to the left periphery, as it is the case for “canonical” referential expressions like those found in subject or object positions. With regard to these latter constituents, the processing account advocated by H&S and Kluender, and the syntactic analysis proposed by Rizzi make fundamentally different predictions.

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<sup>17</sup> I am here using the term “referential” in the sense of Rizzi (1990): a referential expression is a constituent which receives a theta-role referring to the participants of whichever event is described by the predicate (i.e., *argument*, *theme*, *patient*, etc.)

Although Rizzi (2000) does not provide any indication as to how his account should relate to actual processing times, some expectations regarding the reading times associated with d-linked and non-d-linked constructions necessarily follow from the assumptions and claims he makes.

Rizzi (2000) acknowledges that d-linked wh-questions featuring an intervening weak island are perceived as being more acceptable than non-d-linked ones. He claims that this is due to the fact that the latter involve a weak island violation, whereas the first do not. Under this analysis, it follows that the faster reading times reported by Hofmeister (2007) and Hofmeister and Sag (2010) at the intermediate gap site must necessarily be due to the grammaticality of d-linked questions: grammatical constructions are obviously going to be read faster than ungrammatical ones. Under this logic, questions featuring an intervening weak island and a non-d-linked wh-filler should not give rise to any processing speed-up, as these structures will necessarily incur in an island violation. Rizzi's account equally expects an effect of d-linking only to be observed for structures featuring extraction out of a potential island: if no island is present, both the d-linked and the non-d-linked conditions will be equally grammatical and hence will be read equally fast. Finally, the most important prediction for the purposes of the present work: Rizzi's theory predicts that no processing advantage should be observed for d-linked constituents other than left-peripheral phrases, as what causes d-linked questions to be read faster than non-d-linked ones is the possibility for the lexical restriction to remain in the CP. No effect is expected for non-left-peripheral constituents, as these obviously do not have the option of having their restriction remain in the left periphery, as this was never there in the first place.

On the other hand, a processing analysis of d-linking is not in principle incompatible with an effect of d-linking for constituents other than left-peripheral elements, and for syntactic environments other than weak islands. This is because, according to a processing analysis, d-linking is not the by-product of some special syntactic property associated with left-peripheral elements, but a more general processing mechanism by which otherwise taxing structures can be processed more rapidly. In particular, a processing analysis of d-linking assumes d-linked constituents to be more accessible, to be bearing a stronger memory trace and to be associated with a more accurate mental representation than non-d-linked constituents. Crucially, these are properties which would not simply facilitate the processing of left-peripheral elements, but of probably most types of constituent. Under this latter analysis, an effect of d-linking would thus in principle be possible also for constituents which are not merged or moved to the left periphery, provided for instance that the syntactic environment these constituents are associated with is also costly in terms of processing resources<sup>18</sup>, or that the language user has limited resources, as it is the case for aphasic patients (Grillo, 2008) or children (Avrutin, 2000).

Crucially then, if an effect of d-linking were to be found also for constituents other than left-peripheral elements, this would be convincing evidence in favor of a processing analysis over a domain-specific one like Rizzi's (2000) binding account.

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<sup>18</sup> It is reasonable to assume that the d-linking of a constituent will only have an effect on reading times if the structure the constituent is part of is associated with a processing cost: as a matter of fact, if the processing of a given sentence already occurs as fast as the human sentence processor will allow, no mechanism meant to facilitate these processes will be able to lower reading times any further.

Shifting the object of inquiry from left-peripheral constituents to constituents which are merged in other positions will also provide some useful indications as of the entity and the domain of application of d-linking. If under a processing analysis of d-linking we expect differences in reading times to also be observed for constituents other than those merged in the left periphery, we are however unsure about the entity, the locus and the nature of such an effect. In particular, we are unable to provide an answer to the following, crucial questions: will the d-linking of non-left peripheral constituents have an effect at all? And if an effect were indeed to be observed, would this be a positive (speed-up) or negative (slow-down) one? What would be the entity of such an effect? And at what regions would this effect be observed? Testing constituents which are not merged in the C field will thus not only allow us to more consciously choose between a processing and a syntactic account of d-linking, it will also provide us with the chance of gaining a better understanding of d-linking in general.

#### 4.1 What Qualifies as a D-Linked Referential Expression?

According to the definition of d-linking proposed in section 3.1, d-linking is a composite notion formed by two primitive concepts, *givenness* and *restrictiveness*. The properties of being given and being restrictive are not exclusively properties of wh- fillers, but of DPs in general: exactly like wh-phrases, any referential expression can or cannot refer to an entity which is part of a pre-established set. Moreover, just like wh-phrases, any DP can have an exact referent or an unspecified one.

But what would a d-linked referential expression “look like” exactly, and how can different DPs be manipulated to obtain different degrees of d-linking?

As already discussed above, restrictiveness is not a binary feature but a graded notion: a given constituent can be more or less restrictive than another one, depending on how specific its referent is. A similar argument can be made with respect to givenness: a given constituent can be perceived as being more or less pre-established, depending on how it was introduced in the preceding context. For example, if the constituent was introduced in a contrastive focus position, chances are that it will be perceived as being more salient than it would have been had it been merged in an adjunct position. Higher levels of saliency are then likely to correlate with a stronger perceived degree of givenness, as more salient constituents are more likely to remain longer in the focus of attention (Radó, 1998; Frazier & Clifton, 2002; Diaconescu & Goodluck, 2004).

As this is the first study which employs a composite definition of d-linking, and which investigates the d-linking of constituents other than left-peripheral elements, I deemed it more appropriate to restrict the analysis to the endpoints of the *givenness* and *restrictiveness* scales, rather than considering also all intermediate degrees of such notions. Once more is known about these two primitives, it will be eventually possible to extend the analysis so as to also cover these other degrees. In this study, I thus compared non-restrictive expressions with restrictive ones, and given DPs with non-given ones. Because of the graded nature of these two notions, the reader should however bear in mind that this is no more than a convenient

abstraction: nominal expressions cannot be absolutely restrictive or non-restrictive, and given or non-given, but are more or less given and restrictive if compared to some other expression or arbitrary reference point.

In Experiment 2, the degree of restrictiveness of a referential expression was manipulated by modifying the expression itself. For all [-restrictive] experimental conditions, the tested DP had the form of “un certo X”, e.g., “un certo esercizio” (“some X”, “some exercise”), an Italian construction whose purpose is generally to express uncertainty about the exact reference of the X item. This type of indefinite construction can be described as [- restrictive] because, despite restricting the set of entities to be considered to the set of all exercises, it does not provide any indication regarding which specific exercise one should pick.<sup>19</sup>

Two types of [+restrictive] nominal expressions were used: *hypernym/hyponym*-type ones, and *label*-type ones. An example of a [- restrictive/+ restrictive] pair with a hypernym/hyponym-type of constituent was for example “*some meat/chicken*”, where *chicken* is a hyponym of *meat*. Whereas the indefinite “some meat” does not indicate which entity to pick out of the set of types of meat, the word “chicken” picks a specific type of meat out of this latter set. The hypernym/hyponym contrast as an instance of specificity was also employed by Donkers et al. (2011).

An example of a [- restrictive/+ restrictive] pair with a label-type constituent was for instance “*some exercise/exercise 1*”. Just like the hypernym/hyponym types of constituent, the more restrictive item in the pair picked a specific entity out of a bigger, indistinct set. Unlike the hypernym/hyponym type of constituent, however, this restriction was not achieved via hyponymy, but through nominal and adjectival modification. Four types of modification were employed in this experiment: modification by number (e.g., *some exercise/exercise 1*), color (e.g., *some crayon/blue crayon*), size (*some chair/the biggest chair*) and shape (*some box/the square box*). These types of modifiers were chosen as they appear to represent primitives of modification and to be processed relatively fast if compared to other types of modifiers. This is a desirable condition, as it allows us to reduce possible differences associated with processing [+ restrictive] label-type DPs, which feature a modifying phrase, and [- restrictive] nominal expressions, for which no extra modifiers must be processed.

The degree of givenness was manipulated by varying the context preceding the DP whose d-linking was manipulated. As pointed out in section 2., the existing definition of d-linking does not provide any indication as of what types of preceding context make a given constituent d-linked (*given* in our definition), nor as of what types of manipulations are necessary to transform a non-d-linked context into a d-linked one. This will thus be something we will have to gauge for ourselves.

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<sup>19</sup> One can in fact easily think of expressions which are even less restrictive than “some exercise”: for example, “some thing/something” or “whatever” (the referential equivalent of an aggressively non-d-linked filler). These expressions were not used in this experiment because they are stylistically marked, and as such, they would have easily been spotted by participants as appearing in multiple items. In conclusion, there are other referential expressions which qualify as being less restrictive than “some X”, but “some X” appears to be the less restrictive option which can be tested experimentally to avoid participants recognizing the type of structure which is being tested.

There are arguably two ways for a constituent to be given (or, according to the standard terminology, d-linked): the constituent must have as referent an entity which either represents shared knowledge, or is pre-established in the sense of “previously mentioned/introduced in the discourse”. Testing shared knowledge experimentally is quite challenging, as this notion more readily applies to natural conversations, where real speakers make real assumptions on what bits of knowledge their interlocutors may share with them. In this study, I thus focused on the “pre-established” option which is also part of the definition.

It is reasonable to assume that there are at least two ways for a constituent to be pre-established: the constituent was either directly mentioned in the preceding discourse (e.g., A is saying to B that he can choose out of a set of seven possible courses to follow this semester, and B asks, “which courses will you take?”), or the preceding context referred to a semantically related word or concept (e.g., A is saying to B that he will be starting a fancy BA in Arts this September, and B asks, “which courses will you take?”). The manipulations of givenness conducted in this second experiment reflected these two modalities: for example, to have a DP like “exercise 1” be given, the preceding context either mentioned a set of exercises that students were engaged with (direct mention), or said that students were busy working on their science homework (indirect mention: homework is likely to consist of exercises). Having a modality other than direct mention to elicit givenness ensures that [+ given] constructions will not be read faster simply because the manipulated DP was mentioned before in the preceding context, i.e., because of *repetition priming* (Forster & Davis, 1984; Grill-Spector et al., 2006; Logan, 1990). This may however be an unnecessary precaution, in that the notion of d-linking, as intended by Pesetsky (1987), is indeed as “simple as that”: d-linked constituents are said to be pre-established, and the most common way for a constituent to be pre-established is precisely to have been mentioned before in the discourse.

## 4.2 The Tested Structure

To be able to determine whether the d-linking of a referential expression also has an effect on the overall sentence, the DP whose d-linking is manipulated must obviously be inserted in an appropriate clause. The sentence used in Experiment 2 had in particular the following structure:

- 36) Com'è<sub>i</sub> che Mario pensa che l'esercizio n. 1<sub>ii</sub> possa essere risolto t<sub>ii</sub> t<sub>i</sub> per trovare sia la x che la y?  
How<sub>i</sub> does Mario believe that exercise 1<sub>ii</sub> can be solved t<sub>ii</sub> t<sub>i</sub> to find both the x and the y?

The underlined DP (“l'esercizio n. 1” (“exercise 1”) in (36)) represented the nominal expression whose restrictiveness and givenness were manipulated to obtain different degrees of d-linking.

There are several reasons why a structure like (36) is interesting for the purposes of our investigation, as will become evident later in this section. Let us first start by analyzing the syntax of (36). It features two different types of dependency: the A-bar dependency headed by the adjunct “how”, a wh- dependency, and the A-dependency headed by the embedded DP “exercise 1”, which is a derived subject. It follows that, by the time comprehenders encounter the embedded DP “exercise 1”<sup>20</sup>, two constituents will have to be held in working

<sup>20</sup> More precisely, this will happen upon the presentation of the passive auxiliary “essere” (“be”), i.e., when it becomes clear that the embedded clause is in the passive tense and hence that “exercise 1” must be a derived subject.

memory until they can be reintegrated at the appropriate gap site, something which we know to be costly for the human sentence processor (Frazier & Clifton, 2002; Frazier & Flores D'Arcais, 1989). For both the wh-adjunct and the derived subject, this dependency will be resolved once the past participle “solved” is presented.

We know that wh- dependencies are costly (Wanner & Maratsos 1978; King & Just 1991; Kluender & Kutas 1993a; Hawkins 1999). As Hawkins (1999) suggests,

*Identifying the gap is not easy. It is an empty element with no surface manifestation and its presence must be inferred from its immediate environment. At the same time, the filler must be held in working memory, and all other material on the path from filler to gap must be processed simultaneously, and the gap must be correctly identified and filled.*

(Hawkins, 1999:246-7)

The wh- dependency in (36) also incurs in the extra processing cost of being an *adjunct* dependency. Adjunct wh-dependencies appear to be inherently more complex than argument wh-dependencies: syntactically, adjunct extraction is grammatical in fewer environments and is more sensitive to degradation because of intervening material (Huang, 1982; Lasnik & Sato, 1984; 1992). According to Hofmeister and Sag (2010), the lower acceptability of structures featuring adjunct extraction in fact correlates with their higher costs in terms of processing resources.

The processing costs associated with the presence of a wh- dependency and with the fact that this dependency is an adjunct one must be added to the cost of processing all material intervening between the displaced adjunct and its gap site. Gibson, (1998, 2000), Warren and Gibson (2002) and Warner and Glass, (1987) hypothesized that the costs of integrating a given displaced constituent in the relevant structure is a function of the number of referential expressions which intervene between the displaced constituent and the gap site. In (36), these are two, “Mario” and “exercise 1”. The second referential expression, “exercise 1”, is not only an intervening referential expression but also the head of a second dependency. It follows that “exercise 1” must be processed and reintegrated in its base position in a sentence featuring another open dependency –the adjunct one–, something which is known to be a quite demanding task (Abney & Johnson, 1991; Gibson, 1998; Lewis, 1996). As (36) can clearly be said to be a costly structure in terms of processing resources, manipulations of the level of d-linking of the intervening DP “exercise 1” should have an effect on the perceived complexity, and hence on the reading times, of structures like (36).

What we are keen to find out and what makes (36) a particularly interesting structure to test is of course the kind of effect that this will be.

On the one hand, the derived subject is for all purposes material intervening between the endpoints of an open dependency, the adjunct one. As Deane (1991) pointed out, the ability to successfully complete a filler-gap dependency is contingent upon the ability to attend to both the extracted element and the retrieval site

simultaneously: the more the costs associated with processing intervening material increase, the less resources are available to compute the filler-gap dependency.

According to our proposed definition of d-linking, also backed up by the results of Experiment 1, d-linked constituents are restrictive. As argued before, restrictive elements clearly encode more information than non-restrictive ones. This additional information must be processed upon encountering a [+restrictive] DP, something which is likely to reduce the resources available to complete the wh- dependency. As the resources available for sentence processing are limited (Gibson, 1998; Just & Carpenter, 1992), having the embedded DP to be d-linked (or, at least, [+restrictive]) should thus have a negative effect on the reading times associated with (36). This slow-down would then most likely occur at the region where the wh- dependency is completed, i.e., upon the presentation of the past participle “solved”.

On the other hand, as noted by Kluender (1992, 1998) (see in particular section (3.2), d-linked elements are also highly accessible. That d-linked constituents are easily accessible also follows from the composite definition of d-linking suggested in section 2.1: d-linked elements are not only *restrictive*, they are also *given*. We know that given constituents are more easily accessible than non-d-linked ones, and are thus easier to process (Ariel, 1990). Having the intervening DP in (36) to be d-linked (or at least [+given]) would thus make the completion of the A-bar dependency headed by “how” an easier task, in that less resources would be needed to process the intervening nominal expression. Under this latter analysis, we would then expect the d-linking of “exercise 1” to have a positive effect on reading times. Once again, this effect would most likely be observed upon the presentation of the “solved” segment, where the A-bar dependency is completed. Another reason why the d-linking of the intervening DP could have a positive effect on reading times has to do with the nature of the DP in question: “exercise 1” in (36) is not simply an intervening referential expression, but is itself the head of a dependency. A-dependencies at least partially resemble A-bar ones in that, in both cases, a constituent must be held in working memory until it can be reintegrated in the structure at the relevant base position. If Hofmeister and Sag (2010) are correct in assuming that d-linking facilitate the retrieval of displaced elements, it is possible that the d-linking of the derived DP will also equally facilitate its reintegration in its argument position.

## 5. Experiment 2: Self-Paced Reading (SPR)

### 5.1 Participants

33 students of Ca' Foscari University of Venice, Italy, participated in this experiment. All were native speakers of Italian; their age ranged from 19 to 26 years (mean: 21.3; standard deviation: 1.8). They had diverse academic backgrounds: some were Economy majors, some were students of Biology, some others of Languages and Literature. All received a compensation for their participation in the experiment.

### 5.2 Design and methods

Each participant was presented with 28 test items and 28 fillers, for a total of 56 stimuli. All test items consisted of small stories which could be subdivided into four different blocks: (a) an initial pretest, (b) an interrogative clause, (c) a reply to the interrogative clause and (d) a final comprehension question. The

interrogative clause ((b)) was represented the structure detailed in (36), our tested structure, and was thus the region of highest interest.

Below is an example of a complete test item, highlighting the four-block subdivision, as well as the different phrasal options for the pretest and the interrogative clause:

**Table 10:** example of a complete test item, SPR experiment.

<p><b>a) Pretest</b></p>	<p>Mario sta lavorando ai compiti di Matematica, Mario is working on his Math homework,</p> <p>(i) <i>che consistono di un set di dieci esercizi.</i> → + GIVEN <i>which consists of a set of ten exercises.</i></p> <p>(ii) <i>che oggi sono particolarmente difficili.</i> → - GIVEN <i>which is particularly challenging today.</i></p>
<p><b>b) Interrogative clause</b></p>	<p>(iii) Com'è che Mario ritiene che <i>l'esercizio 1</i> possa essere risolto per trovare sia la x che la y? → + RESTRICTIVE How does Mario believe that <i>exercise 1</i> can be solved to find both the x and the y?</p> <p>(iv) Com'è che Mario ritiene che <i>un certo esercizio</i> possa essere risolto per trovare sia la x che la y? → - RESTRICTIVE How does Mario believe that <i>some exercise</i> can be solved to find both the x and the y?</p>
<p><b>c) Reply to the question</b></p>	<p>Usando il teorema di Ruffini. Using Ruffini's theorem.</p>
<p><b>d) Yes-No comprehension question</b></p>	<p>Mario sta lavorando ai compiti di Scienze? Is Mario working on his Science homework?</p>

The purpose of the **pretest** was to lay the ground for the interrogative clause: the pretest introduced the entities which featured in the story and provided a plausible background for the interrogative clause to be formulated. The pretest also had the very important function of introducing the pre-established set of entities in the [+given] conditions. Consider the example in table 10: depending on whether the DP “exercise 1” in the interrogative clause was meant to be given or not, the second part of the pretest would have either featured proposition (i), where a set of exercises is introduced, or proposition (ii), where no such mention is made.

The **interrogative clause** was in many ways the “heart” of the experiment. Throughout all test items, this consisted of a double-embedded question with a bare wh-phrase. The wh-phrase was always an adjunct: the

wh-phrases used were *how*, *where*, *when*, *how much*, *for how long*, *to whom/what*, *with whom/what*, *for whom/what*, *on what*, *between what*. Similarly to how the pretest varied according to the level of givenness, the intervening DP varied according to the elicited level of restrictiveness. As explained in section 4.1., in the [+ restrictive] conditions, this DP had a very specific reference (e.g., “exercise 1”); in the [- restrictive] conditions, it had the form of “un certo X” (“some X”, e.g., “some exercise”).

In other words, to manipulate the givenness of the intervening DP, the pretest was manipulated. To manipulate its restrictiveness, changes to the DP itself, and hence to the interrogative clause, were made.

A **reply to the question** was added so as to ensure that the presence of an interrogative clause would not be perceived as pragmatically infelicitous: questions are normally followed by answers, especially in short stories and written text. There was some initial concern that a specific reply like “using Ruffini’s theorem” (see table 10) would be inappropriate for a question featuring a [- restrictive] intervening DP. To determine if that was indeed the case, 10 monolingual Italian speakers (none of which took later part in the actual experiment) were consulted. Half of these speakers were presented with some of the test items in [- restrictive] conditions and were asked to judge whether specific replies like “Using Ruffini’s theorem” were acceptable. All of them concluded that these were indeed felicitous. The other half was presented with the [- restrictive] interrogative clauses in isolation, and was asked to produce an appropriate possible reply. None of the replies produced by these latter 5 speakers was semantically dissimilar from the ones which are acceptable for the [+ restrictive] conditions, so a same reply was used for both conditions.

The **comprehension question** only appeared for around 30% of the items, and was a YES/NO type of question. Comprehension questions were added to ensure that participants would actually read the items rather than just merely “click their way” out of them: participants were informed that they would only receive the compensation had they correctly replied to at least 75% of the questions. Comprehension questions could refer to any part of the test item: they could inquire about something mentioned in the pretest, in the interrogative clause or in the reply to the question.

In the pilot version of this experiment, comprehension questions were only appearing after test items. The experiment was later changed so as to also include comprehension questions for fillers when one of the pilot subjects quite smartly figured out that only oddly-numbered items were likely to be followed by a question and candidly admitted she started paying attention only to those.

The 28 fillers presented the same four-block subdivision of the test items, but unlike in the case of the latter, the second block of the fillers did not feature an interrogative clause but a normal declarative clause. Given that the range of possible scenarios depicted in the test items was limited because of restrictions imposed by controlled word length, syntactic structure and type of question, I tried to make sure that at least a portion of the fillers depicted somehow funny or curious scenarios, so as to avoid participants getting too bored or losing interest in the task too quickly.

The region of interest was represented by the interrogative clause and by the following segments in particular (underlined):

37) How does Mario believe that */exercise 1/ /can/ /be/ /solved/ /to/* find the x and the y?

The independent variables in this experiment were two: *givenness* and *restrictiveness*. Each of these variables had two levels: the intervening DP could either be [+ restrictive] or [-restrictive], and [+ given] or [-given]. The combinations of these four values yielded a total of four experimental conditions:

- i) [+ restrictive; + given],
- ii) [- restrictive; + given],
- iii) [+ restrictive; - given],
- iv) [- restrictive; - given].

In other words, there were four possible combinations of type of pretest and interrogative clause, as can be seen in the table below:

**Table 11:** the four possible combinations for a given item, as a function of *Givenness* and *Restrictiveness*.

		RESTRICTIVENESS	
		+ <i>RESTRICTIVE</i>	- <i>RESTRICTIVE</i>
GIVENNESS	+ <i>GIVEN</i>	Mario is working on his Science homework, which consists of a set of ten exercises. How does Mario believe that exercise 1 can be solved to find both the x and the y?	Mario is working on his Science homework, which consists of a set of ten exercises. How does Mario believe that some exercise can be solved to find both the x and the y?
	- <i>GIVEN</i>	Mario is working on his Science homework, is particularly challenging today. How does Mario believe that exercise 1 can be solved to find both the x and the y?	Mario is working on his Science homework, which is particularly challenging today. How does Mario believe that some exercise can be solved to find both the x and the y?

The dependent variable was represented by the reading times (RT) associated with a given region, as measured in milliseconds.

### 5.3 Procedure

Four lists of items were created using a latin-square design: each list contained each test items in one of the four experimental conditions, plus the 28 fillers. The order of presentation of the stimuli was randomized and was different for all participants.

The stimuli were presented *constituent-by-constituent* rather than *word-by-word*; no segment however consisted of more than four words. A constituent-by-constituent mode of presentation was chosen because

reading a large amount of text word-by-word is likely to turn out to be quite annoying after a while (Mak et al., 2008). The only systematic exception to the *constituent-by-constituent* procedure was represented by our regions of interest, which were presented word-by-word so as to test reading times.

Stimuli were presented using a non-cumulative, moving-window self-paced reading procedure (Just et al., 1982) on a Fujitsu Siemens computer running Linux. A non-cumulative procedure was chosen because, had a cumulative methodology been adopted, participants would have likely looked back at previous segments, particularly if presented with structurally complex items.

Unlike traditional non-cumulative procedures, however, the mode of presentation chosen for this experiment was not linear but centered (Blom, 2010): each segment appeared in isolation at the center of an otherwise empty rectangle. With each press of the space bar, a given segment would disappear to be replaced by the following segment. An example of how the centered mode of presentation “looked” like is provided below:

**Fig. 2.** Example of a centered, sequential progression of the sentence “*Where does Mario believe that some electronic device can be replaced with a better one?*”



Screen 1, “some electronic device”



+ 1 Space-Bar Press: “can”



+ 2 Space-Bar Presses: “be”

This experiment was in fact originally designed so as to employ the linear mode of presentation: the centered one was nothing more than a back-up plan. The centered procedure however ended up being chosen over the linear one when ten Italian speakers, who were presented with both procedures and were asked to express a preference, all reported to prefer the centered one. In particular, these speakers consistently stated that the centered mode of presentation was less “messy”, more natural and overall easier to follow. Most of them also stated that “*all those extra dashes*” were quite distracting.

These judgments appear to be in line with the analysis presented by Blom (2010), who speculated that one of the main advantages associated with choosing a centered non-cumulative mode of presentation over a linear one lies in the fact that the first tends to be perceived as being considerably more natural than the latter.

All participants were tested individually. The experiment took place in a quiet, dimly lit room. Each participant was walked through a practice trial, which consisted of four items: two small stories with an intervening interrogative clause, and two small stories with an intervening declarative clause. The first mimicked the test items, the latter two the fillers. On average, a session lasted around 30-35 minutes. Participants were instructed to read the stimuli as quickly as possible, but in a way which was compatible with still being able to understand what was narrated in the stimuli. This was done so as to prevent participants from “lingering” on a given segment, something which would likely invalidate the final results and hence our conclusions.

### 5.4 Results

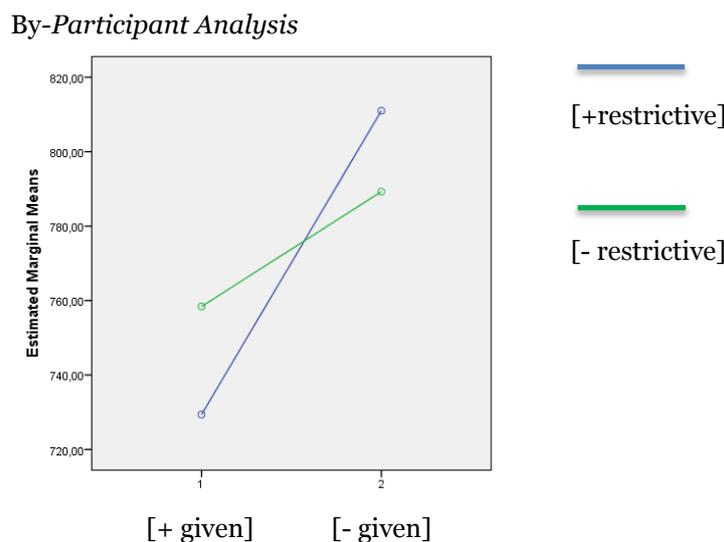
As all participants responded correctly to at least 75% of the comprehension Yes/No questions, no participant was excluded from further analysis. On average, participants provided the correct answer to 88 % of the questions (standard deviation: 5%). The lowest score was 76%.

Out of all reading time results, those which were shorter than 50 ms (1 case) and longer than 3500 ms (5 cases) were excluded from further analysis. From the remaining reading time results, outliers were detected

and excluded using the *outlier labelling rule* (Tukey, 1977; Hoaglin & Iglewicz, 1987; Kimber, 1990). These adjustments discarded 3.2 % of the data.

Two two-way repeated measures analyses of variance were computed on the reading times of the regions of interest, one with *participants* (F1) and one with *items* (F2) as the random variables. The results of the two ANOVAs showed no significant difference among the four different experimental conditions, for any of regions of interest, with the sole exception of the intervening DP (“exercise 1” in example (36)). This was always read faster when [+ given] [ $F(1,32)=13.7$ ,  $p=.001$ ;  $F(1,27)=5.1$ ,  $p=.032$ ]: the mean difference between the [+ given] and [-given] DPs was of 56,25 ms for the *participant* variable, and of 58,74 ms for the *item* variable. No significant difference was found for different levels of restrictiveness:  $F(1,32)=.38$ ,  $p=.85$ ;  $F(1,27)=.16$ ,  $p<.68$ , with a mean difference between non-restrictive and restrictive DPs of 3,65 ms in the by-*participant* analysis, and of 7,99 ms in the by-*item* analysis. Finally, the interaction between the two independent variables was not significant [ $F(1,32)=3.1$ ,  $p=.9$ ;  $F(1,27)=.87$ ,  $p=.36$ ].

Below is the relevant profile plot:



**Fig. 3.** Mean reading times (in ms) for the intervening DP region, as a function of *Givenness* and *Restrictiveness*. Givenness is on the x axis, restrictiveness is on the y axis.

## 5.5 Discussion

In section 4.2, it was suggested that the d-linking of the intervening referential expression could potentially have a positive or a negative effect on the overall sentence and, in particular, on the resolution of the A and the A-bar dependencies which featured in our tested structure. The results of this second experiment show us that neither of these two possibilities was in fact the case: the d-linking of the intervening DP did not have any effect on the reading times associated with the gap site of both dependencies.

This is a significant result in that it points to several interesting conclusions. The lack of a positive effect on the retrieval site (the “solved” segment) shows us that the d-linking of a derived subject does not make its reintegration in the relevant argument position any easier. It also shows us that having a highly accessible element standing in between the endpoints of a wh- dependency does not make the completion of this dependency any faster than it would have been had the intervening element not being given. Finally, the lack of a negative effect of d-linking on the retrieval region shows us that the additional costs associated with processing [+ restrictive] DP are apparently not high enough to justify a processing slow-down when computing the overarching wh- dependency.

Overall, these results appear to be compatible with one main conclusion: the d-linking of non-left-peripheral referential expressions clearly has a much more local effect than that arising from the d-linking of a left-peripheral constituent. As a matter of fact, whereas the d-linking of left-peripheral elements affects the reading times associated with the retrieval site of the displaced constituent, the d-linking of a non-left-peripheral element appears only to affect the reading times associated with the constituent itself, i.e., it only has an effect on its *encoding*. In this respect, this experiment appears to support the validity of the results obtained by Gordon et al. (2004), who found no effect of the definiteness of intervening DPs on the completion of overarching A-bar dependencies. The results of this experiment on the other hand seem to question the conclusion reached by Warren & Gibson (2002), who also tested the influence of intervening referential processing on wh- dependencies and found an effect of definiteness and discourse status.

Note that it is not possible to compare the effect that d-linking has on the encoding of left-peripheral constituents with the effect it has of non-left-peripheral elements. In fact, we do not even know whether d-linking has an effect at all on the encoding of a d-linked left-peripheral element. This is because the filler was not part of the regions of interest analyzed by H&S<sup>21</sup>, who recorded reading times starting from *after* the filler only. However, given that an effect of d-linking was observed for non-left-peripheral constituents, for which d-linking effects appear to be much more local, it is reasonable to assume that d-linking will also have an effect on the encoding of left-peripheral constituents. Whether this effect will be of lesser or greater entity than that associated with non-left-peripheral constituents is however something that only experimental testing can reveal.

It is also interesting to note that the effect of d-linking on the *encoding* of a non-left-peripheral constituent seems to be strikingly more pronounced than the effect of d-linking on the *retrieval* of left-peripheral constituents: for example, whereas the difference between [+given] and [-given] constituents in Experiment 2 was on average of around 57 ms, the average difference between d-linked and non-d-linked constituents reported by H&S at the retrieval region was 15 ms only.

Experiment 2 also shows us that [+given] DPs are always read faster than their [- given] counterparts; these results are compatible with Heim’s (1982) and Kamp’s (1981) observation that building a new discourse referent, be it an entity or an event, requires more resources than accessing previously constructed discourse

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<sup>21</sup> Even if this had been the case, a full comparison would have been impossible, in that H&S did not employ a composite definition of d-linking.

structure. Processing constituents which refer to a pre-established set of entities is therefore easier than processing new referents, as pre-established constituents can be more easily accommodated into the mental representation which is associated with a given sentence or text.

If the results pertaining to the givenness predictor can already be used to formulate hypotheses on the nature of such a variable, the results regarding the restrictiveness variable should be taken with more caution. This is because manipulations of the givenness variable had an effect on the preceding context, but manipulations of the restrictiveness variable had an effect on the DP region itself, one of our regions of interest. It follows that, whereas the intervening DP was identical across different levels of givenness, it varied according to the level of restrictiveness elicited. Consider for instance the DP “the exercise”: in this experiment, the [+restrictive] version of this DP was “exercise n. 1”, whereas the [-restrictive] version corresponded to “some exercise”. In other words, the restrictive and non-restrictive conditions of a given referential expression could result in DPs exhibiting different length and different syntactic complexity, something which makes comparing the two restrictiveness levels virtually impossible.

## 6. Experiment 3: Words in Isolation

To solve the restrictiveness issue, a third experiment was conducted. During this third experiment, the same DPs which were presented during the self-paced reading experiment were presented in isolation to the very same participants who took part in the second experiment. The aim of this experiment was to determine the average difference between the reading time of a DP in isolation and the reading time of the same DP under each one of the four experimental conditions. In particular, I expected that the more a given experimental condition had an effect on the reading times of a given DP, the higher this difference should have been.

### 6.1 Participants

29 students participated in this experiment. These were the same participants who also took part in the SPR experiment.

### 6.2 Design and methods

Participants were presented with ten lists of six nominal expressions each. 28 of these words were the exact same DPs each subject had been presented with in the self-paced reading experiment. For example, if subject A had been presented with the nominal expression “exercise 1” in the self-paced reading experiment, the same phrase would appear in this experiment. If on the other hand subject A had been presented with “some exercise”, “some exercise” would appear instead.

The remaining 32 items were various types of DP whose function was to act as fillers. The experiment was carried out using the same centered, non-cumulative methodology which was employed for the SPR experiment: by pressing the space bar, the participant would uncover a word of the list, which would appear at the centre of the screen, and cause the preceding one to disappear.

This experiment was “disguised” as a memory test. Once all the six words of a list had been presented, a final nominal phrase would appear: participants were asked to identify whether this DP was or was not also part

of the list they had just been presented with, by clicking on a *yes* or *no* button. Participants were told that this was an independent test to determine their general memory capacity. This ensured that they remained naïve about the real purpose of the experiment; it also resulted in participants being eager to take the test to prove “that their memory was good”.

All subjects took the “memory test” either two or three days after the self-paced reading experiment, depending on when they were available to come back to receive the compensation for participating in Experiment 2. The memory test was not administered on the day of the self-paced reading experiment to ensure that participants would not recognize the nominal expressions in the memory test as being the same presented during the self-paced reading procedure.

Four lists of DPs were created mimicking the four lists used in the SPR experiment. Each list contained the 28 nominal expressions a given subject had been presented with during the SPR experiment, plus the 32 fillers, which were identical for all participants. The order of presentation of each of the DPs in the four lists was randomized across participants.

### 6.3 Procedure

The results of the memory test were contrasted with the results of the self-paced reading experiment to determine the mean difference between the reading time of a DP in isolation and under a given experimental condition.

Consider a case where participant B was presented with the [+given, + restrictive] condition of the intervening DP in item 1. This corresponded to the DP “the blue crayon”. The exact same noun was presented in isolation in experiment 3. Let us suppose that participant B read “the blue crayon” in 759 ms in the experimental condition, and in 1249 ms in the isolation condition. The difference between the isolation condition and the experimental [+given, + restrictive] condition for this DP would then be of 510 ms<sup>22</sup>. Let us say that a second participant, participant C, was instead presented with the [- given, +restrictive] experimental condition of the DP in item 1, which also corresponded to “the blue crayon”, and that the difference between this experimental condition and the isolation condition was of 423 ms for participant C. On the basis of these two observations, one could then conclude that a positive value of givenness had the effect of lowering reading times of the intervening DP in item 1 of around 87 ms.

The same mechanism was used to calculate the differences in RTs between the experimental conditions and the corresponding isolation conditions, for all participants and items. The average differences for items and participants were then calculated using SPSS.

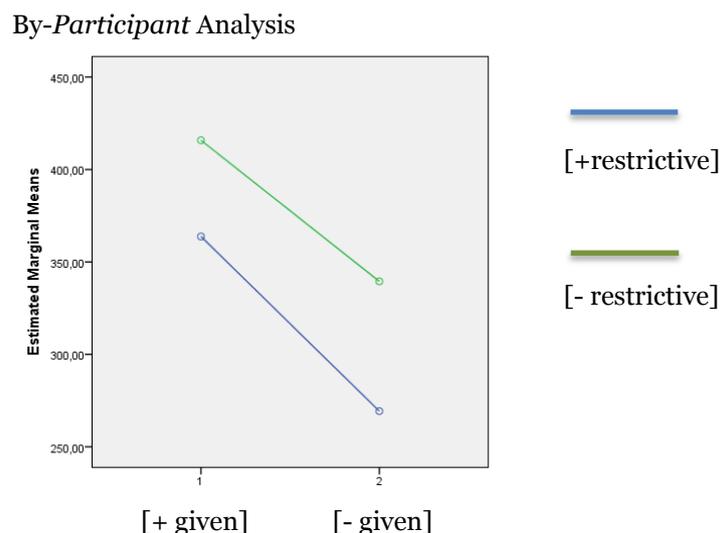
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<sup>22</sup> Importantly, the RTs of a given phrase in isolation were almost always higher than the RTs associated with the same constituent under any of the four experimental conditions. This is because, in Experiment 3, participants were required not only to process and understand a given constituent, but also to keep it in working memory for a possible later identification.

This method has the advantage of calculating differences in reading times on *identical* segments; possible differences in syntactic complexity and phrasal length are thus no longer an issue as they were in the previous experiment. In this respect, this “memory test” methodology is also probably superior to any methodology employing *residual reading times*. Residual reading times are the differences between the raw data and the reading times which are predicted for a given participant for words of a certain length, which is calculated using a linear regression equation. Estimates of residual reading times however rest on the assumption that reading times are a function of word length, as expressed in characters, and of the participant’s general reading skills and velocity. This appears to be an over-simplistic approach, in that it is much more likely that reading times will also be influenced by the type of constituent and its position in the tree. Indeed, if this was not the case, we probably would not be running self-paced reading experiments.

## 6.4 Results

Two two-way ANOVAs were computed on the mean differences for items and participants, with *participants* (F1) and *item* (F2) as random variables. The results revealed once again a significant main effect of givenness [ $F(1,28)=9.432$ ,  $p=.005$ ;  $F(1,27)=8.56$ ,  $p=.007$ ]: the difference between the isolation condition and the corresponding experimental condition was higher (and hence, the more the experimental condition was positively influencing reading times) when the nominal phrase was [+given]. The average difference between [+given] and [-given] conditions was of 45,766 ms for the *participant* variable, and of 85,383 ms for the *item* variable. Restrictiveness was only significant in the by-item analysis [ $F(1,28)=.52$ ,  $p<.5$ ;  $F(1;27)=5.86$ ,  $p=.022$ ]. The effect was however the opposite of givenness: [- restrictive] conditions were always read faster than the [+ restrictive] ones (mean difference= 61,117 ms), regardless of the level of givenness considered. Finally, the interaction between the two independent variables was not significant [ $F(1,28)=.48$ ,  $p=.5$ ;  $F(1,27)=.087$ ,  $p=.77$ ].



**Fig. 4.** Differences (in ms) between isolation conditions and experimental conditions, as a function of *Givenness* and *Restrictiveness*. Givenness is on the x axis, restrictiveness is on the y axis.

## 6.5 Discussion

The results of the “memory” test experiment support our previous conclusions with respect to the givenness predictor: a positive value of this variable does indeed result in nominal expressions being read significantly faster than they would have been, had they not been [+ given]. The memory test also confirmed that a positive value of givenness always results in a processing advantage for a given nominal expression, regardless of the level of restrictiveness of the constituent in question.

The results of the memory test experiment also revealed that [- restrictive] intervening DPs were read faster than their [+ restrictive] counterparts; this was however only significant in the by-item analysis. This suggests that at least some participants found [+restrictive] nominal expressions to be more taxing than [-restrictive] ones, something which is compatible with our suggested analysis of this variable (see in particular section 4.2): more restrictive DPs encode a higher amount of information than non-restrictive ones. This information must be processed and must be accommodated in an adequate mental representation, something which obviously correlates with higher processing costs. Moreover, restrictive nominal expressions are overwhelmingly definite DPS (compare “exercise 1”, a definite DP, with “some exercise”, an indefinite) and definites carry a presupposition of familiarity: they must have appeared before in the discourse. [+ Restrictive] expressions thus trigger the search for an antecedent or a semantically related expression in the preceding discourse: it is pragmatically odd to utter a definite DP like “the exercise” if no previous mention was made to an exercise or at least to some homework assignment. Non-restrictive entities, which were all indefinites in this experiment, do not trigger such a search, and therefore bypass a processing task which could potentially be problematic. That [+ restrictive] entities may be more demanding in terms of processing costs is also supported by the results obtained by Goodluck (2005) and Goodluck (2010): the author tested Broca’s aphasics and normally developing children, and found out that more restrictive DPs stimulate a more detailed visualization of the relevant referent, which results in an increased processing complexity for the given nominal expression.

## 7. General Discussion

The purpose of Experiment 2 and 3 was to gain a better insight on the nature of d-linking effects, and hence to be able to determine which account is more appropriate between Rizzi’s syntactic analysis and Kluender and H&S’s processing account. How can the results of the last two experiments be interpreted in the light of such a question?

The results of the SPR experiment demonstrate that not all types of d-linked constituents result in the rest of the sentence being processed faster: constituents which are not wh-elements appear not to give rise to such an effect, as their d-linking only affects the encoding of the constituent whose d-linking is being manipulated. This seems to suggest that the peculiar properties associated with d-linked wh-phrases, as reported by H&S, are dependent on their collocation at the left edge of the clause. At first blush, this conclusion would seem disfavor a processing analysis of d-linking: if d-linking were solely ascribable to general processing mechanisms, we would expect the effects reported by H&S to arise for constituents other than left-peripheral ones. The results of Experiment 2 would thus appear to support a syntactic analysis *à la* Rizzi: d-linking

effects are clearly tied to the left periphery clause, something which is readily captured by Rizzi's assumption that d-linked constituents are endowed with specific syntactic properties, which relate to the left periphery, which make these constituents insensitive to islands. Recall in particular what stated in section 3.3: a processing account of d-linking should be legitimately preferred over a language-specific one like Rizzi's only if the first manages to capture the same amount of empirical data that the latter does.

On the other hand, we *did* observe an effect of the d-linking on the intervening DP. This effect was very local and fundamentally different from that associated with d-linked fillers, but was nevertheless present. This is unexpected under a binding analysis in that, if d-linking were solely the result of a left-peripheral syntactic process, we would not expect any kind of effect of *restrictiveness* and *givenness* for any constituents other than those merged or moved to the left periphery.

Additional evidence against Rizzi's account is represented by the results yielded by Experiment 1: the results of the acceptability judgment questionnaire show that the degree of acceptability of a weak island violation is strongly dependent on the restrictiveness of the fillers, and that judgments are gradually distributed on scale which moves from less restrictive to more restrictive elements. These results are unexpected under a binding analysis: if the property underlying d-linking effects were solely represented by the possibility versus impossibility for the lexical restriction not to be reconstructed in its base position, we would expect "yes" or "no" acceptability ratings, not graded judgments. This is because lexical restrictions can arguably only either be reconstructed or not be reconstructed: they cannot be "half reconstructed" or "a bit reconstructed".

It thus seems we are facing an impasse: one the on hand, a binding approach à la Rizzi correctly predicts that only left-peripheral elements will exhibit the d-linking effects reported by H&S. Rizzi's account however fails to capture the graded nature of the restrictiveness judgments in Experiment 1. It also fails to predict the effect of restrictiveness and givenness on the encoding of referential expressions which was observed in Experiments 2 and 3. On the other hand, a processing account offers a better explanation of the restrictiveness data, but appears to make too strong predictions with respect to non-left-peripheral nominal expressions.

A possible solution to this *catch 22* would be to account for the observed results in terms of the different processing load associated with left-peripheral positions and A-bar dependencies. The left edge of the clause is known to be associated with elevated processing costs, both in production and in comprehension: N400 peaks, which are standardly assumed to mirror difficulties with the semantic integration of a given stimulus (Kutas & Hillyard, 1980; Van Berkum et al., 1999; Van Petten & Kutas, 1990; Van Petten, 1993), have for instance been reported for sentence-initial positions (Kluender & Kutas, 1993; Kluender, 1998). Clause-initial positions are also associated with a higher rate of disfluencies: these have been observed in normally developing children (Guasti, 2002; Rizzi, 1993/1994; Hoekstra & Hyams, 1995), adults (Clark & Wasow, 1998; Kluender, 1998) and subjects whose language abilities are impaired, as it is the case for aphasic patients (Friedmann & Grodzinsky, 1997; Friedmann, 2002; Grillo, 2008). Not only are left-peripheral positions more demanding than other syntactic positions, wh- movement operations are also considerably more costly than most other syntactic operations, including for instance A-dependencies. This is because,

unlike A-movement, wh- movement is fundamentally unbounded and can thus span over multiple predicates and intervening referents. The longer a dependency is, the more intervening material will then have to be processed, with potentially negative effect for the completion of the dependency itself, as the memory trace associated with the filler will decay and/or be subject to interference (Van Dyke & McElree, 2006, 2011; Van Dyke & Johns, 2012).

It could thus be speculated that d-linking is by itself a phenomenon which is associated with rather weak effects: under normal circumstances, it is only powerful enough to affect the reading times associated with the constituent it directly modifies. Evidence in favor of such a “low-potency” analysis is represented by the fact that, even when d-linking *does* affect the reading times associated with regions other than the manipulated element itself, this effect is still quite minor. Consider in particular the difference in reading times associated with the retrieval region of d-linked and non-d-linked fillers, as reported by Hofmeister and Sag: this difference was statistically significant ( $p = .01$ ), but was nevertheless rather small (around 15 ms).

Under this analysis, the effects reported by Hofmeister and Sag at the retrieval site of d-linked left-peripheral fillers would then arise because of a *super-additive* process: even a low-potency phenomenon like d-linking will have an effect on left-peripheral positions, as these are associated with high processing costs. No facilitatory effect will be observed for positions and dependencies other than left-peripheral elements and A-bar dependencies, as these processes either already occur in the minimum amount of time that the human sentence processor can allow, or are not associated with high enough processing costs. The d-linking of these latter types of constituent will thus not be able to lower retrieval times any further, or at least not to an appreciable extent.

To explain this super-additivity hypothesis with a metaphor, imagine dropping off from a very tall building like the Domtoren a crochet magazine, plus another copy of the very same magazine, but crumpled up so as to be shaped like a ball. Despite the normal and the crumpled up copy having the same mass, the normal magazine will hit the ground second due to higher air drag. D-linking effects can be analyzed in similar terms: left-peripheral and non-left-peripheral elements are associated with proportionally different processing costs (the difference in shape of the two copies of the crochet magazine, which determines the amount of air friction): when these two elements are d-linked (when the two magazines are dropped from the Domtoren), an effect will be observed for both (both will begin to fall down), as d-linking does not apply to a single class of DPs but is a property of DPs in general (gravitational pull applies to all types of body). The effect of d-linking will however be different for left-peripheral and non-left-peripheral constituents, as these are associated with different processing costs (the amount of time taken by each copy of the magazine to hit the ground is a function of the amount of air friction which applies to the body).

## 8. Conclusion

Despite being around for almost thirty years, our understanding of the notion of d-linking is still rather fragmentary: there are several aspects of this phenomenon which are still unclear to us, or even escape us completely. Given that, as Cicero said, “no one can speak well, unless he thoroughly understands his subject”,

the present thesis was an attempt to elaborate and expand on our current understanding of d-linking, so as to hopefully improve it.

A considerable part of this work was devoted to formulating a more descriptively adequate definition of d-linking. In particular, I reanalyzed d-linking in terms of a composite notion, and I argued that *restrictiveness* is one of the primitives underlying d-linking effects. A *restrictiveness* analysis of d-linking has several advantages: it accounts for the fact that fillers with a lexical restriction will always be perceived as more acceptable in island domains, even if presented in isolation, and hence in contexts where no link to the discourse can be established. It also captures the graded acceptability of different types of d-linked fillers as a function of their restrictiveness, as reported in Experiment 1. An analysis of d-linking in terms of restrictiveness thus appears to be more descriptively adequate than any theory suggesting givenness to be the only factor at play in d-linking.

As pointed out in section 2, descriptively adequate definitions are not of much use if they do not also provide some indication regarding how a given phenomenon should relate to actual clausal and phrasal environments, i.e., by stating, for example, what types of preceding context should be employed to elicit a given level of d-linking. As discussed in section 2.1, these “vague” definitions are particularly detrimental to scientific analysis in that they make the testing of any theory based on such definitions a virtually impossible task. In the present work, I made an attempt to remedy this undesirable state of affairs: I identified two possible ways for a constituent to be *given*, i.e., by direct reference or by indirect mention (through semantically related words or concept). I also argued that the two primitives composing the notion of d-linking, *givenness* and *restrictiveness*, should be treated as graded notions rather than as binary features, and provided some examples and considerations on how different levels of restrictiveness and givenness may be elicited. Given the explorative nature of this study, these are but preliminary conclusions: further research is needed in order to reach more solid conclusions and to be able to formulate a more detailed framework of reference. This is particularly the case for the givenness variable: additional research is necessary to establish how different levels of givenness correlate with the syntactic positions in which a given constituent was first merged. Moreover, the status of the “restrictiveness via context” examples which were briefly discussed in section 2.1. is also something which requires a more exhaustive analysis.

In spite of the limitations just listed, I am confident that the results and considerations presented in this thesis will contribute to the general research on d-linking, in that they indicate in which directions the study of d-linking phenomena should proceed.

To be able to truly “speak well” about a given subject, one must also explore it from different perspectives and under different conditions, so as to acquire a better understanding of its properties and limitations. This was essentially the aim of Experiment 2 and 3: to investigate d-linking as applied to non-canonical environments (i.e., non-left-peripheral constituents) so as to determine its possible domains of application, as well as to better understand its more general nature.

The results of Experiment 2 and 3 suggest that the d-linking effects reported by H&S are strongly dependent on the constituent which is manipulated being a left-peripheral element. As a matter of fact, if the constituent in question is not a left-peripheral element, its d-linking will only affect its encoding, with positive values of

givenness lowering reading times, and positive values of restrictiveness resulting in a processing slow-down. The d-linking of a non-left peripheral constituent will thus have no effect on its retrieval at the gap site, nor on the retrieval of possible displaced constituents which may be part of overarching dependencies. These results are particularly interesting in that they are fundamentally unexpected: they are incompatible with both of the analyses presented in this paper, i.e., the binding account suggested by Rizzi, and the processing analysis advocated by Hofmeister, Sag and Kluender. The outcomes of Experiment 2 and 3 rather seem to suggest that d-linking is a phenomenon which is by itself associated with a rather low potency, and that it is the high processing load associated with left-peripheral positions which give rise to the d-linking effects reported by H&S, because of a super-additive process.

## 9. Appendix

### 9.1 Test items used in Experiment 1

#### 1) *Whether island, to buy, books*

- i) Cosa ti domandi se comprare?
- ii) Quale libro ti domandi se comprare?
- iii) Quali fra questi libri ti domandi se comprare?
- iv) Quali fra quei tre libri ti domandi se comprare?
- v) Quali fra i libri di letteratura ti domandi se comprare?
- vi) Quali fra i libri che Maria ha consigliato ti domandi se comprare?

#### 2) *Whether island, to rent, DVDs*

- i) Cosa ti domandi se noleggiare?
- ii) Quale DVD ti domandi se noleggiare?
- iii) Quali fra questi DVD ti domandi se noleggiare?
- iv) Quali fra quei tre DVD ti domandi se noleggiare?
- v) Quali fra i DVD horror ti domandi se comprare?
- vi) Quali fra i DVD che piacciono a Paolo ti domandi se comprare?

#### 3) *Whether island, to fire, employees*

- i) Chi ti domandi se licenziare?
- ii) Quale impiegato ti domandi se licenziare?

- iii) Quali fra questi impiegati ti domandi se licenziare?
- iv) Quali fra quei quattro impiegati ti domandi se licenziare?
- v) Quali fra gli impiegati scansafatiche ti domandi se licenziare?
- vi) Quali fra gli impiegati che si sono lamentati ti domandi se licenziare?

**1) Negative island, to solve, exercises**

- i) Cosa non sai come risolvere?
- ii) Quale esercizio non sai come risolvere?
- iii) Quali fra questi esercizi non sai come risolvere?
- iv) Quali fra quei tre esercizi non sai come risolvere?
- v) Quali fra gli esercizi di Matematica non sai come risolvere?
- vi) Quali fra gli esercizi che la maestra ha assegnato non sai come risolvere?

**2) Negation island, to beat, athletes**

- i) Chi non sai come battere?
- ii) Quale atleta non sai come battere?
- iii) Quali fra questi atleti non sai come battere?
- iv) Quali fra questi tre atleti non sai come battere?
- v) Quali fra gli atleti Nigeriani non sai come battere?
- vi) Quali fra gli atleti che sono arrivati primi a Parigi non sai come battere?

**3) Negation island, to persuade, students**

- i) Chi non sai come convincere?
- ii) Quale studente non sai come convincere?
- iii) Quali fra questi studenti non sai come convincere?
- iv) Quali fra quei tre studenti non sai come convincere?
- v) Quali fra gli studenti maggiorenni non sai come convincere?
- vi) Quali fra gli studenti che frequentano questo corso non sai come convincere?

## 9.2 Test items used in Experiment 2

- 1) “Lucia deve colorare un disegno per la lezione di educazione artistica. Per farlo, ha a disposizione una scatola di pastelli colorati./ Per farlo, ha a disposizione l'intero pomeriggio.”  
“Com'è che Lucia sostiene che il pastello blu/ un certo pastello debba essere sfumato per ottenere risultati migliori?”  
"Usando la mano sinistra."
- 2) “Questo mese, tre carissime amiche di Anna compiono gli anni. Anna ha quindi comprato tre tipi di ombretti colorati. Ne donerà uno a ciascuna delle tre amiche./ Anna ha quindi comprato vari cosmetici, che poi dividerà fra le tre amiche.”  
"A chi è che Anna pensa che l'ombretto verde/un certo ombretto debba essere regalato con l'augurio che se lo metta spesso?"  
"A Carla, che ha gli occhi chiari.”
- 3) “Enrico vuole rifornire il suo guardaroba invernale. Ha quindi appena acquistato una serie di maglioni, in diversi colori./ Ha quindi appena acquistato parecchi capi di abbigliamento.”  
"Con cos'è che Enrico crede che il maglione rosso/un certo maglione debba essere abbinato per farne risaltare il tessuto?"  
"Con dei pantaloni in pelle nera.”
- 4) “Rosa vuole ammodernare un po' l'aspetto del salotto. Ha quindi deciso di modificare la disposizione dei due tavolini vicino alla porta./ Si è quindi presa un pomeriggio libero e si è messa all'opera.”  
"Tra cos'è che Rosa è convinta che il tavolino rotondo/un certo tavolino debba essere collocato per valorizzarne la forma?"  
"Tra la lampada da terra e la libreria.”
- 5) “Lisa lavora alle poste. Oggi un cliente le ha consegnato cinque scatole da spedire all'estero. Sfortunatamente, alcuni degli indirizzi sono illeggibili./ Oggi un cliente le ha consegnato vari colli da spedire all'estero. Sfortunatamente, alcuni degli indirizzi sono illeggibili.”  
"Verso dov'è che Lisa suppone che la scatola più grande/una certa scatola debba essere spedita per fare contento il cliente?"  
"Verso l'afrika orientale, o almeno così spera.”
- 6) “Sofia si trova in un famoso negozio di articoli per la cucina. Ha messo gli occhi su alcune bellissime tovaglie. Sofia ha quindi deciso di fare un regalo alle sue tre nuore./ Ha messo gli occhi su moltissimi articoli interessanti. Sofia ha quindi deciso di fare un regalo alle sue tre nuore.”  
"A chi è che Sofia pensa che la tovaglia rotonda/una certa tovaglia possa essere regalata per via della sua forma?"  
"Alla sua nuora più giovane, che ha solo tavoli rotondi.”
- 7) “Luisa e Serena stanno traslocando. Al momento stanno cercando di decidere in che modo incastrare le due poltrone del salotto nel furgone dei traslochi./ Al momento stanno cercando di decidere in che modo incastrare più cose possibili nel furgone dei traslochi.”  
"Dov'è che Serena crede che la poltrona più grande/una certa poltrona debba essere collocata per evitare che venga danneggiata?"  
"Vicino alla porta scorrevole.”
- 8) “Tommaso ha appena avuto un'infezione al piede. Patrizio, il dottore, gli ha imposto di prendere tre tipi di pastiglie antibiotiche al giorno./ Patrizio, il dottore, gli ha consigliato di assumere vari tipi di antibiotici.”

"Quand'è che Patrizio sostiene che la pastiglia più piccola/una certa pastiglia debba essere assunta per evitare che interferisca con le altre?"

"Almeno due ore prima della tachipirina."

- 9) "Roberto si trova ad un'asta d'arte di epoca barocca. Ha messo gli occhi su un gruppo di quadri in diversi formati dipinti dal famoso Tiepolo./ Ha messo gli occhi su alcune creazioni del famoso Tiepolo."

"Quant'è che Roberto sostiene che il quadro più piccolo/un certo quadro debba essere pagato per via del suo valore storico?"

"Almeno duemila dollari."

- 10) "Mario sta lavorando ai compiti di matematica, che oggi consistono di un set di dieci esercizi./che oggi sono particolarmente difficili."

"Com'è che Mario ritiene che l'esercizio n. 1/un certo esercizio possa essere risolto per trovare sia la x che la y?"

"Usando il teorema di Pitagora."

- 11) "Serafino lavora come addetto alle pulizie in un bowling in centro città. Questo bowling è dotato di tre piste, ciascuna rivestita con un tipo di legno differente./ Questo bowling è molto lussuoso, essendo rivestito con vari tipi di legno pregiato."

"Con cos'è che Serafino crede che la pista n. 2/ una certa pista debba essere pulita per evitare di rovinarne il legno?"

"Con acqua e aceto."

- 12) "Nunzia è sommelier in un rinomato ristorante Veneziano. In questo ristorante, i clienti possono scegliere tra tre menù fissi./In questo ristorante, vengono serviti sia piatti a base di carne che di pesce."

"Con cos'è che Nunzia ritiene che il menù n. 3/ un certo menù debba essere servito per esaltarne al massimo i sapori?"

"Con il prosecco."

- 13) "Martino è un esperto traduttore. Per domani deve tradurre dal russo un articolo che è composto da tre pagine/Per domani deve tradurre dal russo un articolo che tratta di politica."

"Com'è che Martino ritiene che la prima pagina/una certa pagina debba essere tradotta per mantenere lo stile dell'autore?"

"Usando tante metafore."

- 14) "Questa settimana passa il camion della raccolta differenziata. Letizia sta quindi riempiendo gli appositi bidoni colorati dei rifiuti./ Letizia sta quindi preparando la spazzatura."

"Quand'è che Letizia ritiene che il bidone blu/un certo bidone debba essere esposto per far sì che venga svuotato?"

"Il mercoledì."

- 15) "Lucia andrà a Parigi per una breve vacanza. Starà lì sette giorni, dal lunedì alla domenica./ Alloggerà in un hotel nel settimo arrondissement."

"Dov' è che Lucia è convinta che il martedì/un certo giorno possa essere trascorso per ottimizzare il tempo disponibile?"

"Al Louvre: il martedì è quasi deserto."

- 16) "Carlo è il proprietario di un Euronics. Oggi deve decidere come prezzo gli ultimi cellulari arrivati./ Oggi deve decidere come prezzo la merce appena arrivata."

"A quant' è che Carlo ritiene che l'Iphone 5/un certo telefono possa essere venduto per ottenerne un guadagno ragionevole?"

"Ad almeno 500 euro."

- 17) "Tania sta preparando con grande cura la tavola per il pranzo di Pasqua. Proprio ora sta disponendo le varie posate./ Proprio ora sta aggiungendo gli ultimi ritocchi."  
"Dov'è che Tania crede che il coltello/una certa posata debba essere collocato per fare sì che la tavola risulti più elegante?"  
"A destra del piatto."
- 18) "Questo settimana Luca, che è di Roma, girerà il Nord Italia con alcuni amici. In particolare, Luca vorrebbe visitare le province del Veneto./ Ci sono moltissimi posti che Luca vorrebbe visitare."  
"Quand'è che Luca sostiene che la provincia di Padova/una certa provincia debba essere visitata per poter approfittare degli sconti sui musei?"  
"La prima domenica del mese."
- 19) "Veronica insegna in un liceo. Durante la pausa pranzo, ha discusso con alcuni colleghi di quando le materie principali dovrebbero essere insegnate./di come si potrebbe migliorare l'orario scolastico."  
"Quand'è che Veronica ritiene che la Matematica/una certa materia debba essere insegnata per evitare di tediare gli studenti?"  
"Di prima mattina."
- 20) "Stella sta ripassando la lezione di Geografia di stamattina, che è stata incentrata sugli stati del Nord Europa./ che è stata particolarmente interessante. Stella sta ora cercando di collegare le varie nozioni imparate."  
"Con cos'è che Stella pensa che l'Olanda/un certo stato possa essere comparato per via dell'utilizzo estensivo della bici?"  
"Con la Danimarca/L'Olanda, con la Danimarca."
- 21) "Negli ultimi anni, Luca ha sviluppato una forte coscienza ecologica. Ha quindi deciso che sostituirà gli elettrodomestici della cucina con modelli più ecocompatibili./ Ha quindi deciso che cercherà di rendere casa sua più ecocompatibile."  
"Dov'è che Luca ritiene che il frigorifero/ un certo elettrodomestico possa essere cambiato con un modello a risparmio energetico?"  
"All' Euronics sotto casa."
- 22) "Tina e Tom sono al supermercato, nel reparto dolci. I due stanno ammirando e discutendo dei vari tipi di cioccolata spalmabile./ I due stanno ammirando e discutendo dei vari dolci disponibili."  
"Su cos'è che Tina è convinta che la Nutella/un certo tipo di cioccolata possa essere spalmato per ottenere una combinazione divina?"  
"Sui popcorn!"
- 23) "Stasera Patrizio e Alberta daranno un'importante cena di lavoro. I due stanno quindi discutendo di quali tipi di carne servire./ I due stanno quindi discutendo su come rendere la serata perfetta."  
"Con cos'è che Alberta sostiene che il manzo / un certo tipo di carne debba essere servito per esaltarne il sapore?"  
"Con gli asparagi."
- 24) "Cesare è un progettista urbano. Stamattina, insieme alla collega Laura, Cesare ha rivisto alcuni dei progetti per la costruzione di nuovi edifici pubblici./ alcuni dei progetti fissati per questo mese."  
"Tra cos'è che Laura sostiene che la scuola/un certo edificio debba essere collocato per facilitarne l'accesso agli utenti?"  
"Fra la libreria e la palestra."

- 25) "Pernelle sta seguendo un corso di anatomia umana. Insieme al compagno Tullio, sta discutendo della collocazione degli organi principali./ sta discutendo dell'apparto circolatorio."  
"Dov'è che Tullio sostiene che il cuore/ un certo organo debba essere collocato nel corpo umano?"  
"Non lo sa, perchè è asino."
- 26) "Lia e Teo stanno discutendo di quali bevande si possano ordinare al bar. Lia, un' amante del thé, sta elencando i tipi di thé più famosi./ Lia, un'esperta in materia, sta elencando le sue bevande preferite.""  
"Con cos'è che Lia sostiene che il thè verde/una certa bevanda debba essere servita per esaltarne l'aroma?"  
"Con gli amaretti."
- 27) "Quest'anno, Luca ha deciso di piantare un piccolo orto. Ha quindi chiesto consiglio a Tea in merito a quali verdure piantare."/ Ha quindi chiesto consiglio a Tea, un'esperta di giardinaggio. "  
"Quand'è che Tea sostiene che l'insalata / una certa verdura debba essere seminata per ottenere un buon raccolto?"  
"Durante la luna calante."
- 28) "Luca è un falegname. Ieri pomeriggio, ha assemblato alcuni banchi per la scuola del paese. La sera si è purtroppo accorto che uno dei suoi attrezzi era sparito./La sera si è purtroppo accorto di avere perso qualcosa."  
"Dov'è che Luca ritiene che il suo cacciavite/un certo suo attrezzo possa essere finito con probabilmente anche altro?"  
"Nella fessura fra muro e cattedra."

## 10. References

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