

# **The Online Processing of French Reflexives: Experimental Evidence for an Unaccusative Analysis**

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## **1. Introduction**

From a theoretical point of view, the status of French reflexive verbs (reflexives, henceforth) is quite controversial. Even if their intransitivity is not really in question, the debate about the type of intransitivity – unaccusativity or unergativity – is still open.

The goal of this paper is to provide experimental evidence that will shed light on this question. Using the Cross Modal Lexical Priming (CMLP, henceforth) technique, we show that reflexives behave like unaccusatives. We do this by comparing the online processing of reflexives with that of unaccusatives and unergatives in French. Moreover, we argue that the VP-internal subject Hypothesis (among others, Zagana 1982, Kitagawa 1986, Fukui and Speas 1986, Sportiche 1988, Kuroda 1988, Koopman and Sportiche 1991) should be integrated in the CMLP experimental investigation of languages like French that exhibit an auxiliary alternation between unaccusatives and unergatives.

## **2. Theoretical Background: the Controversial Status of Reflexives in French**

Although the topic has been investigated for many years, there is still no

consensus about the status of reflexives in French, in particular whether they are unergative or unaccusative. The crucial point is whether the subjects of reflexives are generated in subject position as external arguments (Unergativity Hypothesis, cf. 2.2) or in object position as internal arguments (Unaccusativity Hypothesis, cf. 2.3).

## 2.1. French Reflexive Verbs

French reflexives are formed with the clitic *se*, as exemplified in (1).

- (1) Claire *se* lave.  
Claire SE wash  
“Claire washes herself.”

At first glance, the clitic *se* looks like an object clitic, similar to other object clitics such as object masculine singular *le* ('him'):

- (2) Claire *le* lave.  
Claire him wash  
“Claire washes him.”

However, several facts argue against an object analysis of *se* (e.g., Kayne 1975, Reinhart and Siloni 2005). In particular, causative constructions show that reflexives do not pattern with transitives, but with intransitives.

- (3) a. Je *la* ferai laver à Louis.  
I her will\_make wash to Louis  
“I will make Louis wash her.”  
b. Je ferai *se* laver Louis.  
I will\_make SE wash Louis  
“I will make Louis wash himself.”

- c. Je ferai courir Louis.  
 I will\_make run Louis  
 “I will make Louis run.”

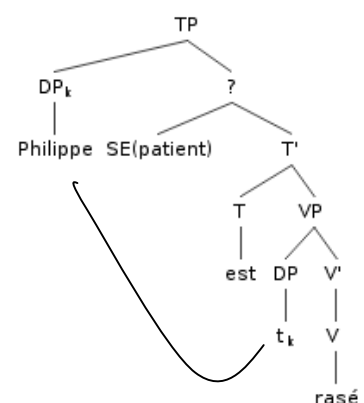
As shown in (3), reflexives do not require the preposition *à* introducing the argument of the embedded verb (3b), unlike transitives (3a), but like intransitives (3c).

Therefore, it is not the intransitivity of reflexives that is in question here, but the type of intransitivity (unergativity/unaccusativity).

## 2.2. The Unergativity Hypothesis

According to the Unergativity Hypothesis (e.g., Grimshaw 1982, Wehrli 1986, Chierchia 1989, Reinhart and Siloni 2005), subjects of reflexives are base-generated as external arguments, and thus behave like subjects of transitive verbs. *Se* absorbs the internal argument (patient) and the external argument (agent) moves to the surface subject position.

- (4) Philippe<sub>k</sub> s' est [VP t<sub>k</sub> rasé].  
 Philippe SE is shaved  
 “Philippe shaved himself.”



This hypothesis is based on the observation that subjects of reflexives do not pass some of the usual tests for unaccusativity in French: the subjects of reflexives systematically fail the diagnostics of internal arguments, just like the

subject of unergatives and unlike the subjects of unaccusatives.

One test concerns impersonal constructions, which are possible with unaccusatives, but not with unergatives. Since reflexives seem to be impossible in this position,<sup>1</sup> they pattern with unergatives.

- (5) a. \* Il a souri beaucoup d' enfants.  
there has smiled many of children  
"Many children smiled." (Unergative)
- b. Il est arrivé beaucoup d' enfants.  
there is arrived many of children  
"Many children arrived." (Unaccusative)
- c. ?? Il s' est lavé beaucoup d' enfants.  
there SE is washed many of children  
"Many children washed." (Reflexive)

The two next tests are even clearer, in that they are not controversial.<sup>2</sup>

The first is based on the fact that the French quantitative clitic *en* can cliticize only out of object position and thus serves as a test to discriminate between the internal and the external arguments in postverbal position. *En*-cliticization is possible with unaccusatives as their subject is an internal argument (6b), but impossible with unergatives as their subject is an external argument (6a). Since reflexives do not license *en*-cliticization (6c), this supports the hypothesis that their subject is an external argument like the subject of unergatives.

- (6) a. \*Quand j'ai dit la blague aux enfants, il en a souri quelques-uns.  
when I have told the joke to\_the children there EN has smiled some  
"When I told the joke to the children, some of them smiled."  
(Unergative)

b. J' ai invité tous les enfants; il en est déjà arrivé quelques-uns.

I have invited all the children there EN is already arrived some  
“I invited all the children; some of them already arrived.”

(Unaccusative)

c. \*Parmi les enfants qui sont dans l' eau, il s' en est lavé seulement quelques-uns avant de plonger dans la piscine.  
only some before of dive in the swimming\_pool  
“Among the children who are in the water, only some washed before diving into the swimming pool.” (Reflexive)

Similarly, only objects undergo quantification at a distance and thus, unaccusatives (7b), unlike unergatives (7a), allow the quantifier *beaucoup* 'many' to be separated from the object that it quantifies over. Reflexives (7c) do not license quantification at a distance, which argues for their unergativity.

(7) a. \*Quand j'ai dit la blague aux enfants, il en a souri beaucoup.

when I have told the joke to\_the children there EN has smiled many  
“When I told the joke to the children, many of them smiled.”

(Unergative)

b. J' ai invité tous les enfants; il en est déjà arrivé beaucoup.  
I have invited all the children there EN is already arrived many  
“I invited all the children; some of them already arrived.”

(Unaccusative)

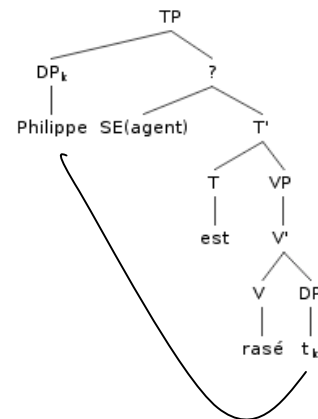
c. \*Parmi les enfants qui sont dans l' eau, il ne s' en est pas lavé beaucoup avant de plonger dans la piscine.  
among the children who are in the water, there NE SE EN is not washed many before of dive in the swimming\_pool  
“Among the children who are in the water, not many washed before diving into the swimming pool.” (Reflexive)

So, according to these tests, French reflexives behave like unergative verbs.

### 2.3. The Unaccusativity Hypothesis

But according to the Unaccusativity Hypothesis (Marantz 1984, Bouchard 1984, Kayne 1988, Grimshaw 1990, Pesetsky 1995, Sportiche 1998), the subjects of reflexives are base-generated as internal arguments, and thus behave like objects of transitive verbs. *Se* absorbs the external argument (agent) and the internal argument (patient) moves to the surface subject position.

- (8) **Philippe<sub>k</sub>** *s'* est [VP rasé **t<sub>k</sub>**].  
 Philippe SE is shaved  
 "Philippe shaved himself."



There are several arguments in support of this hypothesis. First, reflexives cannot be formed in constructions where the external argument is lacking, such as with raising verbs (9).

- (9) \* Jean<sub>i</sub> *se* semble [t<sub>i</sub> malade].  
 Jean SE seems sick  
 "Jean seems himself to be sick."

As shown by Marantz (1984) or Bouchard (1984), under the unaccusative hypothesis, *se* absorbs the external argument; but since the raising verb *sembler* ('seem') lacks an external argument, *se* cannot absorb it, and the sentence (9) is therefore ungrammatical.

Passives make a similar point, as illustrated in (10): since the passive morphology absorbs the external theta-role, it is thus no longer available for the

reflexive morpheme.

- (10) \* Marie s'est été décrite.  
Marie SE is been described  
"Marie was described to herself."

Moreover, reflexives share two other characteristics with passives, which are clearly unaccusative. First, they take the auxiliary *être* ('be') and even though there is no absolute correlation between auxiliary choice and unaccusativity in French, it is always true that verbs that select *être* are unaccusative. Therefore, the fact that reflexives have *être* as auxiliary (11c), like passives (11a), but unlike unergatives (11b), argues in favor of their unaccusativity.

- (11) a. Romain **est** critiqué par Guillaume.  
Romain is criticized by Guillaume  
"Romain is being criticized by Guillaume." (Passive)
- b. Guillaume **a** souri.  
Guillaume has smiled  
"Guillaume smiled." (Unergative)
- c. Romain s' **est** critiqué dans son article.  
Romain SE is criticized in his paper  
"Romain criticized himself in his paper." (Reflexive)

Secondly, reflexives also behave like passives with respect to agreement. In French, we observe agreement between the subject and the past participle with passives, and with actives when the object precedes the verb. This suggests that the participle only agrees with the underlying internal argument when it superficially appears before the verb. So, the fact that surface subjects of reflexives do agree with the participle suggests that they are underlying objects.

(12) a. Les fillettes sont décrit-es par Lise et Aude.

the girls(**fem.pl**) are described-**agr(fem.pl)** by Lise and Aude.

“The young girls are described by Lise and Aude.”

(Passive)

b. Lise et Aude ont décrit les fillettes.

Lise and Aude have described the girls

“Lise and Aude described the young girls.”

(Transitive)

c. Les fillettes se sont décrit-es.

the girls(**fem.pl**) SE are described-**agr(fem.pl)**

“The young girls described themselves.”

(Reflexive)

Thus, these syntactic tests support the unaccusativity of reflexives. Moreover, we propose that the apparent arguments against it, viz. the fact that reflexives do not pass certain for unaccusativity, are independently due to the specific binding properties of *se* (Dominique Sportiche, p.c.), as shown in (13).

(13) a. [=5c] ?? Il s<sub>k</sub>' est lavé [beaucoup d' enfants]<sub>k</sub>.  
there SE is washed many of children

“Many children washed.”

b. [cf. 6c] \* Il s<sub>k</sub>' en est lavé [quelques-uns]<sub>k</sub>.  
there SE EN is washed some

“Some of them washed.”

c. [cf. 7c] \* Il s<sub>k</sub>' est [beaucoup]<sub>k</sub> lavé [d' enfants].  
there SE is many washed of children

“Some of them washed.”

In neither of these examples is *se* c-commanded by its intended binder. Therefore, it is not because reflexives are unergative that these sentences are ungrammatical but because of binding violations (conditions A and/or C). So,



such sentences do not undermine the Unaccusativity Hypothesis.

## **2.4. Our Experimental Hypothesis**

Both the Unergativity Hypothesis and the Unaccusativity Hypothesis seem to be well supported by several kinds of arguments. This makes clear why the status of reflexives is still controversial and why we want to provide an experimental argument in order to clarify this debate.

Thus we want to test the Unaccusativity Hypothesis experimentally by looking at the online processing of reflexives as compared to unaccusatives and unergatives, using the CMLP methodology.

## **2.5. Existing Experimental Work on Unaccusatives**

Friedmann et al. (2008) use the CMLP method to test A-movement with unaccusatives in English.

This technique (e.g., Swinney, Onifer, Prather, and Hirshkowitz 1979) is based on the idea that the speed of access to a word during sentence processing can be affected by several factors, such as frequency and semantic priming: frequent words are accessed more rapidly than infrequent words; when a word is read shortly after a semantically related word, it is accessed more quickly than when it appears after an unrelated word (e.g., Meyer, Schvaneveldt and Ruddy 1975, Neely 1997). This phenomenon is used in psycholinguistic research to determine at what point during the course of auditory sentence processing word meanings are activated. Sentences are presented aurally at a normal speaking rate and at some point during the presentation of each sentence, a letter sequence (word or nonword) is briefly displayed on a screen. The participant is asked to

listen to the sentence and to make a lexical decision (word/nonword) about the letter sequence via a button press.

Crucially for our purposes, this method can also be used in the study of online processing of the trace of movement: if we assume that an antecedent is reactivated at its trace position, the reactivated item should prime a related word at that position. The idea is to check if there is a priming effect in the lexical decision at the trace position: if so, this means that the moved constituent has been reactivated at the trace, serving as a prime for a semantically associated visual target word.

CMLP studies have found that a moved constituent indeed appears to be reactivated twice in the sentence. First, reactivation occurs when the constituent is first encountered. Then, in the case of A-bar movement such as relativization (e.g., Love and Swinney 1996, Zurif et al. 1993, 1995), the constituent is reactivated again at the gap/trace to which it is syntactically linked. But in the case of A-movement as in passives (e.g., McElree and Bever 1989, Osterhout and Swinney 1993), reactivation is temporally delayed (around 750 ms) after the trace position of A-chains.

As for Friedmann et al. (2008), like Bever and Sanz (1997), their main aim was to test the theoretical claim that Subject-Verb sentences with unaccusatives are derived by movement of the object to the subject position, while Subject-Verb sentences with unergatives do not include such movement. Interestingly, they found that the processing of sentences with unaccusative verbs includes reactivation of the subject antecedent after the verb, while in sentences with unergative verbs, such reactivation is not observed, as predicted. Moreover, they found that the reactivation does not occur immediately at the trace position, but rather 750 ms following it, as had been already observed in

the case of A-movement.

Our experiment designed to test the nature of French reflexives was inspired by Friedmann et al.'s experiment.

### **3. Method**

#### **3.1. Outline of Our Experiment**

Our experimental goals are threefold. First, we replicate Friedmann et al.'s experiment in French to determine whether we find the same contrast between unaccusatives and unergatives: based on Friedmann et al.'s result, we predict reactivation of the subject trace of unaccusatives after the verb.

However, with respect to unergatives, we argue that it is also necessary to integrate the VP-internal Subject Hypothesis into our predictions. Whereas Friedmann et al. do not find any reactivation of the subject trace of unergatives in English, we predict reactivation of this trace before the verb (at the VP-internal position) in French. Crucially, this prediction is reasonable in French because of the auxiliary alternation: since in French *avoir* ('have') is the auxiliary generally selected by unergatives and *être* ('be') is the auxiliary generally selected by unaccusatives, we predict that when encountering the auxiliary, the parser can build the subject trace of unergatives before the verb (Specifier of VP position) and the subject trace of unaccusatives after the verb (Complement of V position).

Thirdly – and this is our main goal – we want to know if the subject trace of the reflexive is reactivated at the same position as the subject trace of unaccusatives (V-complement) or unergatives (VP-internal subject). Crucially, we assume that the binding properties of *se* will not interfere with this reactivation because the morpheme *se* is ambiguous: *se* yields reflexive readings

but also other readings that do not involve coreference, for example in middle constructions (14a), neutral constructions (14b) or inherently pronominal constructions (14c).<sup>3</sup>

- (14) a. La tour se voit de loin.  
the tower SE sees from far  
“The tower can be seen from far away.”
- b. Agnès s' est promenée tout l' après-midi.  
Agnès SE is walked all the afternoon  
“Agnès went for a walk the whole afternoon.”
- c. Le coureur de marathon s' est évanoui à l' arrivée.  
the runner of marathon SE is passed\_out at the arrival  
“The marathon runner passed out when he arrived.”

Therefore, when encountering *se*, the parser does not reactivate the subject by default as it is unclear at that point of the sentence if there is coreference. Based on our theoretical arguments in favor of the Unaccusativity Hypothesis, we predict that the subject of a reflexive is reactivated at the Complement position like the subject of an unaccusative.

### 3.2. Participants

Participants are 59 native speakers of French (age range: 18-65) who were tested in France.

### 3.3. Experimental Design

We compare the online processing of three verb classes: unergatives, unaccusatives and reflexives. We use 18 sentences for each verb class (54 target sentences) and 54 fillers.

Moreover, we use three probe positions to examine the different possible points of reactivation. Since reactivation is tested by priming effects, two types of probes are used: probes that are semantically related to the subject noun (and thus possibly primed by the subject noun in the right positions) and probes that are semantically unrelated to it (and thus serving as control).

First, we test priming at the subject offset (position 1) to control for semantic priming. In all cases, we predict that the subject noun is primed at that position. The second position is at the verb offset (position 2). Crucially, based on the VP-internal subject Hypothesis and the observation that constituents moved by A-movement are reactivated shortly after their trace, we predict reactivation of the subject of unergatives at that position (since position 2 occurs shortly after the Specifier of VP position), but no reactivation for unergatives and reflexives (since position 2 occurs exactly at, rather than shortly after, the Complement of V position). Position 3 appears 750 ms after the verb offset. Since reactivation of constituents moved by A-movement has been shown to occur around 750 ms after the trace position, we predict priming effects for the three verb classes at that position (assuming slow decay of reactivation in the case of unergatives). The following examples illustrate the position of the probes for the three verb classes (e.g. (15a) for unergatives, (15b) for unaccusatives, (15c) for reflexives); the position is indicated by the superscript and the probes (related/unrelated) are given in parenthesis at the end of the sentence.

- (15) a. Le pêcheur<sup>1</sup> aux yeux bouffis de sommeil et au menton  
 the fisher at<sub>1</sub> the eyes puffed<sub>2</sub> up of sleep and at<sub>1</sub> the chin  
 mal rasé a marché<sup>2</sup> dès l'aube en di<sup>3</sup>rection de la  
 forêt  
 badly shaved has walked from the dawn in direction of the forest

avant que les touristes n'arrivent. (poisson/couloir)

before the tourists arrive

“The fisher<sup>1</sup> with eyes puffed up from sleep and a badly shaved chin walked<sup>1</sup>

at dawn in the di<sup>3</sup>rection of the forest before the tourists arrived.”

(fish/corridor)

b. Le **pompier**<sup>1</sup> de la petite ville ravissante et sans histoires

the fireman of the small town delightful and without trouble

**est arrivé**<sup>2</sup> sur place<sup>3</sup> juste à temps sous les applaudissements

is arrived on place just at time under the applause

enthousiastes du voisinage enfin soulagé. (feu/cas)

enthusiastic of the neighborhood at last relieved

“The fireman<sup>1</sup> from the delightful and quiet city arrived<sup>2</sup> on the spot<sup>3</sup> just in time to the enthusiastic applause of the neighborhood which was finally relieved.” (fire/case)

c. Le **randonneur**<sup>1</sup> avec un gros sac à dos rempli de lourd matériel  
the hiker with a big backpack filled of heavy material

**s' est défendu**<sup>1</sup> avec courage<sup>3</sup> quand le voleur a soudainement

SE is defended with courage when the thief has suddenly

surgi au milieu de la clairière. (montagne/officier)

appeared at the middle of the clearing

“The hiker<sup>1</sup> with a big backpack filled with heavy material defended himself<sup>2</sup> with courage<sup>3</sup> when the robber suddenly entered the clearing.” (mountain/officer)

Thus, the design includes six conditions for each verb class (unaccusative/unergative/reflexive): position (position 1/position 2/position 3) x probe type (related/unrelated). Six scripts comprising 54 identical target and 54 filler sentences were created so that no sentence would be heard more than once by the same participant. Moreover, the 6 conditions were completely counterbalanced across the 6 scripts.

### 3.4. Materials

#### 3.4.1. Verb Selection

The verbs were selected so that they unambiguously fall into each class, and they are matched for frequency across classes.

Unaccusatives were selected based on the following criteria: they had to meet all the criteria for unaccusativity mentioned above (impersonal construction, *en*-cliticization, quantification at a distance) and they had to select the auxiliary *être* ('be') and show agreement between the subject and the past participle. We excluded verbs with multiple possible argument structures, such as *sortir* ('go out'/'take out'), which can be both unaccusative and transitive, and verbs that exhibit auxiliary variations among speakers, such as *intervenir* 'intervene', which can select both *être* ('be') and *avoir* ('have') depending on the speakers or even for the same speaker. Since less than 18 verbs in French meet all these criteria, we chose to repeat some verbs to reach 18. But to avoid a possible side-effect of repetition, we added the prefix *re-* ('again'/'back') to the verbs to obtain new verbs such as *revenir* ('come back'/'come again') formed by *re-* prefixation of *venir* ('come').

Unergatives were chosen based on the same criteria as unaccusatives: they had to fail all the diagnostics mentioned above (impersonal construction, *en*-cliticization, quantification at a distance, auxiliary *être* ('be') and past participle agreement).

Concerning reflexives, we chose verbs associated with *se* that clearly exhibit a reflexive interpretation as opposed to middles or anticausatives for example.

Overall frequency between the three verb types was balanced. For each verb, frequency was calculated as the mean of the lemma frequency of the verb

in two corpora (movie subtitles and recent literary texts) given in the lexicon constructed by New et al. (2001). The mean frequencies for the unaccusatives, unergatives and transitives to be used as reflexives are 518.35, 380.71 and 463.06 per million respectively, which is not significantly different:  $F(2,51) = 0.308$ ,  $p=0.736$ : non significant.

### **3.4.2. Aurally-presented Sentences**

All the target sentences have a similar length and the same structure Subject-Verb-Adjunct, and all subjects are definite singular NPs.

Moreover, we added sentential material between the subject and the verb so that enough time would elapse between the subject noun and the trace to allow for decay in activation from the initial appearance of the subject noun. Previous data (e.g., Swinney 1979, Onifer and Swinney 1981, Love and Swinney 1996) indicate that 1.5 seconds or 3-5 syllables are typically required to detect decay in priming. That's why we chose to include 14 syllables between the subject noun and the verb in each sentence. Moreover, we made sure that no close associate to the subject noun occurs between the subject noun and the verb (verb included), and until the third probe position to avoid side-effects in priming.

Furthermore, to prevent any undesired delay in reaction time or any interference of any kind, we avoided traces in the sentences other than the argument traces (thus, no relative clause was included in the target sentences until the last probe position) and binding (no anaphor appears until the last probe position).<sup>4</sup>

We added 12-16 words after the verb to avoid end-of-sentence effects and to allow the responses to both the second and the third probe positions to be carried out while the sentence is still running.



Fillers have the same general Subject-Verb-Complement-Adjunct structure as the target sentences but contain transitive verbs with direct object. Moreover, material is also added between the subject noun and the verb, but we allow traces and binding to occur in fillers.

### **3.4.3. Visually-presented Probes**

The role of visually-presented probes is to test for priming by the subject noun (antecedent). All the antecedents are common nouns, balanced between animates and inanimates. Moreover, subject nouns that are semantically close to the verb are excluded.

The related probes are close semantic associates of the subject noun. They were selected through an online questionnaire: 100 native French speakers were asked to write the first semantic associate they thought of for each subject noun. The most frequently provided response for each subject noun was chosen as the related visual target probe unless it did not meet certain conditions: we excluded words other than common nouns or words having the same root as the antecedent. For instance, *piscine* ('swimming pool') was selected to be primed by the subject noun *nageuse* ('swimmer').

Unrelated probes match related probes in number of letters, syllables, and frequency (according to the lexicon mentioned above) and are semantically unrelated to the subject noun. For example, the unrelated probe *salaire* ('salary') corresponds to the related probe *piscine* ('swimming pool').

As for nonwords (48), they conform to French orthographic and phonological rules (e.g. *dramiche* proposed by Millotte et al. date). Nonwords are used for fillers (45) and 3 practice sentences. Note however that not all fillers are associated with nonwords to avoid a complete discrepancy in this

respect between target sentences, which would be exclusively associated with words, and fillers, which would be exclusively associated with non words; therefore, 9 random words are also used for fillers.

### **3.5. Procedure**

Participants sat in a quiet room in front of a laptop computer. The sentences were presented over headphones via a digital tape recorder. During the temporal unfolding of each sentence, a visually-presented lexical decision probe appeared centrally for 500 ms on the screen. Subjects were asked to listen carefully to the sentences and to make a visual lexical decision whenever a letter string appeared on the screen as quickly and accurately as possible by pressing the key marked O (like *oui* ('yes')) or N (like *non* ('no')) on the keyboard; response times for this decision were recorded by the computer.

In 20% of the sentences, subjects were asked a yes/no comprehension question about the sentence that they would have just heard (15 questions for target sentences, 7 questions for fillers) with the purpose of ensuring that the subjects were paying attention to the sentences.

Prior to the test, five training sentences were presented to each participant, two coupled with words, three coupled with nonwords so that they could get used to the task.

E-prime software was used to deliver the stimuli and record reaction times via the computer.

### **3.6. Results**

The main goal of the study was to investigate where reactivation of the

subject noun of reflexives occurs as compared to the subject nouns of unergatives and unaccusatives. This was examined by testing for priming by the subject noun in the various probe positions for the different verb classes. Priming was calculated by subtracting the reaction times (RTs) for related probes to the reactions times for unrelated ones in the lexical decision.

Five subjects were excluded from further analysis because they did not reach 70% correct on question accuracy and/or 90% correct in the lexical decision task. In addition, 7 items that did not show priming in position 1 for a detectable reason (unequal number of syllables in related and unrelated probes) were also discarded.

Mean priming effect was calculated as RTs for unrelated probes minus RTs for related probes and averaged over items; this is summarized in table 1.

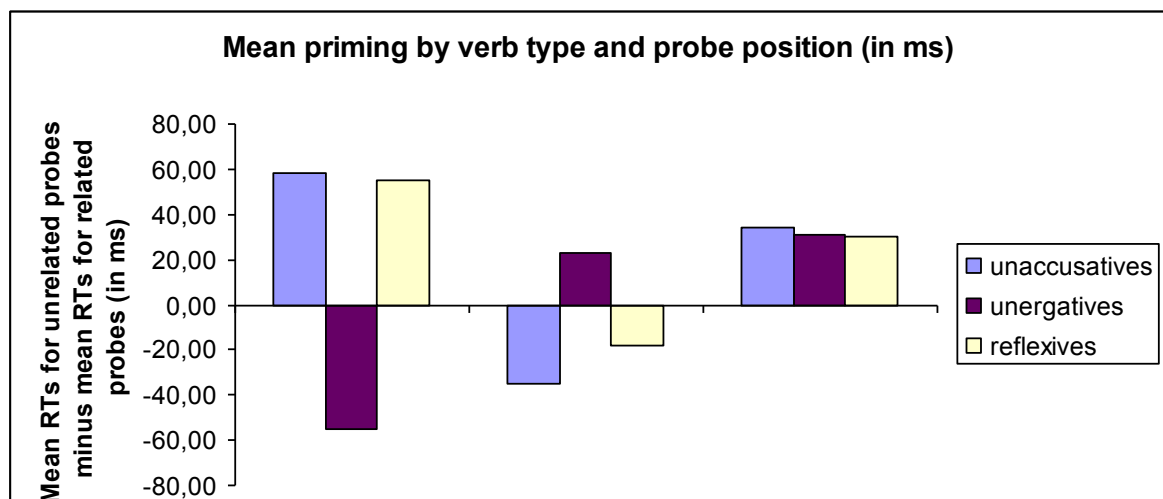
Table 1

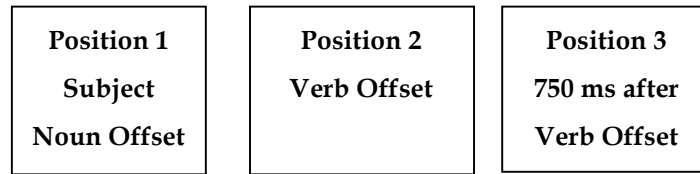
*Mean priming (RTs for unrelated probes minus RTs for related probes) by verb class and probe position (in ms)*

	Probe position 1	Probe position 2	Probe position 3
Unaccusatives	58,65	-34,60	34,55
Unergatives	-55,27	22,99	30,99
Reflexives	55,05	-18,04	30,36

Figure 1 displays the results graphically

Figure 1





First, the mean priming effect for two of the three verb classes is positive at position 1, which means that, as expected, there is priming at that position.<sup>5</sup>

More importantly, the only verb class that exhibits priming at position 2 is the unergative class. This supports the hypothesis that subject traces of unergatives are posited before the main verb.

On the other hand, unaccusatives exhibit reactivation of the subject trace only at position 3. This supports the hypothesis that subject traces of unaccusatives are not posited until after the main verb.

Furthermore, reflexives pattern like unaccusatives: they exhibit reactivation of the subject trace only at position 3, which suggests that their subject trace is posited after the main verb.

A series of pre-planned independent sample t-tests were performed in order to estimate our results. We found a marginally significant priming effect in Position 1 for unaccusatives ( $p=0.08$ ), but no other comparisons were significant. At this point, two observations are in order: first, the effects that we are testing are generally very subtle.<sup>6</sup> Second, our sample is (at this point) considerably smaller than that of other existing studies. For instance, Friedmann et al. tested 120 subjects. The following conclusions are drawn under the assumption that by doubling our sample size, our preliminary results will become significant.

### 3.7. Discussion and Conclusion

This study shows three main points.

First, it confirms Friedmann et al.'s findings that subjects of unaccusatives originate as objects: in both English and French, the subjects of unaccusatives are reactivated around 750 ms after the verb offset, which means that the A-trace is situated at the complement of V position.

Secondly, this study shows that the VP-internal subject Hypothesis should be integrated into CMLP techniques in languages that show an auxiliary alternation: subjects of unergatives originate as VP-internal subjects since their subject is reactivated shortly after this position.

Thirdly, this study supports the Unaccusativity Hypothesis insofar as reflexives behave like unaccusatives: subjects of reflexives seem to originate as objects since they are reactivated around 750 ms after the complement position.

This last result is important in several respects. First, it provides an additional argument of another nature (experimental) in the theoretical debate concerning the status of reflexives in French. More generally, it shows that online processing techniques can address important issues in linguistic theory. Finally, this result has an important implication for issues in the field of language acquisition. According to the Maturation Hypothesis (Borer and Wexler 1987), A-chain formation is maturationally delayed and children's apparent unaccusatives have non-adult (=unergative) representation. However, some studies (e.g., Snyder, Hyams and Crisma 1993; Hyams and Snyder 2006) argue against this hypothesis based on the observation that Italian and French children demonstrate mastery of auxiliary selection with reflexives (Italian *essere*; French *être* ('be')), suggesting that they treat reflexives as unaccusatives. However, this argument crucially rests on the assumption that reflexives are

indeed unaccusative. Thus, our results play a notable role in the debate over the delay of A-chain formation (and other proposals that derive this effect, for example, Wexler's (2004) Universal Phase Requirement).

## Notes

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<sup>1</sup> According to Reinhart and Siloni (2005: p.392), reflexives are not completely impossible in this position: actually, following Kayne (1975), they use this example (and the fact that speakers find it better than impersonal constructions with transitives) to show that reflexives behave like intransitive verbs. However, we think that reflexives may be possible in impersonal constructions only under a middle reading.

<sup>2</sup> For example, Reinhart and Siloni (2005) do use these arguments – as opposed to the first one – to argue in favor of the unergativity of reflexives.

<sup>3</sup> Note that all these *se* constructions do pass all the tests of unaccusativity. So if we assume that reflexive *se* is not unaccusative, then we fail to have a unified account of French *se*, which would be unparsimonious and theoretically undesirable. This is one further argument for the unaccusativity of reflexive *se* (Dominique Sportiche, p.c.).

<sup>4</sup> Recall that we assume that the binding properties of *se* do not interfere with reactivation since there are several *se* constructions in French that do not involve coreference as illustrated in example (14).

<sup>5</sup> We have no explanation for the unexpected behavior of unergatives in position 1: they do not exhibit priming effects, but show the opposite pattern.

Nevertheless, note that the fact that unergatives do exhibit priming at positions 2 and 3 makes this strange result at position 1 somewhat less problematic.

<sup>6</sup> For example, most of the p-values reported by Friedmann et al. are very close to  $p=0.05$ .

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