

RESEARCH

# The pragmatics of descriptive and metalinguistic negation: experimental data from French

Joanna Blochowiak<sup>1,2</sup> and Cristina Grisot<sup>2,3</sup>

<sup>1</sup> Université catholique de Louvain, Place Blaise Pascal 1/L3.03.10, 1348 Louvain-la-Neuve, BE

<sup>2</sup> Université de Genève 2, Rue de Candolle 1211 Genève 4, CH

<sup>3</sup> Université de Neuchâtel, Centre de Sciences Cognitives, Espace Louis-Agassiz 1, 2000 Neuchâtel, CH

Corresponding author: Joanna Blochowiak ([Joanna.Blochowiak@unige.ch](mailto:Joanna.Blochowiak@unige.ch))

---

The phenomenon of descriptive and metalinguistic negation has been debated for a long time from a theoretical perspective. On the one hand, there are defenders of the ambiguit approach to negation, in which the descriptive negation basically serves to deny an utterance's propositional content, and that this takes place by default (Horn 1985; 1989; Burton-Roberts 1989), while the metalinguistic negation surfaces only when the descriptive negation cannot be applied, and targets the non-truth-conditional contents of the utterance (e.g. implicatures, its register, its morphology or its phonology). Only the former is truth-functional, and the latter is claimed to be non-truth-functional as it does not operate on propositions. On the other hand, there are proponents of the non-ambiguit approach, who maintain that both types of negation are truth-functional since, in the case of metalinguistic negation, the process of pragmatic enrichment guarantees that the full proposition on which negation can operate will be reached (Carston 1996; 2002; Noh 1998; 2000; Moeschler 2010; 2013; 2017). Regarding processing, the ambiguit account predicts that it will take more time to treat metalinguistic negation because it always occurs as the second of two steps; in contrast, the non-ambiguit account makes no such prediction, since the interpretation of negation is contextually driven and the right context will issue the correct interpretation from the start. This paper will be devoted to the presentation of two self-paced reading experiments and of one offline elicitation experiment we carried out on French descriptive and metalinguistic negation. Our findings provide evidence in favor of the non-ambiguit approach.

---

**Keywords:** descriptive and metalinguistic negation; elicitation offline experiment; self-paced reading experiment; incremental model of language processing; Relevance Theory

---

## 1 Introduction

This paper experimentally investigates the well-known phenomenon of descriptive (DN) and metalinguistic (MN) negation. There are two main approaches to the distinction between DN and MN that have been defended from a theoretical perspective: an ambiguit and a non-ambiguit type of account. The ambiguists (Horn 1985; 1989; Burton-Roberts 1989) maintain that there are two negation operators. The first is the truth-functional operator that simply serves to deny an utterance's propositional content, and corresponds to the descriptive use of negation (*It isn't warm; It is rather cold here*). The second is non-truth-functional, as it is used *metalinguistically* to deny various forms of non-truth-conditional content such as conversational implicatures, presuppositions and linguistic forms (e.g. *We didn't see small childs, we saw small children*). The non-ambiguists (Carston 1996; 2002; Noh 1998; 2000; Moeschler 2010; 2013; 2017) claim that there is one unique operator of negation that is truth-functional, and the interpretation of negation as descriptive or metalinguistic hinges on contextual considerations related to the

principle of optimal relevance (Sperber & Wilson 2004), or the relationship of incoming information to the conversational record and the common ground (Moeschler 2017).

The two types of account do not make the same predictions for cognitive experimental testing. The ambiguit account initially proposed by Horn (1985; 1989) and supported by Burton-Roberts's (1989) semantic analysis leads to the prediction that metalinguistic negation will take longer to process, because it necessitates two steps in the interpretation process. In the first step, the hearer tries out the descriptive interpretation, and only when she realizes that this interpretation cannot work does she interpret negation as metalinguistic. The non-ambiguit approaches do not claim that metalinguistic negation takes longer to be processed, because the interpretation process in general largely depends on contextual cues available to the hearer, who will use these to get the most relevant interpretation, keeping cognitive efforts as low as possible.

We will proceed by explaining in more detail both types of accounts in Section 2. In Section 3 we will describe two previous studies that have been carried out to test experimentally the processing cost of descriptive and metalinguistic negation, and in Section 4 we will present our two self-paced reading experiments and one offline continuation task. Section 5 will provide a general discussion, and Section 6 will conclude the paper.

## 2 The state of the art

### 2.1 Ambiguit and non-ambiguit approaches to negation

Negative sentences can be understood in various manners in natural language. One of the most frequently studied oppositions refers to the distinction between descriptive and metalinguistic uses of negation. In its simple descriptive use, the basic logical property of negation consists in reversing the truth-value of the proposition on which it operates. For instance, (1) – if true – makes (2) false.

- (1) Mary is not beautiful.
- (2) Mary is beautiful.

In metalinguistic uses of negation, as in (3)a, this property seems not to apply, since *being gorgeous* implies *being beautiful* (3)b. Thus, the negation in (3)a does not make (2) false, unlike the negation in (1).

- (3) a. Mary is not beautiful. She is gorgeous.
- b. Mary is gorgeous → Mary is beautiful.

This particular characteristic of MN, among other things, has led some researchers to conceive of an ambiguit view, according to which there are two different negations. The first serves to negate an utterance's propositional content whereas the second is employed to reject or object to some previous utterance. The two main proponents of this thesis, with varying degrees of detail, are Horn (1985; 1989) and Burton-Roberts (1989). Horn is usually associated with the pragmatic view of negation and Burton-Roberts with the semantic account. To be more specific, Horn speaks about pragmatic ambiguit, according to which there are two negation operators: the logical one, which is the unmarked case, and the pragmatic one "I object to U" (U refers to "utterance") which is the marked case. For Burton-Roberts, negation is semantically ambiguit, which is to say that there is one negation operation with two different scopes: narrow and wide. For Horn, the default negation is the non-marked one; for Burton-Roberts, the narrow scope negation is the necessary first step in the interpretation of a negative utterance, and hence the default one. However, for our purpose, there is no need to differentiate between the two approaches since they share the same main thesis – that is, the DN interpretation arises by default – and their theoretical analyses of negation lead to the same predictions for experimental

investigation. In Section 3.1, we spell out these hypotheses and predictions for self-paced reading experiments based on these theoretical approaches.

According to Horn and to Burton-Roberts, the semantics of negation is identical to the classical truth-functional negation operator, and corresponds to DN, as in (1). The important point of this analysis is that such negation arises by default: that is, no matter the type of negation with which we are actually dealing (DN or MN), the departure interpretation is always the descriptive one. This constraint of semantic accounts necessarily leads to a stepwise analysis of negation: DN occurs in one step where MN obligatorily occurs in two steps. In the first step, the hearer tries to interpret the negation descriptively by default. Once he realizes that DN cannot work for some reason (e.g. a detection of a contradiction or another inappropriateness of use), he reanalyzes negation as metalinguistic in the second step. Consider the series of examples below.

- (4)
- a. Mary is not beautiful. She is gorgeous.
  - b. John doesn't regret failing his exam. He passed it brilliantly.
  - c. I didn't meet a woman. I met my wife.

According to Horn's account, MN is a purely pragmatic, non-truth-functional phenomenon and, as we saw, its meaning corresponds to something like "I object to U". In this configuration, U is the positive counterpart of the negative sentence, and it is rebutted or rejected because of different interpretative issues. For instance, in (4)a, the utterance of a positive sentence (*Mary is beautiful*) is rebutted as it is not strong enough. This is made clear by the follow-up statement (*She is gorgeous*). In (4)b, the positive sentence is rejected because its presupposition does not hold, as is made explicit by the corrective follow-up sentence. And finally, in (4)c, we can follow Grice (1975) in saying that the speaker's utterance of the positive sentence (*I met a woman*) conversationally implicates that he didn't meet his wife, mother or sister, otherwise he would have said so, obeying the maxim of quantity. It is precisely this implicature that is targeted by MN, which becomes clear when the clarification clause is heard.

On the other hand, there are non-ambiguist approaches to negation (Carston 1996; Carston & Noh 1996; Noh 1998; 2000; Moeschler 2010; 2013), which differ in detail (cf. section 4) but agree on the general claim that negation is not ambiguous. Moeschler (2010; 2013) adheres to the view that there is one single negation operator, defined as a standard, truth-functional negation operator originating in propositional logic. Formally, it can have wide scope, when it "logically dominates the propositional material" (also called external negation), or narrow scope, when it "logically dominates a propositional function" (also called internal negation) (Moeschler 2010: 32). So, the scope of negation for him is not determined by structural properties, but computed in the context. The most straightforward association that could be made is to say that DN is internal and has narrow scope, and that MN is external and has wide scope. However, as Moeschler writes (2010: 39), MN scopes not only over the entire proposition but also over other material, such as an assertion, exemplified in (5), or a scalar implicature, illustrated in (6). So, MN cannot simply be identified with a wide scope external negation. Here in particular, the corrective clause entails the negation of some pragmatic content accessible from the positive corresponding clause linked to the scales [*like, love*] and [*three, four*].

- (5)
- a. We don't like L.A.; we love it.
  - b. Assertion: We like L.A.
- (6)
- a. Anne doesn't have three children; she has four.
  - b. Scalar implicature: Anne has exactly three children.

Moeschler (2007; 2010) proposes that negation has wide scope in its logical form (semantics), and gets specified to a descriptive or a metalinguistic interpretation via a process of pragmatic derivation. Following Wilson and Sperber (1981) and Carston (1996; 2002), where there is the distinction between three layers of meaning for negative sentences (*what is said*, *what is implicated* and *what is communicated*), he suggests that the descriptive and the metalinguistic interpretations of negation correspond to *what is communicated*. These interpretations are derived by starting from a wide scope semantic reading of negation at the level of *what is said*, and continuing with the construction of the explicature of the negative utterance through narrowing,<sup>1</sup> either towards wide scope MN, as in (6), or towards narrow scope DN, as in (7).

(7) Anne doesn't have three children; she has two.

Furthermore, the non-ambiguist approach points to the descriptive inadequacy of the semantic two-step account, which can be summarized in two points. First, it should be underlined that, for Burton-Roberts, a clarification clause must be present so as to provide a contradiction, which in turn is a necessary condition for the metalinguistic interpretation of negation. However, as was initially observed by Carston (1996) and reinforced by Noh (1998; 2000), it is not necessary to have a clarification or corrective follow-up clause for a MN to arise. Here are the relevant examples from Carston (1996: 314) and Noh (2000: 114), respectively:

(8) (After proceeding just one mile in two hours, a driver sees a road sign which reads "ROADWORKS AHEAD, DELAYS POSSIBLE" and says:) Delays are not POSSible.<sup>2</sup>

(9) (context: A and B have an ongoing disagreement about the correct plural of 'mongoose', A advocating 'mongeese' and B 'mongooses')  
A: We saw two mongeese at the zoo.  
B: Now, come on, you didn't see two monGEESE.

Second, it has also been noted that the properties related to metalinguistic negation should be considered from a broader perspective. Pierre Larrivé (this volume) analyses a series of other metalinguistic configurations, such as conditionals (10) or comparatives (11).

(10) If Iran is going *nucular*, you must be a George Bush admirer.

(11) We'd better go to the poLice than to the POLice! (Giannakidou & Yoon 2011)  
Since when have you been eating tom[eiDuz] and getting stressed out? (Carston 1996: 161)

A question arises whether logical words (such as negation or conditionals) and other expressions (such as comparatives or questions) should receive another, non-standard interpretation (for instance, non-truth-functional) just because of such metalinguistic configurations in which they can be used.

In addition, Carston (2002: 299) defends a non-ambiguist view of negation considering various metalinguistic configurations, including MN. According to her analysis, there are

<sup>1</sup> For Moeschler (2010), this restriction process takes place at the level of the explicature (and not at the level of the implicature), and it pertains to semantics. Moreover, this process is a general one, as it applies to all logical connectives and quantifiers (*if* interpreted bi-conditionally, the exclusive *or*, and *some* interpreted as *not all*).

<sup>2</sup> Capital letters indicate an accentuated pronunciation of that particular word chunk.

two main properties of MN. First, there is a unique negation operator that has a standard truth-functional meaning and applies to both descriptive and metalinguistic uses of negation. Second, the essential property of MN is the presence under the scope of the negation operator of a fragment that is not used descriptively but has to be understood echoically (cf. Sperber & Wilson 1986; Wilson & Sperber 1988; 1992). In other words, MN operates on non-descriptive uses of representations: that is, on metarepresentations (Sperber & Wilson 1986; Wilson 2000). In Relevance Theory, a metarepresentation is a representation that is used neither to refer directly to nor describe a situation, but to mention, quote or echo some other representation, as in (12). The examples from (8) to (11) provide further illustration.

(12) A mother to his child: You don't have two FOOTS, you have two feet.

The crucial point made explicit in Carston's proposal (2002: 301) is that the presence of such metarepresentational or echoic material under the scope of the negation operator does not force a non-standard (i.e. non-truth-functional) use of the negation operator. Instead, an utterance containing a metarepresentation simply gets pragmatically enriched to form a fully-fledged proposition, as in (13).

(13) not (you have two of what the correct plural form is 'foots'); you have two of what the correct plural form is 'feet'

In this manner, a *sine qua non* condition for the truth-functionality of the negation operator – that is, the presence of a proposition on which it can operate – is met.

## 2.2 Previous experimental studies on metalinguistic negation in Korean, French and Arabic

Previous experiments on metalinguistic negation are scarce. The only two of which we are aware are Noh et al.'s 2013 paper on Korean and Guella et al. (in preparation) on French and Arabic. We will briefly present them in this section.

In their 2013 study, Noh et al. carried out two eye-tracking experiments in which they tested differences in processing DN and MN in Korean. It is important to note that in this language there are two negative forms (long and short). The aim was to evaluate two accounts of metalinguistic negation labeled by the authors as the *semantic* (Burton-Roberts 1989) and the *cognitive* accounts (Carston 1996; Carston & Noh 1996; Noh 2000). Their experimental hypotheses align with ours: the semantic account (*ambiguist* in our terms) predicts that MN will take longer because of the two-step analysis involving a reanalysis of the negated sentence (NEG) and, according to the cognitive account (*non-ambiguist* in our terms), MN does not take longer because of the considerations related to optimal relevance. As far as eye-tracking measures are concerned, the prediction of the semantic account is that, on the corrective follow-up (COR) clause, the readers should go back to the negative sentence in order to reinterpret it. The cognitive account does not make such a prediction.

As we mentioned above, Korean provides two means of negating a clause: the short form and the long form ((14)a and b respectively, taken from Noh et al. 2013: 3). Both of them can be interpreted as MN, but the short form is mostly dedicated to the descriptive use of negation.

(14) a. Short form: *an* "not" – verb  
 Yuna-ka ton-ul **an** pel-ess-ta.  
 Yuna-NM money-AC **not** make-PST-DC  
 'Yuna didn't make money.'

- b. Long form: verb-*ci an-h* [verb-NOM *not-do*]  
 Yuna-ka ton-ul pel-**ci** **an-h**-ass-ta.  
 Yuna-NM money-AC make-NOM **not-do**-PST-DC  
 ‘Yuna didn’t make money.’

However, in some specific syntactic configurations (i.e. copula + NP or NP + relative clause), only the short form can be used, and in such specific sentences the negation can be interpreted descriptively or metalinguistically. Therefore, the experimental material, previously rated in a sensicality test by another group of participants, consisted of this type of negative sentences. Two conditions were tested. In the first, the set of experimental items was composed of a series of pairs of sentences in which the target of negation was the linguistic form, in particular the pronunciation of a word. In the second condition, the set of experimental items contained a series of pairs of sentences where negation targeted an implicature. (15) and (16) provide, respectively, examples of translated sentences from each condition from Noh et al. (2013: 6).

- (15) a. Changswu does not go to school [haykkyo], he goes to school [hakkyo].  
 b. Changswu does not go to work, he goes to school.
- (16) a. I don’t like Girls’ Generation, I love them.  
 b. I don’t dislike Girls’ Generation, I love them.

As the examples demonstrate, the first part of the two-sentence sequence (i.e. the negative sentence) was different for DN as in the a. variants and MN as in the b. variants, while the second part (i.e. the corrective sentence) was kept the same for DN and MN.

The overall results showed no difference in total reading times, nor in the reading times of specific target regions between MN and DN. Noh et al. reported that the negation of a linguistic form took longer to be processed than when negation targeted implicit content, which is treated by Noh et al. (2013) as a (Gricean) conversational implicature.<sup>3</sup> According to their own suggestion, this result could be attributed to the fact that the task concerned phonological errors in pronunciation while the participants were tested in reading. In essence, their results do not support the semantic account, because no significant difference between MN and DN was observed either in reading time or in eye-tracking measures.

A similar experiment was conducted with French and Arabic (Standard Modern Arabic) by Guella et al. (in preparation). The participants were native Arabic, L2 learners of French, from King Saud University of Saudi Arabia. The control group was formed of different native Arabic speakers. The L2 learners of French were tested for French, and the control group for Standard Modern Arabic. The predictions were the same as in Noh et al. (2013), as well as in our own study. The *reinterpretation* account (semantic in Noh et al. and ambiguit in our terms) predicts longer reading times for MN and a return to the negative sentence in eye-tracking setup, whereas the *non-reinterpretation* account (cognitive in Noh et al. and non-ambiguit cognitive approach in our terminology) does not predict longer treatment for MN.

The tested material consisted in a series of pairs of two-sentence sequences and included only the negation of a linguistic form – more precisely, grammatical errors in determiners. (17) provides a relevant set of examples from Guella et al. (in preparation).

<sup>3</sup> It is worth underlining that, for other scholars such as Moeschler (2010), in the case of the pair *like-love* MN scopes over an assertion rather than a scalar implicature (as it is the case for numerals; cf. examples (5) and (6)).

- (17) a. Marie ne va pas à le maison. Elle va à la maison.  
 Marie is not going to the [M] house. She is going to the [F] house.  
 b. Marie ne va pas chez Françoise. Elle va à la maison.  
 Marie is not going to Françoise. She is going to the house.

Their results basically confirm Noh et al.'s findings. No difference in reading times for the corrective sentences was found among Arabic L2 learners of French. However, one statistically significant difference was reported, namely that the first pass reading times (also called *gaze durations*)<sup>4</sup> were longer in the DN condition than in the MN condition. This point is interesting regarding our own findings, and we will come back to it later in Section 4.2.

### 3 Experiments with French negative sentences with and without context

In this paper we present two online self-paced reading experiments and one offline elicitation task experiment, in which we investigate one particular type of metalinguistic negation that involves cancelling the implicature drawn from scalar terms. Due to the [*beautiful, gorgeous*] scale given in (18), when the speaker utters *beautiful*, the hearer is entitled to comprehend *not gorgeous*, as in (19). Using metalinguistic negation, one can cancel this implicature, as in (20).

- (18) [*beautiful, gorgeous*]  
 gorgeous → beautiful  
 beautiful + > not gorgeous
- (19) Mary is beautiful + > Mary is not gorgeous.
- (20) Mary is not beautiful. She is gorgeous.

The aim of our experimental investigation was to test the on-line processing of DN and MN to evaluate the predictions of ambiguous and non-ambiguous approaches to negation. Two self-paced reading experiments were carried out, in which reading times of NEG and COR were assessed: one with a context provided through a picture (Experiment 1); and the second without context (Experiment 2). The same material (experimental items and fillers) was used in both Experiment 1 and Experiment 2. The main difference between these two experiments was the presence or absence of a context.

The aim of the elicitation experiment (Experiment 3) was to verify the comprehension of negative utterances and their possible interpretations as MN or DN when they are preceded by a visual context but not followed by a COR segment. In other words, we aimed to test whether participants can derive the MN interpretation based only on a previous visual context and without having access to a clarification sentence. Participants in the three experiments were comparable in terms of age and educational background.

#### 3.1 Predictions for the current experimental investigation

The theoretical approaches to the problem of descriptive and metalinguistic negation that we have detailed in Section 2.1 give rise to different predictions concerning the cognitive treatment of negation. They are summarized in Table 1 for the two target segments for which reading times were assessed.

<sup>4</sup> The first pass reading times measure the first view of a word or region before moving in a forward or a backward direction. It is often associated with cognitive processes related to word recognition and lexical access. This measure is different from other late measures, such as regression path duration and total times, which take rereading and regressions into account and are often associated with processes of integration and reanalysis (Canestrelli 2013: 36).

**Table 1:** Summary of predictions for the NEG and COR segments.

		NEG	COR
<b>Experiment 1:</b> compatible visual context (here, the picture of a beautiful woman)	Example	<i>Mary is not beautiful.</i>	<i>She is rather ugly.</i>
	Ambiguists	MN > DN	MN = DN
	Non-ambiguists	MN = DN	MN = DN
<b>Experiment 2:</b> no previous context	Example	<i>Mary is not beautiful.</i>	<i>She is gorgeous.</i>
	Ambiguists	MN = DN	MN > DN
	Non-ambiguists	MN = DN	MN = DN

As can be observed, we make different predictions for each target segment according to whether the participant sees (Experiment 1) or does not see (Experiment 2) a previous context compatible with the descriptive or the metalinguistic interpretation of negation. We consider the previous context to be a source of information that is used by the comprehender to identify the speaker's intended meaning. Other sources that the comprehender might use are the clarification clause (which is frequently used when negation is interpreted metalinguistically, although not always; cf. discussion in Section 2.1), prosody or world knowledge.

We will start by discussing the prediction of the ambiguit approach (Horn 1985; Burton-Roberts 1989; cf. also discussion in Noh et al. 2013). The theoretical analysis undertaken in this approach yields the prediction that it should take longer to read a negative sentence which is interpreted metalinguistically than one which is interpreted descriptively, because of the two-step analysis. The hearer will always try out the descriptive interpretation first, and, if he detects any problem, such as a contradiction, he will pragmatically derive a metalinguistic interpretation through a reanalysis. As one of the anonymous reviewers pointed out, ambiguists would also expect that the contradictory information can either be explicitly asserted by COR or implicitly provided by the context. Consequently, our experimental assumptions are based on the availability of multiple sources of contradictory pieces of information that may come not only after but also before the NEG segment. We hypothesize that the processing of MN should differ according to whether contradictory information is provided before (for example, from a picture as in Experiment 1) or only after the NEG segment (for example, from COR as in Experiment 2).

In Experiment 1, in which the context was provided by a picture, when participants read *Mary is not beautiful*, they have to process the contradiction between the information coming from the picture and the default interpretation of negation (that is, the DN interpretation). Therefore, according to this approach, significantly longer reading times for the NEG segment should be measured for MN than for DN. Furthermore, when they read the COR segment, the clarification sentence is only a confirmation of the MN interpretation at this point in the interpretation process. Hence, no significant difference between MN and DN is expected for COR. This predicted additional cognitive load for MN is generally associated in offline tasks with a higher rate of errors (Millis & Just 1994; Sanders & Noordman 2000).

In Experiment 2, in which no previous context is provided, when participants read *Mary is not beautiful* they have no information which might lead them to doubt that negation should not be interpreted as DN (which is the default interpretation). Thus, for the NEG segment in the condition without context, we expect no significant difference between MN and DN. Contradictory information will be provided only when reading the clarification clause, and it is at this segment that the reanalysis of negation should take place. Therefore, significant reading time differences should be found for the COR segment in Experiment 2.



The non-ambiguist approaches do not share these predictions. In the relevance-theoretic proposal we discussed earlier (Carston 1996; Carston & Noh 1996; Noh 1998; 2000), MN should not take longer to process than DN, because negation is under-determined and its interpretation is built contextually. It either gets restricted to the DN or the MN interpretation, depending on the consideration of optimal relevance which corresponds to a speaker's intended meaning. The hearer is constantly searching for an optimal interpretation of the speaker's utterance, which leads him to enrich pragmatically the logical forms of the utterances he processes in order to arrive at propositions on which the negation operator can operate. Given that both DN and MN need pragmatic enrichment to arise according to the non-ambiguist account, this approach does not predict a difference in reading times for DN and MN in both Experiment 1 and Experiment 2. Specifically, in the absence of context, negation remains under-determined because no cues are provided that point to the DN or the MN interpretation.

In order to explore the extent to which participants are able to identify the DN vs. MN interpretations of a negative utterance based only on the cue provided by a picture, we carried out Experiment 3. In this experiment, participants were asked to provide a continuation of a negative sentence preceded by a picture. The two experimental conditions were the DN configuration, in which the picture was consistent with the DN interpretation, and the MN configuration, in which the picture was consistent with the MN interpretation. The ambiguist and the non-ambiguist accounts would make different predictions in terms of accuracy. The ambiguist account would predict that participants provide more DN continuations across the two experimental conditions. This corresponds to a lower accuracy rate for the MN context than for the DN context. In other words, we expect to find significant differences regarding the types of continuations given in the MN vs. the DN contexts. The prediction made in the non-ambiguist approach is that comprehenders should take into account the available cue (the picture), and interpret the subsequent negative sentence appropriately. This means that we expect to find similar accuracy rates, thus no significant differences between the MN and the DN contexts.

### **3.2 Experiment 1: On-line processing of DN and MN with context**

#### **3.2.1 Participants**

Participants in Experiment 1 were 28 second- and third-year students from the University of Neuchâtel in Switzerland (24 females, mean age 22.75 yrs., range 20–31). All participants were native speakers of French and studied language sciences or speech therapy. Their participation in the experiment was part of their activity for one course in linguistics, and they were not paid for their participation.

#### **3.2.2 Material and procedure**

We created 16 pairs of DN and MN stimuli divided into two lists, with each list including only one sentence from each pair, and 16 fillers. Each participant saw only one list. The experiment was run using the E-prime self-paced reading software (Schneider et al. 2012). The software presented the items and the fillers in a randomized order for each participant. Participants saw a series of three segments: the first was NEG; the second, the COR follow up sentence; and the last one was a wrap up sentence, whose function was to finalize the task and to avoid a reading time measure taken on a series-final segment. The three segments were followed by a *yes/no* question, where the ostensible task was to decide whether or not the situation described by the three segments (NEG, COR and the wrap up sentence) correctly described the picture. All the experimental items correctly described the corresponding pictures. There was a mixture of true and false answers in the case of the fillers.

All the sentences were formulated in the present tense and had simple vocabulary. The number of syllables of NEG and COR varied between 5 and 6. The two target segments for which the reading time measures were taken were NEG and COR. Table 2 provides an example of each category.

Participants were tested individually in a quiet room. After signing an informed consent form, each participant was invited to sit in front of the computer screen where the instructions explaining the experiment were displayed. They were informed that they would see a picture, that they should take the time to look at it, that they would read three sentences and that they would have to decide whether the three segments did or did not describe the picture.

Each session began with written instructions, followed by a training phase, in which participants read sentences similar to the experimental items and the fillers. At the end of the training phase, which was carried out on 4 items similar to experimental items and 4 items similar to fillers, they had the opportunity to ask questions of the experimenter before the actual experiment began. All the trials began with a fixation cross in the middle of the screen, which lasted for 1000ms. Then the picture appeared, remaining until the participants pressed the space bar. After that, participants could read the sentences one after another, by pressing the space bar. There was no time constraint imposed for the task, and each participant completed the experiment within approximately 8 minutes.




**3.2.3 Results**

The participants' accuracy rate was .92%, indicating that they understood the task in which they were engaged. Before conducting the analysis, outliers were removed from the data by deleting all observations that were 2.5 standard deviations above or below the participant's mean for the two target segments (NEG and COR). This procedure led to a removal of 7% of the total number of observations. The mean reading times measured in milliseconds for NEG and COR are reported in Table 3.

A Kolmogorov test applied to the data showed that they were not normally distributed ( $p < .05$ ). In order to normalise reading time data, we transformed the actual mean values into Log10. This transformation results in a normal distribution of the data allowing for the use of t-tests for further analyses of the data.

A paired-samples t-test was performed on the Log10 of the mean values in order to compare reading times in the DN and MN conditions, firstly for the NEG segment and then the COR segment. For the NEG segment, no significant effect was found: the mean values (Log10) of the reading times DN ( $M = 3.17, SE = .018$ ) were not significantly different

**Table 2:** The examples of the three-segment series in the condition with context.

	<b>Context: picture</b>	<b>Negative sentence (NEG)</b>	<b>Corrective follow up (COR)</b>	<b>Wrap up sentence</b>	<b>Expected answer</b>
<b>DN</b>		The shoe is not big.	It is small.	It is a baby shoe.	True
<b>MN</b>		The shoe is not big.	It is enormous.	It is made of wood.	True
<b>Filler</b>		The dog is not in the doghouse.	The roof is green.	The dog is sleeping.	False

**Table 3:** The mean reading times (in ms) for NEG and COR in Experiment 1.

Type of negation	Segment	Mean	Std. Error
<b>DN</b>	NEG	1523	57
	COR	1193	44
<b>MN</b>	NEG	1482	68
	COR	1180	74

from the mean values (Log10) of the reading times for MN ( $M = 3.15$ ,  $SE = .018$ ),  $t(27) = .632$ ,  $p > .05$ . Nor was a significant effect found for the COR segment: the mean values (Log10) of the reading times for DN ( $M = 3.06$ ,  $SE = .02$ ) were not significantly different from the mean values (Log10) of the reading times for MN ( $M = 3.05$ ,  $SE = .02$ ),  $t(27) = .470$ ,  $p > .05$ .

### 3.2.4 Discussion

These results do not reject the null hypothesis of no difference in the reading times for NEG and COR between the two conditions, and provide no evidence for the difference predicted by the ambiguit approach to negation between DN and MN.<sup>5</sup> In particular, one would have expected to find that MN takes longer to process because of a re-analysis of the negative phrase when the reader encounters a contradictory piece of information – that is, a piece of information which contradicts his previous interpretation of negation. Contradictory pieces of information can come from various sources, such as the previous (immediate) context in which the negative sentence is uttered, general world knowledge, prosody, or the corrective which follows the negative.

In our case, the previous context was constituted by the picture. As such, the picture shown before the negative sentence had already provided participants with a piece of information that was probably used when they read the NEG segment. In other words, when participants read the negative sentences, which were kept constant in both experimental conditions, they were able to construct one of the two interpretations of negation. However, we observed no significantly different reading times between DN and MN, neither for the NEG nor for the COR sections. Therefore, these results do not provide evidence in favor of a costlier re-analysis of the MN operator, as predicted by the ambiguit approach.

### 3.3 Experiment 2: On-line processing of DN and MN without context

Experiment 2 was designed to explore how readers process negative sentences without a previous context, using only information given in the COR segment (which appears after the negative sentence). According to the ambiguit approach, we would expect to have similar reading times for the NEG segment between DN and MN, and longer reading times for the COR segment for MN, due to the reanalysis. For the non-ambiguit approach, we would not expect differences in reading times, be they in the NEG or COR segments, because negation is under-determined and its interpretation is constructed as readers progress in the comprehension process (cf. Table 2).

<sup>5</sup> In our case, as was the case for Noh et al. (2013), one of the two competing theories predicts no difference between the two experimental conditions, and hence null results. In order to reinforce these results, we think that our future research will need to find an original experimental design able to pinpoint a positive effect.

### 3.3.1 Participants

Participants in Experiment 2 were 27 second- and third-year students from the University of Neuchâtel in Switzerland (24 females, mean age 20.55 yrs., range 19–23). All participants were native speakers of French and studied language sciences or speech therapy. Their participation in the experiment was part of their activity for one course in linguistics, in which they did not discuss the topic of negation. They were not paid for their participation.

### 3.3.2 Material and procedure

As in Experiment 1, the experiment was run using the E-prime self-paced reading software (Schneider et al. 2012), which presented the items and the fillers in a random manner for each participant. The two experiments are identical with respect to the experimental items and the fillers, and different regarding the design. In Experiment 2, participants saw a series of three segments: the first was the negative sentence (NEG); the second, the corrective sentence (COR); and the last one was a wrap up segment in the form of a *yes/no* question that served to finalize the task. Reading time measures were performed for NEG and COR. Table 4 provides an example of each category.

Participants were tested individually in a quiet room. After signing an informed consent form, each participant was invited to sit in front of the computer screen where the instructions explaining the experiment were displayed. They were informed that their task would be to read two segments which describe a situation, providing little information about it, and to answer the question at the end of each series on the basis of the small quantity of information they received. They were also instructed that the segments would show up on the screen one after another as they pressed the space bar. The last, third segment would correspond to a question that they would have to answer by pressing a key for *yes* or for *no*, according to their choice.

As in Experiment 1, at the end of the training phase, they had the opportunity to ask questions of the experimenter before the actual experiment began. All trials began with a fixation cross in the middle of the screen, which lasted for 1000ms, and continued with the NEG segment that appeared upon pressing the space bar, followed by the COR segment, and then the final question. There was no time constraint imposed for the task, and each participant completed the experiment within approximately 8 minutes.

### 3.3.3 Results

Before conducting the analysis, outliers were removed from the data by deleting all observations that were 2.5 standard deviations above or below the participant's mean for the two target segments (NEG and COR). This procedure led to a removal of 9% of the total number of observations. The mean reading times for NEG and COR are reported in Table 5.

As in Experiment 1, the data, which were not normally distributed, were transformed into Log10. A paired-samples t-test was performed on the Log10 of the mean values in order to compare reading times in the DN and MN conditions, firstly for the NEG segment and then the COR segment. In the NEG segment, no significant effect was found: mean values (Log10) of the reading times for DN ( $M = 3.04$ ,  $SE = .04$ ) were not significantly different from the mean values (Log10) of the reading times for MN ( $M = 3.07$ ,  $SE = .03$ ),

**Table 4:** The examples of the three-segment series in the condition without context.

	Negative sentence (NEG)	Corrective follow-up (COR)	Question to finalize the task
<b>DN</b>	The shoe is not big.	It is small.	Do you think you could wear it?
<b>MN</b>	The shoe is not big.	It is enormous.	Do you think it is in a museum?
<b>Filler</b>	The dog is not in the doghouse.	The roof is green.	Do you think it wants to play?

**Table 5:** The mean reading times (in ms) for NEG and COR in Experiment 2.

Type of negation	Segment	Mean	Std. Error
<b>DN</b>	NEG	1219	97
	COR	1488	113
<b>NM</b>	NEG	1294	106
	COR	1372	88

$t(26) = -1.278, p > .05$ . Nor was a significant effect found for the COR segment: mean values (Log10) of the reading times for DN ( $M = 3.13, SE = .03$ ) were not significantly different from the mean values (Log10) of the reading times for MN ( $M = 3.11, SE = .02$ ),  $t(26) = 1.039, p > .05$ .

### 3.3.4 Discussion

Similar to Experiment 1, the results of this experiment do not provide evidence for the ambiguous approach to negation. As we saw earlier, when contradictory information comes after the negative sentence (in COR), we would expect MN to exhibit costlier COR segment processing than DN. As for the NEG segment, we should not observe a difference between cases when it is interpreted descriptively and cases when it is interpreted metalinguistically, since at this precise point negation is ambiguous. These results do not provide evidence in favor of a costly reanalysis taking place for the COR segment. As for the NEG segment, no difference in reading times was found.

As noted in Section 3.1, according to the non-ambiguist approach, hearers build the DN or the MN interpretation based on the information provided by the context. Given the two-step analysis, the ambiguist approach predicts that participants would perform at a lower accuracy rate in MN contexts, since their first trial will always correspond to DN.

In order to test this, we carried out an offline elicitation experiment, in which participants had to provide continuations for a negative sentence that was preceded by a picture. In summary, we expected them to provide the clarification clause that would indicate whether they interpreted negation descriptively or metalinguistically.

## 3.4 Experiment 3: Offline elicitation experiment

### 3.4.1 Participants

Participants in Experiment 3 were 72 second- and third-year students from the University of Neuchâtel in Switzerland (59 females, mean age 21.8 yrs., range 18–48). All participants were native speakers of French and studied language sciences or speech therapy. They were not the same participants as those from Experiments 1 and 2, but were comparable in age and educational background. Their participation in the experiment was part of their activity for one course in linguistics, and they were not paid for their participation.

### 3.4.2 Material and procedure

The offline experiment tested a selection of 10 experimental items and of 14 fillers used in Experiment 1. Each experimental item and each filler consisted of a picture, which provided a context compatible with the DN or MN intended interpretation of negation, and the NEG segment. The participants' task was to look at the picture, read the given sentence (which corresponds to the NEG segment, in the case of the experimental items), and propose a follow up sentence. The provided sentence and the follow up sentence had to describe the picture correctly. In analyzing the follow up sentences, we were interested in whether participants correctly identified the MN or the DN interpretation of negation based only on the visual cue provided by the picture.

The experiment took place during a linguistics class. All participants saw the experimental items and the fillers appear on the screen. For each trial, participants saw a fixation cross, then the picture, then the provided sentence, and finally they had to write down a continuation that would correctly describe the picture. The experimental phase was preceded by a short training phase.

### 3.4.3 Results

Data were coded by two independent coders, who compared the participants' responses with the complete reference items previously used in Experiments 1 and 2, including the picture, the NEG segment and the COR segment. The two coders reached an inter-coder agreement of 0.86. This value indicates that their coding is reliable. Further, each coding was compared to the reference items, as provided in Table 6, which gives the number of observations across 10 experimental items (5 in the MN condition and 5 in the DN condition) and 72 participants. The INC label corresponds to continuations which are inconclusive regarding MN or DN interpretations of the NEG segment, as in (21) (cf. Table 6). This was the case for 30% of the cases in the MN condition, and 42% of the cases in the DN condition.

(21) The shoe is not big. It is brown.

In our further analysis, we considered only conclusive continuations (that is, 70.5% in the MN condition and 57.5% in the DN condition). Among the conclusive cases, a finer-grained distinction was made between *explicit* and *implicit* types of continuations. Explicit continuations are cases in which participants provided a follow-up sentence which explicitly pointed towards an MN or a DN interpretation of negation, as in (22). Implicit continuations are cases in which the follow-up sentence pointed only implicitly towards an MN or a DN interpretation of negation, as in (23).

(22) The shoe is not big. It is huge.

(23) The shoe is not big. The people are smaller than it.

Table 7 provides the number of conclusive explicit continuations given by participants in MN and DN contexts. Using the visual cue provided by the picture, in MN contexts participants proposed 61.7% explicit and 37.2% implicit MN continuations. In contrast, they only proposed 1.2% of (explicit) DN continuations. As for DN contexts, participants provided 58.8% explicit and 32.7% implicit MN continuations. In contrast, they proposed 8.5% (implicit) continuations. Using a Chi-Square significance test, this distribution of explicit and implicit MN and DN continuations is shown to be significantly different from random distributions (Chisq 289.94,  $df = 3$ ,  $p < .001$ ).

**Table 6:** Results across 72 participants (mean values for the two coders).

	MN expected		DN expected	
<b>DN observed</b>	3	0.8%	189	52.6%
<b>MN observed</b>	250	69.6%	17.5	4.9%
<b>INC</b>	106	29.5%	152.5	42.5%
<b>NA</b>	1	0.3%	1	0.3%
<b>Total observed</b>	359		359	
<b>Total expected</b>	360		360	

**Table 7:** Conclusive continuations in MN and in DN contexts (mean values for the two coders).

	MN expected		DN expected	
<b>DN explicit</b>	3	1.2%	121.5	58.8%
<b>DN implicit</b>	0	0%	67.5	32.7%
<b>MN explicit</b>	94	37.2%	17.5	8.5%
<b>MN implicit</b>	156	61.7%	0	0.0%
<b>Total DN</b>	3	1.2%	189	91.5%
<b>Total MN</b>	250	98.8%	17.5	8.5%
<b>Total</b>	253	100%	206.5	100%

### 3.4.4 Discussion

The results of this elicitation experiment do not favor the ambiguit approach, which predicted more DN continuations across both conditions. This would be due to the assumption that DN is the default interpretation of negation, and consequently, that lower rates of accuracy were expected for the MN condition than for the DN condition. As shown above, participants successfully identified the reference interpretation (MN expected in the MN experimental condition, and DN expected in the DN condition) in more than 90% of the cases (98.8% MN continuations in the MN condition, and 91.5 DN continuations in the DN condition).

Consequently, this experiment provides evidence that seems to support the hypothesis defended in the non-ambiguit approach, according to which the MN and the DN interpretations of negation are contextually built, using cues as they become available. This approach did not predict a significant difference between the participants' types of continuations given in the MN conditions and those in the DN conditions.

## 4 General discussion

### 4.1 The pragmatic schema for the interpretation of negation

The few existing experimental studies on negation point in the same direction. The prediction of the ambiguit type of analysis is not supported by any of the results of the three experimental studies. More specifically, the findings of eye-tracking and reading time experiments observed by Noh et al. (2013) do not reveal any statistically significant difference between processing DN and MN in Korean. Guella et al. (in preparation) found the same results in French when studying Arabic L2 learners of French, and in Modern Standard Arabic using a control group of Arabic native speakers.

These comparable results have been assessed using different techniques (eye-tracking and self-paced reading experiments) and different experimental designs. In the two previous experiments, which explicitly tested COR's role in interpreting the negative operator descriptively or metalinguistically, the COR sentences were kept constant, while the NEG sentences varied across conditions. In our study, which tested how comprehenders process NEG sentences in a given context, the NEG sentences were kept constant, while the COR sentences varied across conditions. This allowed us to test the prediction that the necessary cues for directing the hearer towards a DN or an MN interpretation, such as a contradictory information for MN, may come from a source other than COR itself. This is particularly striking in Experiment 3, in which the participants' task was to propose a clarification clause by themselves (that is, the COR segment) based on the picture seen and on the NEG segment previously read.

In our study, we replicated the previous results regarding the role of COR, and we found that a previous context is equally useful in building the interpretation of negation. More

specifically, Experiments 1 and 2 showed that participants do not experience an additional cognitive load, as measured in terms of reading times, when processing the NEG and the COR segments in the MN condition when compared to the DN condition. This is the case both when the NEG segment is processed in a visually compatible context (Experiment 1) and when it is not preceded by a context (Experiment 2). Experiment 3 showed that a visual cue provided before the NEG segment is sufficient to guide the comprehender towards the MN or the DN interpretation of negation. Indeed, among all the conclusive continuations in the two conditions (70.5% in the MN condition and 57.5% in the DN condition), comprehenders correctly identified the MN interpretation in an MN context in 98.8% of the cases, and the DN interpretation in a DN context in 91.5% of the cases.

Based on the findings of our study, we would like to propose a comprehension schema of negative utterances, which draws on the general comprehension procedure on the one hand (Wilson & Sperber 2004: 615) and on Moeschler’s (2017) semantic and pragmatic relations of DN and MN on the other. As mentioned above, according to Wilson and Sperber (2004), the comprehender constructs a series of premises and conclusions when interpreting an utterance that can be split into the following categories: an appropriate hypothesis about the explicit content of an utterance (explicated premises or hypotheses, as shown in Table 8); an appropriate hypothesis about the intended contextual assumptions (implicated premises); and an appropriate hypothesis about the intended contextual implications (implicated conclusions). As can be seen in example (24), what B explicitly communicates is that, beyond being beautiful, Mary is in fact gorgeous, and B implicitly communicates that, for him, she has a high chance of winning the beauty contest. In other words, the choice of the DN vs. MN interpretation of negation for the utterance *Mary is not beautiful* is made at the level of the explicature of the utterance.<sup>6</sup>

- (24) A: Do you think that Mary will win the beauty contest?  
 B: Mary is not beautiful. She is gorgeous.

In sum, we suggest that the interpretation of negation is made at the level of the explicature by making use of linguistic and non-linguistic (e.g. visual) cues as they become available in the context. The hearer formulates contextual hypotheses which are plausible in the

**Table 8:** The interpretation of negation at the level of the explicated hypothesis about the explicit content of the utterance.

		$t_0$	$t_1$	$t_2$
<b>MN</b>	Cues	photo of a beautiful woman	photo of a beautiful woman <i>Mary is not beautiful</i>	photo of a beautiful woman <i>Mary is not beautiful</i> <i>She is gorgeous</i>
	Explicated hypothesis	$\emptyset$	~95% MN ~5% DN	100% MN
<b>DN</b>	Cues	photo of a rather ugly woman	photo of a rather ugly woman <i>Mary is not beautiful</i>	photo of a rather ugly woman <i>Mary is not beautiful</i> <i>She is rather ugly</i>
	Explicated hypothesis	$\emptyset$	~95% DN ~5% MN	100% DN

<sup>6</sup> We are grateful to one of the anonymous reviewers for pointing this out to us.



context (in our experiments, the context is given by the photo and the COR sentences), and uses them to choose the most relevant interpretation of negation: DN or MN.

If we wanted to look in more detail at the way in which negation is interpreted, taking into account the temporal order in which the hearer becomes aware of the available cues, we have to consider the role of each cue in the interpretation of negation and the time at which it becomes available, as given in Table 8.

According to this proposal, in both the MN and DN configurations, no conclusion can be reached at  $t_0$ , when the comprehender only has access to the visual cue. At  $t_1$ , in the MN configuration, the comprehender cannot fully commit to the MN interpretation upon reading NEG, as shown by the results of Experiment 3 (given in Table 7) where, based on the photo, participants recognized the MN interpretation in 86% of the cases. However, the visual cue seen at  $t_0$  allows for the formulation of a hypothesis about the explicit content of the NEG segment (i.e. its explicature), which corresponds to the MN interpretation in most cases. At  $t_2$ , having processed the COR segment, the explicated hypothesis is confirmed and the comprehender derives the MN interpretation, which is at this point the optimally relevant configuration; as such, he can fully commit to it. In the DN configuration, at  $t_1$  the information provided by the photo is directly compatible with the content of NEG, thus yielding the DN interpretation of negation, to which the comprehender fully commits. The COR segment provided at  $t_2$  confirms the hypothesis reached at  $t_1$ , and does not add new information to it.

In examples such as (24), the explicated hypothesis of NEG, which is the output of the first pragmatic process of enrichment, serves as input for a further pragmatic inference yielding implicated conclusions – i.e. the speaker's intended meaning (B's answer to A's question). First, A's question activates an implicated premise related to the world knowledge that *usually very beautiful women win beauty contests*. This implicated premise, together with the explicated hypothesis of NEG and the explicit premise provided by COR, delivers an implicated conclusion, which is B's answer to A's question: A believes that Mary will win the beauty contest.

This interpretation is compatible with relevance theoretic proposals made for other phenomena, such as scalar terms, disjunction or conjunction (cf. Bezuidenhout & Morris 2004; Noveck 2001; 2004). For example, Bezuidenhout and Morris (2004) have shown in an eye-tracking experiment that the comprehension process of sentences with ambiguous scalar interpretations of *some* (such as in (25), where *some* can be interpreted as in (26) or in (27)) does not lead readers to “fully commit to the *some but not all* reading right away. Rather, they engage in an incremental process utilizing all available information at any given moment in time.” (Bezuidenhout & Morris 2004: 272).

- (25) Some books had colour pictures.
- (26) Some *but not all* books had colour pictures.
- (27) Some *and possibly all* books had colour pictures.
- (28) Some books had colour pictures. In fact all of them did, which is why the teachers liked them.

In other words, when the hearer reads the further information given in the second clause of example (28) from Bezuidenhout and Morris (2004), he finds new cues which will direct him towards the *some and possibly all* reading of *some*. Consequently, the hearer will discard the *some but not all* reading, which was equally possible when he first read *some*.

The schema defined for the interpretation of negation (cf. Table 8) can also be applied to the above interpretation of *some*, as shown in Table 9.

As one can see in Table 9, while reading the first sentence at  $t_0$ , the comprehender formulates a hypothesis about the explicit content of *some*, which for the great majority

**Table 9:** The interpretation of *some* at the level of the explicated hypothesis about the explicit content of the utterance.

	$t_0$	$t_1$
Cues	Some books had colour pictures.	In fact all of them did, which is why the teachers liked them.
Explicated hypothesis	~95% <i>some</i> <sub>but not all</sub> ~5% <i>some</i> <sub>and possibly all</sub>	100% <i>some</i> <sub>and possibly all</sub>

of adults corresponds to the *some but not all* interpretation, whereas for typically and atypically developing children the *some and possibly all* interpretation may already be available from the start (Smith 1980; Noveck 2001; 2004).

This prediction for processing based on the interpretation schema is that MN and DN require similar processing efforts, because the comprehender takes into account all relevant pieces of information and chooses one of the two types of negation as he processes the target segments. This proposal is compatible with the incremental psycholinguistic model of comprehension (e.g. Gibbs 2002; Koornneef & van Berkim 2006), according to which the interpretation process is incremental, in the sense that cues are integrated as they become available (e.g. Gibbs 2002; Koornneef & van Berkim 2006). For example, Gibbs (2002 and previous) offered evidence against the Gricean treatment of figurative language (such as metaphors and irony, which pertain to the metarepresentational usage of language) as being cognitively costlier, because it requires reanalysis when the comprehender situates the figurative utterance in context. More specifically, he has shown that people “can read figurative utterances (e.g., *You’re a fine friend* meaning *You’re a bad friend*) as quickly as, sometimes even more quickly than, literal uses of the same expressions in different contexts, or equivalent non-figurative expressions” (Gibbs 2002: 459). In opposition to Grice’s treatment of figurative language, Gibbs proposes that comprehenders build the interpretation of an utterance (be it literal or figurative) in the context. In the same vein, Scott-Philips (2014) argues that metarepresentational – i.e. echoic – phenomena are not costlier from a processing point of view. For him, mindreading is “often less like thinking, and more than perception, i.e. something that we do unconsciously, as part of the background cognition that manages much of our daily lives” (Scott-Philips 2014: 72–73).

**4.2 More fine-grained distinctions in the non-ambiguist approach**

Further research should consider the more fine-grained distinction that can be made in non-ambiguist pragmatic studies. Specifically, we are aware of two slightly different accounts. The first is the non-ambiguist pragmatic *cognitive* account, represented by Carston and Noh, for whom the essential feature of MN is its metarepresentational (echoic) use. In Carston’s words (2002: 290), MN corresponds to “a wide scope use of an ordinary descriptive negation operator but with metarepresented material in its scope”. The second is the recent non-ambiguist *contextualist* account, proposed by Moeschler (2017; this volume), which takes into account the conversational record. For Moeschler, MN (be it the upper entailing MN applied to scalar terms or the presupposition denying MN) corresponds to one of the two possible uses of the negation operator derived by narrowing the wide scope semantics of the logical operator.

The two variants of the non-ambiguist approach make different predictions regarding cognitive costs for processing MN. The non-ambiguist cognitive account predicts that there would be basically no difference between DN and MN, mainly because the hearer contextually builds the optimally relevant interpretation of negation. As Noh et al. (2013) put it, when the COR clauses of the respective MN and DN interpretations of NEG are identical, as in (29) and (30), their processing time may indicate whether the reader takes

more time to process the COR segment for MN than for DN. If this is not the case, it could be concluded that the comprehender chooses the most accessible interpretation of the negation if it yields a cognitive effect. In other words, “only if the speaker finds the metalinguistic interpretation optimally relevant, will she or he take that interpretation” (Noh et al. 2013: 2).

(29) Father does not feel lousy; he is indisposed.

(30) Father does not feel good; he is indisposed.

The non-ambiguist contextualist account would predict that MN should in fact require shorter processing times than DN, mainly because of dissimilar patterns when assessing the representational properties of DN and MN linked to their inferential structure. There is a number of entailment relations that hold between NEG, COR and POS. Importantly, they are different for metalinguistic and descriptive negation, as shown in (31) and (32) respectively.

(31) MN: COR  $\rightarrow$  POS

Mary is not beautiful (NEG), she is gorgeous (COR)

Mary is beautiful (POS)

Mary is gorgeous  $\rightarrow$  Mary is beautiful

(32) DN: COR  $\rightarrow$  NEG

Mary is not beautiful (NEG), she is ugly (COR)

Mary is ugly  $\rightarrow$  Mary is not beautiful

(33) [beautiful, gorgeous]

gorgeous  $\rightarrow$  beautiful

beautiful + > not gorgeous

Mary is beautiful + > Mary is not gorgeous.

In the metalinguistic use of negation (31), the corrective clause (COR) gives direct access to the positive counterpart (POS) via entailment, whereas in the descriptive use of negation (32), POS cannot be accessed directly from COR, since COR entails NEG (Moeschler 2017; this volume). So, the procedure of accessing POS involves three steps with DN and only two with MN, as shown in the second column of Table 10. Since *beautiful* and *gorgeous* form a scale (33), we can see that MN also cancels the scalar implicature. These differences in the network of semantic relations in both types of negation have an impact on the cognitive effects of processing DN and MN and, hence, on the updating of the conversational record, as shown in Table 10.

As the first line of the Table 10 shows, uttering COR in DN is not informative because COR entails NEG, making it redundant.<sup>7</sup> This is due to the fact that it asserts information which is semantically available through entailment. Additionally, uttering NEG triggers

**Table 10:** Semantic and pragmatic properties of negation (adapted from Moeschler 2017).

	Entailments	Utterance explicatures	Context	Cognitive effects
<b>DN</b>	COR $\rightarrow$ NEG $\rightarrow$ POS	NEG $\wedge$ COR	POS	$\emptyset$ S
<b>MN</b>	COR $\rightarrow$ POS	NEG $\wedge$ COR	POS	POS + scalar implicature

<sup>7</sup> One of the anonymous reviewers pointed out COR is not redundant, as the DN interpretation of *Mary is not beautiful* is compatible with several alternatives, namely: she is merely pretty; she is plain; she is ugly; etc. As COR selects one of these alternates, it should not be considered redundant. We agree that, from the semantic point of view, this solution points in the right direction. However, we want to suggest that in order to arrive at the *beautiful/plain* or *beautiful/merely plain* pairs, one needs to have specific contexts or prosodic cues. This doesn't seem to be the case for the *beautiful/ugly* pair of antonyms.

the corresponding POS representation of the utterance (Lüdtke et al. 2008). This means that POS is in the conversational record. For Moeschler, the cognitive effect of DN is the suppression of POS from the conversational record.

As the second line of the Table 10 shows, in the metalinguistic configuration, uttering COR gives direct access to POS, which is already in the context. This results in the reinforcement of POS and the suppression of the scalar implicature, which makes it highly relevant to the hearer. In other words, MN is predicted to be less costly from a cognitive point of view, because the COR brings up two cognitive effects. Guella et al. (in preparation) found a result compatible with Moeschler's proposal, i.e. the only measure that reached statistical significance in their study was the gaze duration for COR, which was longer for DN than MN. No theoretical explanation of this result was included in their study, but this finer-grained split of non-ambiguist approaches allows it to be taken into account. However, it should be stressed that it is not possible to formulate a strong conclusion on this type of result at this point, but that this issue should be considered in more detail in further experimental investigations.

## 5 Conclusion

In this paper we experimentally evaluated two families of theoretical stances on the interpretation of descriptive and metalinguistic negation. On the one hand, there is the ambiguity account, represented by Horn (1985; 1989) and Burton-Roberts (1989), according to which the DN arises by default and is truth-functional, whereas MN is non-truth-functional and emerges under some specific conditions as a purely pragmatic phenomenon. Specifically, it emerges when the hearer tries to arrive at the DN interpretation but this process is blocked (e.g. because of a contradiction with a corrective follow-up clause) and he is forced to re-analyze negation as metalinguistic to reach a meaningful interpretation. On the other hand, the non-ambiguist account, supported by some pragmatic approaches (Carston 1996; 2002; Carston & Noh 1996; Noh 1998; 2000; Moeschler 2010; 2013; 2017), argues that there is one negation, which is truth-functional. Its interpretation as descriptive or metalinguistic is derived via an appropriate context, without the need for a re-analysis. The ambiguity account clearly predicts that MN will exhibit longer processing times, generally associated with higher error rates. According to the non-ambiguist account, MN need take no longer than DN, nor result in higher error rates.

The results of the two online experiments do not provide evidence in favor of the ambiguity account, which suggests that hearers interpret negation as DN by default, and then reanalyze it as MN once they have encountered a contradictory piece of information. Instead, they are compatible with the non-ambiguist account, which argues that hearers build their interpretation of negation in context, using cues as they become available. The results of the offline elicitation experiment provide evidence in addition to the results of the online experiments, in which we did not find evidence supporting the hypothesis of an additional cognitive load when deriving the MN interpretation. More precisely, participants successfully identified the reference interpretation (MN in the MN experimental condition and DN in the DN condition) in more than 90% of the cases for each of them.

In this paper, we proposed that the choice between the DN and the MN interpretations of negation takes place at the level of the explicature of the negative utterance. More precisely, we distinguish between the general comprehension procedure of utterances (which allows the hearer to identify the speaker's intended meaning, i.e. at the level of implicature) and the construction of the explicature of a negative utterance (where the hearer makes hypotheses about the DN or MN interpretation of negation based on the available linguistic and non-linguistic contextual cues).

The findings presented in this article enhance our understanding of negation and of the distinction between DN and MN. One of the factors that influences the interpretation of utterances is frequency. Future work should determine which of the two interpretations of negation is more frequent, and how this influences processing. Additionally, the current study has only examined the role of context as provided by a picture. In further research, we plan to vary the type of context. This could be done in two ways: by integrating the NEG and/or COR sentences in a larger previous linguistic context (i.e. a story or a dialogue), and by making use of prosodic cues.

### Abbreviations

AC = Accusative case particle, DC = Declarative sentence-type suffix, F = Feminine, M = Masculine, NA = Missing value, NP = Noun phrase, L2 = Second language, PST = Past tense/perfect aspect suffix.

### Acknowledgements

The two authors thank students from University of Neuchâtel for their participation in the experiments. They would like to thank the anonymous reviewers for their constructive suggestions and to Richard Zimmermann for his helpful observations on an earlier version of this paper. A special thanks is addressed to Jacques Moeschler for his valuable comments and for his constant support.

### Funding Information

The present study was a part of the project n° 100012\_146093: “LogPrag: the semantics and pragmatics of logical words (negation, connectives, quantifiers)” carried out at the University of Geneva (2014–2017) and funded by the Swiss National Science Foundation. The first author is grateful to this institution for the generous financial and administrative support.

### Competing Interests

The authors have no competing interests to declare.

### References

- Bezuidenhout, Anne L. & Robin K. Morris. 2004. Implicature, relevance and default pragmatic inference. In Ira A. Noveck & Dan Sperber (eds.), *Experimental pragmatics*, 257–282. London: Palgrave Macmillan. DOI: [https://doi.org/10.1057/9780230524125\\_12](https://doi.org/10.1057/9780230524125_12)
- Burton-Roberts, Noel. 1989. On Horn’s dilemma: Presupposition and negation. *Journal of Linguistics* 25(1). 95–125. DOI: <https://doi.org/10.1017/S0022226700012111>
- Canestrelli, Anneloes R., Willem M. Mak & Ted J.M. Sanders. 2013. Causal connectives in discourse processing: How differences in subjectivity are reflected in eye movements. *Language and Cognitive Processes* 28(9). 1394–1413. DOI: <https://doi.org/10.1080/01690965.2012.685885>
- Carston, Robyn. 1996. Metalinguistic negation and echoic use. *Journal of Pragmatics* 25(3). 309–330. DOI: [https://doi.org/10.1016/0378-2166\(94\)00109-X](https://doi.org/10.1016/0378-2166(94)00109-X)
- Carston, Robyn. 2002. *Thoughts and utterances: The pragmatics of explicit communication*. Oxford: Blackwell. DOI: <https://doi.org/10.1002/9780470754603>
- Carston, Robyn & Eun-Ju Noh. 1996. A truth-functional account of metalinguistic negation, with evidence from Korean. *Language Sciences* 18(1). 485–504. DOI: [https://doi.org/10.1016/0388-0001\(96\)00031-9](https://doi.org/10.1016/0388-0001(96)00031-9)
- Gibbs, Raymond W., Jr. 2002. A new look at literal meaning in understanding what is said and implicated. *Journal of Pragmatics* 34(4). 457–486. DOI: [https://doi.org/10.1016/S0378-2166\(01\)00046-7](https://doi.org/10.1016/S0378-2166(01)00046-7)

- Guella, Hakima, Géhane Essawy, Hind Alotaiby, Anne Reboul & Naelah Al-Ageel. In preparation. Metalinguistic Negation among French L2 Learners: Evidence from Eye-tracking Experiments.
- Horn, Laurence. 1989. *A natural history of negation*. Chicago, IL: University of Chicago Press.
- Horn, Laurence R. 1985. Metalinguistic negation and pragmatic ambiguity. *Language*, 121–174. DOI: <https://doi.org/10.2307/413423>
- Koornneef, Arnout W. & Jos J.A. van Berkum. 2006. On the use of verb-based implicit causality in sentence comprehension: Evidence from self-paced reading and eye tracking. *Journal of Memory and Language* 54(4). 445–465. DOI: <https://doi.org/10.1016/j.jml.2005.12.003>
- Larrivéé, P. This volume. Metalinguistic Negation from an informational perspective. *Glossa: a journal of general linguistics. Special Collection: Beyond descriptive and metalinguistic negation*.
- Lüdtke, Jana, Claudia K. Friedrich, Monica De Filippis & Barbara Kaup. 2008. Event-related potential correlates of negation in a sentence–picture verification paradigm. *Journal of Cognitive Neuroscience* 20(8). 1355–1370. DOI: <https://doi.org/10.1162/jocn.2008.20093>
- Millis, K.K. & M.A. Just. 1994. The influence of connectives on sentence comprehension. *Journal of Memory and Language* 33(1). 128–147. DOI: <https://doi.org/10.1006/jmla.1994.1007>
- Moeschler, Jacques. This volume. A set of semantic and pragmatic criteria for descriptive vs. metalinguistic negation. *Glossa: a journal of general linguistics. Special Collection: Beyond descriptive and metalinguistic negation*.
- Moeschler, Jacques. 2010. Negation, scope and the descriptive/metalinguistic distinction. *Generative Grammar in Geneva* 6. 29–48.
- Moeschler, Jacques. 2013. How ‘logical’ are logical words? Negation and its descriptive vs. metalinguistic uses. In Maite Taboada & Radoslava Trnavac (eds.), *Nonveridicality, evaluation and coherence relations*, Leiden, Brill, 76–110. Leiden: Brill. DOI: [https://doi.org/10.1163/9789004258174\\_005](https://doi.org/10.1163/9789004258174_005)
- Moeschler, Jacques. 2017. Representation and metarepresentation in negation. In R. Carston, K. Scott and B. Clark (eds.), *Relevance theory: Pragmatics and interpretation*. Cambridge: Cambridge University Press.
- Noh, Eun-Ju. 1998. Echo questions: Metarepresentation and pragmatic enrichment. *Linguistics and Philosophy* 21(6). 603–628. DOI: <https://doi.org/10.1023/A:1005361528891>
- Noh, Eun-Ju. 2000. *Metarepresentation: A relevance-theory approach* 69. Amsterdam: John Benjamins Publishing. DOI: <https://doi.org/10.1075/pbns.69>
- Noh, Eun-Ju, Hyeree Choo & Sungryeong Koh. 2013. Processing metalinguistic negation: Evidence from eye-tracking experiments. *Journal of Pragmatics* 57. 1–18. DOI: <https://doi.org/10.1016/j.pragma.2013.07.005>
- Noveck, Ira A. 2001. When children are more logical than adults: Experimental investigations of scalar implicature. *Cognition* 78(2). 165–188. DOI: [https://doi.org/10.1016/S0010-0277\(00\)00114-1](https://doi.org/10.1016/S0010-0277(00)00114-1)
- Noveck, Ira A. 2004. Pragmatic inferences related to logical terms. In Ira A. Noveck & Dan Sperber (eds.), *Experimental pragmatics*, 301–321. London: Palgrave Macmillan. DOI: [https://doi.org/10.1057/9780230524125\\_14](https://doi.org/10.1057/9780230524125_14)
- Sanders, Ted J.M. & Leo G.M. Noordman. 2000. The role of coherence relations and their linguistic markers in text processing. *Discourse Processes* 29(1). 37–60. DOI: [https://doi.org/10.1207/S15326950dp2901\\_3](https://doi.org/10.1207/S15326950dp2901_3)
- Schneider, Walter, Amy Eschman & Anthony Zuccolotto. 2012. *E-prime 2.0 Reference Guide Manual*. Pittsburgh, PA: Psychology Software Tools, Inc.

- Smith, Carol L. 1980. Quantifiers and question answering in young children. *Journal of Experimental Child Psychology* 30(2). 191–205. DOI: [https://doi.org/10.1016/0022-0965\(80\)90057-0](https://doi.org/10.1016/0022-0965(80)90057-0)
- Sperber, Dan & Deirdre Wilson. 1986. *Relevance: Communication and cognition*. Oxford: Blackwell.
- Wilson, Deirdre. 2000. Metarepresentation in linguistic communication. In Dan Sperber (ed.), *Metarepresentations: A multidisciplinary perspective*, 411–448. Oxford: Oxford University Press.
- Wilson, Deirdre & Dan Sperber. 1981. On Grice's theory of conversation. In Paul Werth (ed.), *Conversation and discourse*, 155–78. London: Croom Helm.
- Wilson, Deirdre & Dan Sperber. 1988. Representation and relevance. In Ruth Kempson (ed.), *Mental representations: The interface between language and reality*, 133–153. Cambridge: Cambridge University Press.
- Wilson, Deirdre & Dan Sperber. 1992. On verbal irony. *Lingua* 87(1–2). 53–76. DOI: [https://doi.org/10.1016/0024-3841\(92\)90025-E](https://doi.org/10.1016/0024-3841(92)90025-E)
- Wilson, Deirdre & Dan Sperber. 2004. Relevance theory. In Larry Horn & Gregory Ward (eds.), *Handbook of pragmatics*, 607–632. Oxford: Blackwell Publishing.

**How to cite this article:** Blochowiak, Joanna and Cristina Grisot. 2018. The pragmatics of descriptive and metalinguistic negation: experimental data from French. *Glossa: a journal of general linguistics* 3(1): 50.1–23, DOI: <https://doi.org/10.5334/gjgl.440>

**Submitted:** 29 May 2017    **Accepted:** 16 January 2018    **Published:** 20 April 2018

**Copyright:** © 2018 The Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC-BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited. See <http://creativecommons.org/licenses/by/4.0/>.



*Glossa: a journal of general linguistics* is a peer-reviewed open access journal published by Ubiquity Press.

