Processing of relative clauses with stylistic inversion in L2 French in adult learners with L1 English

by

© Chelsea Terry

A Thesis submitted to the

School of Graduate Studies

in partial fulfillment of the requirements for the degree of

Master of Arts

Department of Linguistics

Memorial University of Newfoundland

September 2022

St John’s Newfoundland

Abstract

This thesis studies low to intermediate proficiency L2 speakers of French who have English as their L1 in order to better understand the role of proficiency and transfer in second language processing. Specifically, this study focuses on how these speakers process different relative clauses structures in their second language by having them read different sentences using a self paced reading task followed by comprehension questions. Participants read sentences that were of the following structures: subject relative clauses (SR), object relative clauses (OR), and object relative clauses with stylistic inversion (ORSI). The data provides evidence that proficiency as well as sentence structure have an effect on participants' processing abilities. As participants' proficiency increased so did their processing abilities which was evidenced by them recording faster reading times (RT) and achieving higher accuracy on comprehension questions. These increases in performance were only found to affect the OR and ORSI structures. Participants were consistent in their performance on SR, with results remaining stable as proficiency increased. Ultimately it appears that participants had the most difficulty with ORSI, the structure that is not allowed in their L1. OR had the next highest difficulty level, with participants having no difficulty with SR. The preference for SR over OR and ORSI suggests that the subject-object processing asymmetry was transferred from participants' L1. This is further supported by participants' poor performance on ORSI sentences. Based on comprehension results as well as RT data, participants appear to have begun acquiring the morphosyntactic process needed to process ORSI. These results plus the improved performance with increased proficiency, support the FTFA over the SSH.

Acknowledgements

This endeavour would not have been possible without my supervisors Dr. Maureen Scheidnes and Dr. Leslie Redmond who were patient, supportive and provided invaluable feedback. I am also indebted to the Linguistics department at MUN who generously provided feedback and knowledge. I am also grateful to the participants of the study, without whom this would not have been possible. I'd also like to recognize Hyo Eun Kim for her endless support and friendship. I would be remiss in not also mentioning my family and friends who provided moral support and cheered me on as I undertook this project. Their belief in me was integral in keeping my spirits and motivation high.

Table of Contents

Table of Figures

Index of Tables

Chapter 1: Introduction

Speakers of a second language (L2) tend to have greater difficulty processing sentences in their second language than their first. This is due to a multitude of reasons such as higher cognitive/processing costs as a result of their proficiency level and amount of transfer from their first language (L1). Transfer is widely debated, with researchers debating the extent to which transfer occurs and if it occurs at all. Evidence of transfer is inconclusive, the following studies found possible evidence of transfer occurring: Havik et al. (2009), Hopp (2006, 2010), Kontola & van Gompel (2011), and Meijer & Fox Tree (2003). On the other hand Macdonald (2000) and Montrul (2004) found evidence to the contrary. Of the theoretical frameworks examined in this study, only the Full Transfer Full Access (Schwartz & Sprouse, 1994, 1996) allows for full transfer from the L1 to the L2. The Shallow Structure Hypothesis assumes that transfer is restricted to phonological, orthographical, morpho-lexical, and lexical semantic areas (Clahsen & Felser, 2006). In the current study evidence of transfer is expected to be visible in the results for object relative clauses with stylistic inversion (ORSI, as in example 5). French and English both have subject relative clauses (SR, as in examples 1-2) and object relative clauses (OR, as in examples 3-4), and a processing asymmetry between the two.

(1) The dog [that ____saw the man] has brown fur. (SR)

(2) La femme [qui ____ connaît Jean]. (SR)

The woman who knows John

'The woman who knows John'.

(3) The dog [that the man saw ___] has brown fur. (OR)

(4) La femme [que Jean connaît ___] (OR)

the woman that John knows.

'The woman that John knows.'

(5) La femme que ____ connaît Jean. (ORSI)

the woman who knows John

'The woman who John knows'. (Prévost, 2009)

Native speakers process OR slower than they do SR (Schriefers, Friederici & Kuhn, 1995; Bader & Meng, 1999; Meng & Bader, 2000; Rankin, 2014). ORSI is only allowed in French, and is completely ungrammatical in English. Importantly, transfer effects decrease as proficiency increases (Hopp, 2010). Proficiency also plays a significant role in L2 speakers' processing abilities, even if it is not clear what that role is (Hopp, 2006, 2010, 2015). The lower a speaker's proficiency, the longer it takes them to process a sentence compared to a native speaker. They also tend to have lower comprehension results when tested (Hopp 2006, 2010, 2015). These speakers have been found to have an increase in processing speed as their proficiency increases (Hopp 2006, 2010, 2015). The same results are expected in the current study. Higher proficiency speakers should theoretically have an easier time processing ORSI than lower proficiency speakers. Low proficiency learners will struggle more with stylistic inversion as it requires a higher level of processing resources that are not available until a higher proficiency is achieved (Prévost et al., 2017) The higher the speaker's proficiency, the more computational resources available; as well as an increased skill with syntax and morphology (Prévost et al., 2017).

This thesis is outlined as follows: in Chapter 2 I will begin by examining the similarities and differences between French and English, especially as they pertain to relative clauses. Chapter 2 is also where I will discuss the frameworks being used, both for L1 processing (Prideaux and Baker) and L2 processing (FTFA and SSH). This chapter will also discuss any evidence for proficiency and transfer. Following in Chapter 3, I will discuss the current study and the method used to obtain the data. Chapter 4 will present the results and trends in the data. Finally, in Chapter 5 I will discuss the findings and their implications before concluding the thesis.

Chapter 2: Background

2.1 Introduction

This chapter will discuss the relevant background to the current study, beginning with the relevant properties of English and French in section 2.2. Specifically, word order and relative pronouns will be explored. In section 2.3 I will elaborate further by focusing on the literature regarding the processing of relative clauses in English and French by native speakers as well as the framework created by Prideaux and Baker (1986). I will discuss generally L2 processing in section 2.4; focusing specifically on evidence of transfer and the effects of proficiency. In section 2.5 I will establish the two frameworks being considered in this thesis, the Full Transfer Full Access (FTFA) and the Shallow Structure Hypothesis (SSH). I will conclude the chapter by establishing the research questions and predictions.

2.2 Relevant properties of Relative Clauses in English and French

This section will focus first on establishing word order in English more generally, and more specifically the word order in relative clauses (RCs). RCs in English have a different word order depending on whether the clause is a subject relative clause (SR) or object relative clause (OR). The relative pronoun (RP) in English is optional and varied. French, has a similar word order to English but allows for stylistic inversion whereas English does not. French requires an RP and has less options available. These concepts will explored more in depth in the following sections.

2.2.1 English

This section will go over the important components in the syntax of English relative clauses. English syntax does not allow for stylistic inversion, unlike French. First, following this introduction I will discuss general English syntax and word order in section 2.2.1.1. I will then discuss English RPs used in RCs in section 2.2.1.2.

2.2.1.1 Word Order

English follows SVO word order rather strictly. Relative clauses are post-nominal and typically follow SV word order (Rankin, 2014). This study will focus on relative clauses that are center embedded which are associated with higher processing costs than right-branching relative clauses (Gibson, 1998).

The subject/object distinction, which is well documented in the literature, refers to the syntactic differences between the subject relative clause (SR) and object relative clause (OR). In subject relative clauses, the head noun of the relative clause (*the dog* in 6) is interpreted as the subject within the embedded clause (represented by ____ in (6)), whereas in object relative clauses, the head noun is interpreted as the object of the embedded clause.

(6) The dog [that ____saw the man] has brown fur.

(7) The dog [that the man saw ___] has brown fur.

As can be seen above in (6), the object appears before the verb in the object relative clause. The object follows the verb in subject relative clauses, and it is thought that this difference in word order contributes to the subject/object processing asymmetries that will be discussed later in this thesis (Gibson, 1998; Friedmann, 2009; Prévost, 2009; Prévost et al., 2017).

2.2.1.2 Relative Pronoun

Depending on the sentence, the RP can be optional in English, but this is not the case in French. RPs in English can take the form of *that*, *wh*-pronouns, or null markers. SRs are not able to use null RP unlike ORs. RPs are incredibly important to relative clause structure. In English, the *that* is invariable and does not agree with the head. In (8) and (9) the RP *that* is used for both subject and object extraction, it's the placement of the verb, which can appear either preceding the NP or following the NP, that determines the interpretation. It should be noted that in the literature *that* is referred to as

either an RP or a complementiser depending on the analysis being pursued. For the purposes of this thesis I will continue to refer to it as a RP.

(8) The dog [that ____saw the man] has brown fur.

(9) The dog [that the man saw ___] has brown fur.

2.2.2 French Relative Clauses

French has many similarities to English in word order, with exceptions in cases such as clauses with stylistic inversion. These differences will be explored further in section 2.2.2.1, where I will begin the section explaining first regular relative clause word order. Like English, French has a word order asymmetry for SRs and ORs which will be explored in the first part of the section. In the second part of the section I will explore the different kinds of inversion, focusing on stylistic inversion. In the following section 2.2.2.2 I will discuss French RPs, focusing on the *que*/*qui* distinction, which are the only RPs that are used in relative clause constructions in the current study.

2.2.2.1 Word Order

French has a similar word order to English in that it primarily follows SVO word order. Like with English the object appears before the verb in surface representations of OR. In SR, the object follows the verb. Word order in typical SR and OR is identical between English and French (10-11). SR has the embedded verb appear before the embedded noun (11). OR has the embedded noun appear before the embedded verb (10). However French is different in that it also allows VS order in certain contexts. Stylistic inversion (SI) is one situation where VS word order occurs (12).

(10) La femme [que Jean connaît ___]
the woman that John knows.

'The woman that John knows.'

(11) La femme [qui ____ connaît Jean].
The woman who knows John

‘The woman who knows John’. (Prévost, 2009)

(12) La femme [que ____ connaît Jean].

The woman who knows John

‘The woman who John knows’.

This study will focus on stylistic inversion, which is restricted to *wh*-questions and embedded clauses. It is not able to appear in yes/no questions. Essentially stylistic inversion needs *wh*- or extraction contexts to occur (Lahousse, 2006). Studies have inconsistent results regarding the actual frequency at which stylistic inversion is used. Prévost et al. (2017) cite the following studies of Guillard (2000), and Coveney (1996). Guillard (2000) found that the frequency of use is at 10.8%, while Coveney found 6.6%. That is to say that stylistic inversion is not a very frequently used construction. Prévost et al. (2017) remark that while stylistic inversion is expected in formal contexts, it is not uncommon to find it being used in informal settings.

In stylistic inversion the “full DP subject occurs after the verb or after the second verb in constructions involving complex tenses or a modal followed by another verb. This is different from clitic/verb inversion in which the clitic always follows the first verb if there are multiple verbs”(13) (Prévost, 2009 p. 328). When stylistic inversion occurs the VS word order is actually a result of the inflected V moving from V^O to T^O while the post verbal subject remains in VP (14-19) (Lahousse, 2006). It can be used in independent clauses when a constituent that is typically occurring after the verb in the clause appears in the field before the verb (stylistic inversion). If that constituent is a complement, stylistic inversion becomes obligatory (18-19).

(13) a. Où va Jean?

Where goes John?

‘Where is John going?’

b. À quelle heure a appelé Jean?

At what time has called John?

'At what time did John call?'

c. Dans quelle voiture vont arriver les invités?

In which car go arrive the guests?

'In which car are the guests going to arrive?' (Prévost, 2009)

(14) On ne savait pas du tout [ce que voulait <u>la nouvelle direction.</u>]

'We had no idea [what the new management wanted]'

(15) On ne savait pas du tout [ce que <u>la nouvelle direction</u> voulait.]

'We had no idea [what the new management wanted]'

(16) Renée l'accompagnait poussant un landau [où se trouvaient <u>les deux derniers.</u>]

'Renée accompanied him by pushing a stroller [where the last two were]'

(17) Renée l'accompagnait poussant un landau [où <u>les deux derniers</u> se trouvaient.]

'Renée accompanied him by pushing a stroller [where the last two were]'

(18) *À la diversité géographique* correspond <u>la diversité des crus.</u>

'Geographical diversity corresponds to the diversity of vintages'

(19)**À la diversité géographique <u>la diversité des crus</u> correspond.* (Hansen, 2016)

There are various contexts in which stylistic inversion is never allowed, such as when clitics are present or in the context of direct interrogatives (Hansen, 2016). Example (20) demonstrates an example of stylistic inversion, whereas (21) shows a context wherein stylistic inversion is ungrammatical because of the presence of the clitic. (22) shows a way in which the clitic can be present in a grammatical manner. When in the presence of certain verb complements (such as direct objects (DO)) stylistic inversion cannot occur.

(20) Le village [où habitent Jacques et Maïte $_{SUBJ/NP}$] est assez loin d'ici.

The village [where live Jacques et Maïte $_{SUBJ/NP}$] is rather far from here

'The village where Jacques and Maïte live is rather far from here'

(21)*Le village [où habitent-ils $_{SUBJ/PersPron}$] est assez loin d'ici.

The village [where live they$_{SUBJ/PersPron}$] is rather far from here

'The village where they live is rather far from here'

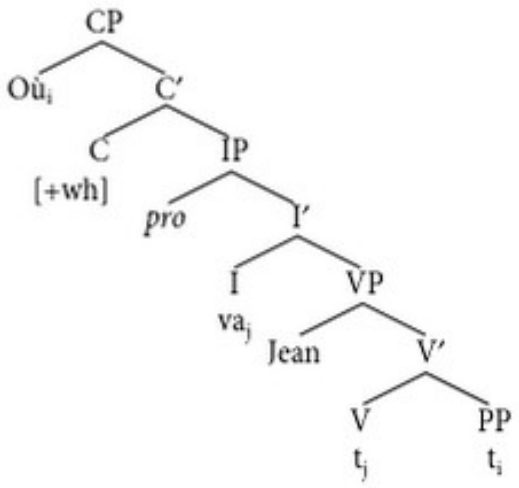
(22) Le village [où ils habitent] est assez loin d'ici.

The village [where they live] is rather far from here

'The village where they live is rather far from here' (Hansen, 2016)

As mentioned above by Hansen (2016), stylistic inversion is caused by the verb moving up to T^{O}. Prévost agrees with this assessment stating that the V moves up to I, not C while the subject remains within the VP. When this occurs the null expletive *pro* appears in SpecIP in order to satisfy the Extended Projection Principle (EPP); then the subject DP adjoins to pro to check its case feature and keep pro from violating the Principle of Full Interpretation (23) (Prévost, 2009 p. 334). When stylistic inversion occurs in *wh*-questions, much like in other forms of inversion the *wh*-word must be fronted.

(23)



(Prévost, 2009)

Of critical importance, when stylistic inversion takes place in French object relative clauses, the sentence has the same word order as a subject clause, but the RP has the same case marking expected in object clauses (14). As a result, the case information present on the RP is integral to distinguishing between SR and ORSI. This will be discussed further in the following section.

2.2.2.2 Relative Pronoun

French requires a RP in the C position of relative clauses, null markers are ungrammatical. In the case of subject and object restrictive relative clauses *que* and *qui* are the only allowable options (Prévost, 2009). As previously mentioned in the English section, while the implications of the RP vs complementizer debate does not have any apparent effect on the results of this study; it is a large enough part of the literature that is worth discussing here. There is a debate as to whether RP *qui* is an allomorph of *que* or the same as the regular [+human] operator (Sportiche, 2011). Sportiche (2011) explains that there are two kinds of *wh*-pronouns: complex and simple. Complex *wh*-pronouns are unmarked for the [+/- human] distinction, and are clearly multimorphemic (*lequel* 'the-which' [*laquelle, lesquels, lesquelles*]).

Simple *wh*-pronouns can display the [+/- human] distinction and appear morphologically simpler. Some examples of complex pronouns include *lequel, laquelle and lesquels* whereas simple pronouns are *que*, *qui, quoi*. *Que* is typically required to head all tensed CPs in French, and only drops in the presence of other overt material such as a *wh*-phrase.

There are two kinds of RP in French : strong and weak. Strong RPs are able to have the distribution of full DPs. Weak RPs have a more restricted distribution. *Que* is exclusively a weak RP while *qui* can be either strong or weak. French has been found to "systematically favor[ing] the weak, less specified form, if the syntactic context allows it" (Sportiche, 2011 p. 105). Below are examples of relative clauses with *que* and *qui*.

(24) La femme [que Jean connaît ___]

the woman that John knows.

'The woman that John knows.'

(25) La femme [qui ____ connaît Jean].

The woman who knows John

‘The woman who knows John’. (Prévost, 2009)

(26) La femme que ____ connaît Jean.

the woman who knows John

‘The woman who John knows’.

In the situation where the relative clause is fully reversible the RP is the only disambiguating factor between a subject interpretation and an object interpretation for SR and ORSI. *Que* appears solely in the ORs with or without stylistic inversion, whereas *qui* only appears when the clause is a SR. *Que* and *qui* are either a RP or complementizer, which poses problems for Kayne and Pollock’s (1978) theory that stylistic inversion is triggered by *wh*-movement, as neither *qui* nor *que* are *wh*-words. Kayne (1976) found the solution, claiming that: “relative clauses with *que* involve both the application of *wh*-movement and the subsequent deletion of the proposed *wh*-element” (Kayne & Pollock, 1978 p. 598). Essentially the *wh*-trigger is present, but then is deleted before the final surface form. Sportiche (2011) argues that *que*/*qui* may actually be *wh*-pronouns that just resemble RPs further supporting Kayne (1976), stating, “if Kayne (1976) is right, some relative forms superficially resembling an interrogative (e.g. special *qui*) are not relative pronouns” (Sportiche, 2011).

As will be discussed in the next section, *que* and *qui* are one of the areas in phoneme monitoring tasks where slowdowns appear (Frauenfelder et al., 1980). This is expected as the RP is one of the disambiguating factors in relative clauses, the other disambiguating factor being word order in situations where canonical word order is used. In regards to SR and OR, it is possible to distinguish the two without processing the RP. Crucially, the morphosyntactic information on the RP, as well as the ability to implement stylistic inversion are the two distinct differences that sets French apart from English in regards to RC structures.

2.3 Processing of Relative Clauses in English and French

In this section I will discuss previous works which have examined L1 processing of relative clause in either English (2.3.1) or French (2.3.2). Once native speakers' processing patterns in English and French is established, I will then discuss the similarities that speakers share (2.3.3).

2.3.1 English

In order to discuss how native English speakers process relative clauses, I will review studies by Gordon et al. (2001, 2004) and Gibson (1998). First I will begin by discussing how different factors such as NP type, for example whether the NP is a pronoun, name, or common noun, affects processing of relative clauses. I will also briefly discuss how embedding has an effect on memory load resulting in processing slowdowns.

Gibson (1998) discusses why subject relative clauses are easier to process than object extracted relative clauses. Gibson determines that it is because of the number of thematic violations that occur through extraction of the NP that slowdowns occur. A thematic violation in this case is an NP which requires a thematic assignment, as well as anything which assigns a thematic role, that has not been completed yet. Each of these incomplete dependencies is associated with a memory cost (Gibson, 1998). Below in example (27b) is a subject extraction that has two local thematic violations which are apparent by the time the reader reaches the RP 'who': "one for the matrix subject 'the reporter' and one for the relative pronoun 'who'" (Gibson, 1998). Conversely, (27a) has three violations, the same first two as (27b), but with the additional violation of 'the senator'.

(27) a. [*S* The reporter [*S*′ who [*S* the senator attacked]] admitted the error].

b. [*S* The reporter [*S*′ who [*S* attacked the senator]] admitted the error]. (Gibson, 1998)

These costs can be further visualized in Tables (1) and (2) which provide memory cost profiles for the sentences in (27). The left-hand column contains all the syntactic predictions that are required to parse

the sentence. The row at the top displays the sentence word by word. The entries consist of the memory load which is associated with the prediction (row) at the word position (column). These entries are done in terms of M(n), wherein n equals the amount of new discourse referents which have been processed since the prediction was made (Gibson, 1998). The asterisk's indicate the position at which the syntactic prediction is satisfied, essentially marking where the structural integration takes place. The matrix verb is assumed to have no memory costs which is marked as 0 in the tables below. These tables show that the memory load is highest at ‘senator’.

Table 1

OR memory cost profile (29a)

	The	reporter	who	the	senator	attacked	admitted	the	error
Matrix Verb	0	0	0	0	0	0	0	0	0
Matrix Subject	M(0)	*							
Matrix Object NP							M(0)	M(0)	*
Embedded Subject NP				M(0)	*				
Embedded Verb			M(0)	M(0)	M(1)	*			
WH-Pronoun Gap			M(0)	M(0)	M(1)	*			
Total cost (MUs)	M(0)	0	2M(0)	3M(0)	2M(0)	0	M(0)	M(0)	0

(Gibson, 1998)

Table 2

SR memory cost profile (29b)

	The	reporter	who	attacked	the	senator	admitted	the	error
Matrix Verb	0	0	0	0	0	0	0	0	0
Matrix Subject	M(0)	*							
Matrix Object NP							M(0)	M(0)	*
Embedded Verb			M(0)	*					
WH-pronoun gap			M(0)	*					
Embedded Object NP				M(0)	M(0)	*			
Total cost (MUs)	M(0)	0	2M(0)	M(0)	M(0)	0	M(0)	M(0)	0

(Gibson, 1998)

The types of nouns used in the relative clause have also been found to have an effect on reaction times (henceforth, RT). Gordon et al.(2004) found that definiteness was an important factor in RTs. When the second NP in the phrase is marked as definite, comprehension was lower and RTs increased (Gordon, Hendrick & Johnson, 2004) Another factor that has been found to influence RTs is the level of ambiguity in the clause. High ambiguity can result in costly reanalysis when the structure turns out to be different than the reader initially interpreted. The longer the clause is ambiguous, the higher chance of processing slowdowns.

Gordon et al. (2001) aimed to examine how memory interference affected native English speakers' processing of SR and OR. Participants completed a self paced reading task and answer a true/false

comprehension question. Where participants had localized slowdowns depended on the sentence structure involved. An example of Gordon et al.'s (2001) experimental items are provided below (28a, b):

(28) a. The banker that praised the barber climbed the mountain just outside of town before it snowed.

b. The banker that the barber praised climbed the mountain just outside of town before it snowed. (Gordon et al., 2001)

In the case of SR (28a), slowdowns occurred on first and second critical word which were located on the embedded verb ('praised') and the matrix verb ('climbed') respectively. The slowdowns were greater on the matrix verb than the embedded verb. Sentences with OR led to the opposite pattern, occur with significantly increased slowdowns: the embedded verb was read slower than the matrix verb, and took nearly double the amount of time as the embedded verb in the SR. OR also had decreased accuracy on the comprehension questions indicating that native speakers have a more difficult time processing OR compared to SR overall. Gordon et al. (2001) proposed that these slowdowns are due to limitations in participants' working memory which are induced by interference during the retrieval process. Further experiments in Gordon et al. (2001) found that this processing asymmetry can be reduced or eliminated by using names or indexical pronouns that have definite descriptions as the NP. Having NPs of different classes can help eliminate any processing differences. Specifically, when sentences include either a description and either an indexical pronoun or name as the two critical NPs, processing costs are reduced. Gordon et al. (2001) argues that the similarity between NPs interferes with the retrieval process, so by having different categories of NP in a sentence there is no interaction during retrieval, leading to faster processing times. Furthermore, having different

category NPs adds information which cues which NP is being modified. In the current study, NPs of the same class are used, and so the classic processing asymmetry is expected to be present.

2.3.2 French

Similar to what has been observed for English, native speakers of French have been found to prefer subject interpretations when ambiguity is present in the clause. This preference for subject interpretations is one of the factors that contributes to the classic subject/object processing asymmetry. Speakers assume that the clause is a subject relative clauses until they encounter the disambiguating information, which appears on the RP in French. It is at this point that reanalysis occurs, resulting in processing slowdowns. Phoneme monitoring tasks in French using eye tracking programs have found that ORSI (with RP *que*) has longer response times (RT) than SR (with *qui*) (Frauenfelder et al., 1980). This is consistent with the subject/object distinction that is found in both English and French. Frauenfelder et al. (1980) used a phoneme monitoring task to study where slowdowns occurred for French speakers. They focused on reversible relative clauses (29, 30), so as to be able to focus on processing of the relative pronoun and the information it provides. An example of the kinds of sentences used in their experiment is provided below (examples 29 and 30).

(29) Le savant qui connaît le docteur travaille dans une université moderne.

'The scientist who knows the doctor works in a modern university'

(30) Le savant que connaît le docteur travaille dans une université moderne.

'The scientist who the doctor knows works in a modern university' (Frauenfelder et al., 1980)

Their results showed that RTs were slower when reading ORs compared to SRs. Specifically, RTs were slower for *que* than they were for *qui*. The boundary for the beginning of the relative clause seems to be where slowdowns for RTs first appears. (Frauenfelder et al., 1980). Frauenfelder et al. conclude that

there appears to be additional mental work which could be related to grammatical computations taking place, and that this presents as longer detection times for the reversible object relatives (Frauenfelder et al., 1980). Even though the word order is identical between the SR and OR, with the sole disambiguating element being the RP, it appears that reanalysis still occurs and causes a processing asymmetry.

Holmes and O'Regan (1981) found that there appears to be an effect in the area of interest on Zone 3 where the embedded verb (SR, ORSI) or embedded noun (OR) reside. Examples of how sentences were divided are provided below in (31). They studied adult native French speakers' processing of reversible relative clauses. Participants were presented with an entire sentence and then asked to answer a yes or no question after having finished the sentence. Participants' eye movements were tracked as they read the sentence, which was divided up into zones. While readers had the same amount of time spent looking at zone 1 and 2 regardless of structure, the same is not the case for the zones that followed. Zone 3 led to longer fixations on the embedded verb 'va attaquer' (31 SR, ORSI) for the subject and transposed object than the NP 'le chasseur' of the OR. Zone 4 found the verb of the OR was fixated on for longer than the NP for the subject and transposed object. Below is an example demonstrating how Holmes and O'Regan designated the zones.

(31) SR: Je crois que le sauvage qui va attaquer le chasseur monte sur un cheval noir

OR: que le chasseur va attaquer

ORSI: que va attaquer le chasseur

1 | Q | 3 | 4 | 5

SR: 'I believe that the savage who will attack the hunter rides on a black horse'

OR/ORSI: 'I believe that the savage who the hunter will attack rides on a black horse'

(Holmes & O'Regan, 1981)

Overall, Holmes and O'Regan found that participants spent more time looking at Zone 3 than Zone 4. Additionally, if a participant were to relook, suggesting reanalysis, it was more likely to take place on the constituents preceding or following the RP. Relooking also occurred at a higher frequency with ORs compared to SRs. Holmes and O'Regan thus concluded that regressive movements occur more often in syntactically complex structures.

Further in support of the subject-object asymmetry in native speakers' processing is Schelstraete and Degand's (1998) study. Schelstraete and Degand studied native French speakers from Belgium as they completed a self-paced reading task made up of SR, OR and ORSI relative clauses. Just as in the other studies mentioned, Schelstraete and Degand found that participants had the least amount of errors on the comprehension questions for SR compared to both OR and ORSI. Their participants were also significantly faster at reading SR with fewer slowdowns overall. Unexpectedly, Schelstraete and Degand found that their participants had more difficulty with OR compared to ORSI. Their results showed that OR had the slowest RTs with the most significant slowdowns taking place on the subordinate verb. This is visible in the figure below: where SR is noted with a square, OR with a triangle and ORSI with a circle.

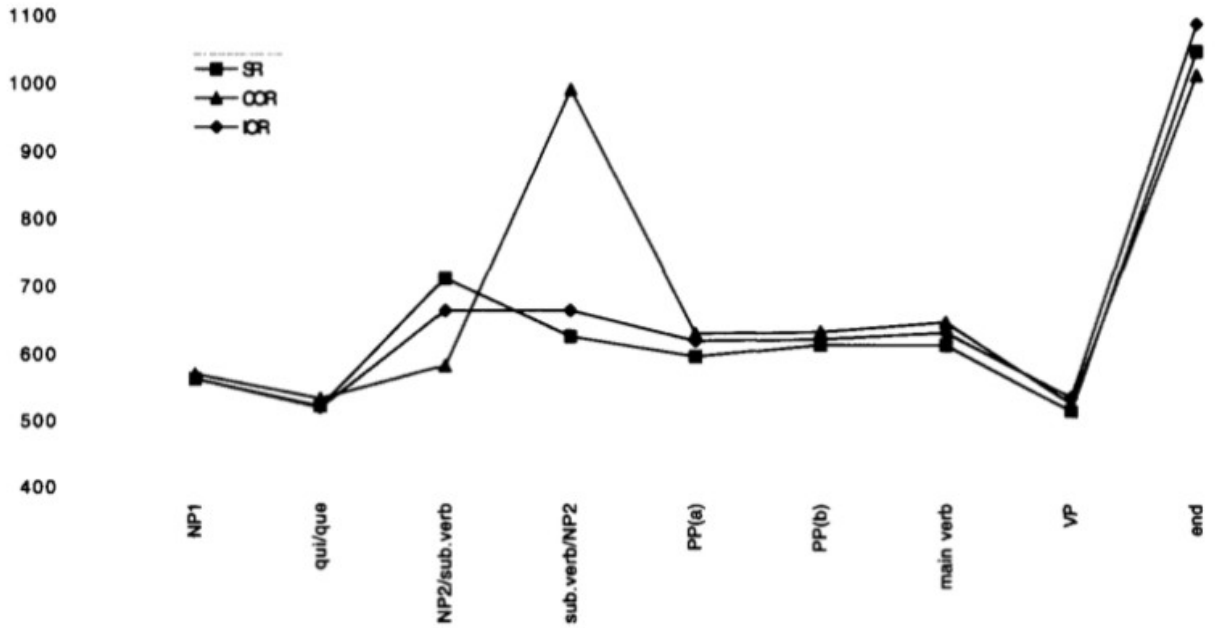


Figure 1: Mean reading times (in ms) by zone as a function of structure (Schelstraete & Degand, 1998)

Just as Holmes and O'Regan found, the most significant slowdowns appear on the embedded verb. The other area of difficulty is that of the embedded NP2 for ORSI. Those two areas in particular are of interest in the current study. Despite having faster RTs, ORSI still had the lowest comprehension scores. Schelstraete and Degand conclude that speakers find SR to be the easiest, while OR are the most difficult, and that ORSI is somewhere in between the two.

2.3.3 Similarities in processing

As established in the two sections above (2.3.1; 2.3.2) processing asymmetries have been observed in adult reading studies in English and French; that is, participants have faster RTs for subject relative clauses (as in examples 32-33) than object relative clauses (as in examples 34-36) (Schriefers, Friederici & Kuhn, 1995; Bader & Meng, 1999; Meng & Bader, 2000; Rankin, 2014). SRs are processed faster and have higher accuracy on comprehension tests than ORs. The examples below (32-36) demonstrate the kinds of sentences in which the processing asymmetry has been observed. Examples (32) and (33) are SR, and are therefore typically processed faster than examples (34) and

(35), which are OR. (36) is processed the slowest since it is ORSI, and crucially for the current study has no English equivalent structure unlike the previous examples.

(32) The dog [that ____saw the man] has brown fur.

(33) La femme [qui ____ connaît Jean].

The woman who knows John

'The woman who knows John'.

(34) The dog [that the man saw ___] has brown fur.

(35) La femme [que Jean connaît ___]

the woman that John knows.

'The woman that John knows.'

(36) La femme que ____ connaît Jean.

the woman who knows John

'The woman who John knows'. (Prévost, 2009)

When processing RCs, speakers assume that the clause is an SR until they encounter evidence that proves otherwise, in this case it is the position of the object in the word order that triggers reanalysis resulting in higher processing times (Schriefers, Friederici & Kuhn, 1995; Bader & Meng, 1999; Meng & Bader, 2000; Rankin, 2014). By encountering a noun rather than the verb that is expected in an SR, speakers realize that the sentence is an OR and must reassess the structure that they had previously constructed.

It seems that the differences in regards to processing can be attributed to the computational costs that take place while the participant is reading the clause. These computational costs will be the focus of this study. Both memory costs and integration costs have been found to play a role in processing slowdowns (Gibson, Schütze & Salomon, 1996; Gordon, Hendrick & Johnson, 2001). The memory cost comes into play whenever there is an instance of an incomplete dependency that involves thematic

role assignment; for example NPs without their needed thematic roles, or thematic role assigners that are lacking necessary arguments (Gibson, 1998).

The Active Filler Strategy (AFS) (Clifton & Frazier, 1989) can be used to explain why there is a processing asymmetry between the SR and OR. The AFS posits that speakers attempt to fill a gap with an identified filler as soon as is possible (Gibson, 1998). This strategy is mainly to avoid ambiguity and save on processing costs. There are fewer memory costs associated with assuming that a gap is available for the dependency following a verb. When the gap is filled by something else, there are additional processing costs required for reanalysis of the clause. An example of this is provided below:

(37) No-gap control sentence:

My brother wanted to know if Ruth will bring us home to Mom at Christmas.

(38) Filled-object gap sentence:

My brother wanted to know who Ruth will bring us home to at Christmas. (Gibson, 1998)

Gibson (1998) explains that (38) is read slower than (37) because 'who' is preferred to associate with the object position as soon as the embedded verb 'bring' is encountered. Reanalysis occurs once the reader reaches the word 'us', the actual object of the sentence. In regards to SR and OR's asymmetry specifically (see 32 and 33 repeated below), the parser attempts to close the A' dependency as soon as possible by assuming that the closest variable to the argument position is the subject (Friedmann et al., 2009). When processing relative clauses, the parser tends to prefer assigning Subject-Object word order, essentially assigning a subject interpretation to an initial NP until a disambiguating element proves otherwise. This assumption works when the sentence is a SR, however causes costly reanalysis when the sentence is actually an OR (Friedmann et al., 2009). I will examine this in reference to examples (32) and (33) which are repeated below (39, 40) for convenience, In (39), according to the AFS, the parser attempts to fill the gap by assuming that 'the dog' is the subject and filled the gap

indicated following the RP ‘that’. In this situation this is the correct analysis and leads to (39) being interpreted as a SR. If the same process is assumed for (40), where the parser assumes that ‘the dog’ is the subject, they will have to reanalyze when they encounter ‘the man’; the true subject of the sentence. ‘The dog’ is in the closest argument position, but due to the difference in structure is incapable of being the subject. The parser only realizes this upon encountering ‘the man’ which is where the structure begins to differ from SR, and reanalysis occurs. Assuming ‘the dog’ is the subject, the parser expects a verb to follow the presumed gap, this is not the case in (40).

(39) The dog [that ____saw the man] has brown fur.

(40) The dog [that the man saw ___] has brown fur.

In English and in French experimental items for the current study, the disambiguating elements (the verb, *que/qui* alternation, etc) appear early in the clause triggering reanalysis, compared to other languages such as German where disambiguation can occur at the end of the clause. Speakers assume (39) until they encounter evidence that the structure is actually (40), at which point a reanalysis occurs causing the classical processing asymmetry.

2.3.4 Prideaux and Baker’s L1 Processing Strategies

Prideaux and Baker (1987) look to explain and predict the processing results of native speakers using a set of strategies which predict the level of difficulty. Prideaux and Baker make a point of mentioning that they are not ascribing to any particular theoretical approach, and that their strategies are universal. They suggest that the strategies are independent of a language-particular structure, but still interact with speakers’ knowledge of the language structure at the same time. This allows for the strategies to be applied to any language by interacting with the speaker’s knowledge. Prideaux and Baker specify that these cognitive operations are metalinguistic strategies because unlike constraints or rules they permit violations or exceptions and are not firm in their application. The higher number of violations, the more

difficult processing should be. For the purpose of this discussion the most relevant strategies are listed in no particular order below:

> CLOSURE: In processing a particular linguistic unit (phrase, clause, etc) the language user (speaker or hearer) attempts to obtain closure on that unit as early as possible.
>
> NORMAL FORM: The language user assumes that the unit being processed is in its 'normal' or 'canonical' form unless the unit is overtly marked to the contrary. (Prideaux & Baker, 1987)

CLOSURE supports speakers initially assuming a subject interpretation. In English and French the subject is typically in NP1 position. By attempting to close the unit as soon as possible, speakers will attempt closure after reaching NP1, therefore forcing a subject interpretation and increasing difficulty for center embedded relative clauses. NORMAL FORM predicts that clauses which violate the typical word order are more difficult to process. As a result, ORSI clauses in French would be more difficult than either SR or OR. Another consequence of NORMAL FORM is the assumption that SR center embedded relative clauses are actually easier to process than right branching OR which are clause final. This contradicts what CLOSURE predicts. Center embedded clauses have been found to be more difficult (Prideaux & Baker, 1987), therefore supporting the idea of ranking strategies, or rather having some strategies be stronger than others, in center embedding CLOSURE appears to take precedence over NORMAL FORM. Prideaux and Baker found that the strength of the strategy seems to vary depending on the linguistic situation that the speaker finds themselves in. For example, in cases of acceptability judgements NORMAL FORM was the strongest, and CLOSURE was found to play a minuscule role. Comparatively, in situations where memory costs were more involved such as with online processing CLOSURE and NORMAL FORM were more similar in strength. Therefore; in terms of the current study ranking of the strategies does not appear to have a significant enough effect, as such it will be assumed that CLOSURE and NORMAL FORM are equivalent in strength.

Gibson (1998) found that center-embedded clauses are more difficult to process overall, suggesting that CLOSURE is a stronger strategy than NORMAL FORM. Finally, by assuming that there is no ambiguity present in the clause, the parser will not be expecting to have to complete reanalysis of the clause, thus making said reanalysis costlier. (Prideaux & Baker, 1987). Essentially, participants assume a subject interpretation before encountering the verb or other information that is incompatible with their initial analysis, thus a costly reanalysis ensues. Based on what I have discussed about the classic subject/object processing asymmetry, I believe that this means in this context, that NORMAL FORM is a relatively strong strategy similar to CLOSURE. These strategies will be discussed further as I apply them to the following studies as well as my own. These findings support the assignment of high strength to CLOSURE and NORMAL FORM which predict that SR are easier to process than OR and that subject interpretation is assumed in the case of ambiguous relative clause. (Prideaux and Baker, 1987).

2.4 L2 Processing Accounts

In this section I will focus on studies of second language acquisition and processing, relying mainly on the studies completed by Clahsen and Felser (2006, 2018), Havik et al.(2009), Hopp (2006, 2010), and Schwartz and Sprouse (1996). While accounts of second language processing have resulted in conflicting analyses, there are still certain aspects which are agreed upon. It is generally agreed that L2 learners tend to have more difficulty processing morphosyntactic structures. Less consistently endorsed is the concept that L2 learners must rely on other comprehension mechanisms such as pragmatics, plausibility and other lexical-semantic information (Clahsen and Felser, 2006, 2018; Hopp, 2006; Havik et al., 2009; Hopp, 2010). It is important to note that morphosyntactic abilities appear to increase with proficiency, although whether that is as a result of increased automaticity or learners adopting more native-like processing abilities remains to be seen (Hopp, 2010). It is also universally accepted

that L2 processing is more heavily impacted by resource limitations than L1 processing (Hopp, 2010). For this section I will focus on what evidence exists in the literature for transfer and proficiency's effect on L2 processing.

2.4.1 Evidence of Transfer

In this subsection I will focus upon the evidence of transfer in the current literature with a focus mainly on Havik et al. (2009) and Hopp (2010). Hopp (2010) examined L2 speakers of different proficiencies as well as L1 backgrounds. Participants were L2 speakers of German and had either English, Russian, or Dutch as their L1. Participants completed speeded grammaticality tasks and a self-paced reading task. The near-native speakers patterned like the native speakers, albeit slower. This group also showed no differences based on the participants' L1. In the advanced proficiency group however, there was an effect based on the L1. On the proficiency test administered (C-test), the L1 Dutch participants had fewer syntactic errors compared to the L1 English or Russian groups. Likely this is due to the similarities between Dutch and German syntax. L1 Russians performed better than their counterparts regarding case information on the proficiency test. In the first experiment, which was an offline grammaticality test, participants' L1 affected the answers they gave. The L1 speakers accepted all sentences which were subject first, and rejected all sentences with object initial orders, regardless of actual grammaticality. L1 Russians performed similarly to natives in this context. The L1 Dutch also refused to accept object initial orders, but performed better than the L1 English on subject initial orders. There were also some L1 effects for the self-paced reading task, which revealed that the L1 Russian speakers performed the same as the other two groups. In other words they did not have local slowdowns to indicate that they were processing whether the RP had nominative or accusative case information, despite having target like performance on case in the previous experiment (Hopp, 2010). Applying these results to the current study, it would be expected that participants will have influence

from their English L1, which will result in them lacking local slowdowns that would indicate whether they are processing the case information on *qui/que.*

Havik et al. (2009) studied speakers who had German as their L1 and were considered advanced in their L2 which was Dutch. Havik et al. had participants complete 2 self paced reading tasks and compared the results to those of the native speakers. They read long and short Subject and Object relative clauses. Havik et al. found that the L2 speakers were significantly slower than their native counterparts. The L2 speakers also had the classic subject-object processing asymmetry although the differences between SR and OR were not as stark as the native speakers. L2 speakers read the long ORs the slowest and had the least comprehension questions answered correctly. Havik et al. also measured participants' working memory as a means of studying cognitive resources. They found that working memory only had an effect on the native speakers. Overall, there was less of a difference between RTs for the different structures by the L2 speakers. Differences between the SR and OR were far more defined for the short relative clauses.

Both Havik et al. (2009) and Hopp (2010) found possible evidence of transfer when studying advanced L2 speakers. The only group which was not found to have transfer effects was that of the near-native speakers (Hopp, 2010). This indicates that speakers' L1 appears to affect their L2 late in the acquisition process, even once a high proficiency is achieved. It can be assumed that transfer effects decrease as proficiency increases based on the difference in performance between the advanced and near-native speakers (Hopp, 2010). As such, lower proficiency individuals are likely to have stronger transfer effects from their L1 on their L2.

2.4.2 Evidence for Proficiency

In this subsection I will focus mainly on the studies done by Hopp (2006, 2010) and Prévost et al. (2017) wherein proficiency's effect on L2 processing was evaluated. Prévost et al. (2017) examined the

processing and production of various *wh*-clauses by L2 French children. One structure they examined in particular was that of *wh*-clauses with stylistic inversion. Prévost et al.(2017) had participants complete picture elicitation tasks and picture comprehension tasks and found that there was a significant interaction between proficiency in morphosyntax and the production and comprehension of clauses with stylistic inversion. More of the L2 participants produced clauses with stylistic inversion than those with Specific Language Impairment, although they had worse comprehension scores (23% compared to SLI's 40%). Prévost et al. postulate that this could be due to the *qui/que* distinction which the children with SLI have access to, that the L2 children have not fully acquired. Essentially, stylistic inversion is acquired as proficiency increases due to its high complexity. Low proficiency learners will struggle more with stylistic inversion as it requires a higher level of processing resources that are not available until a higher proficiency is achieved (Prévost et al., 2017).

In Hopp (2010), discussed above in 2.4.1, L2 speakers of different proficiency levels were examined, so as to better understand the role of proficiency on L2 speakers' processing. Hopp had the participants complete four experiments, one self paced reading task and three grammaticality judgements. The most relevant to the current study is experiment 2 (self-paced reading task) and will be discussed here. Participants were L2 speakers of German with either English, Russian, or Dutch as their L1. Participants' proficiency in German ranged from advanced to near-native. The self paced reading task was made up of sentences with subject-object ambiguities. The sentences were disambiguated either by case information on the NP or by verbal agreement. Regardless of proficiency participants performed better on SO than OS clauses. SO clauses are clauses where the subject appears before the object in the word order, OS clauses are when the inverse occurs. Hopp found that in situations where the sentences were disambiguated by case information, natives and near-natives had significantly slower RTs for the accusative marked NPs, the advanced group also had slowdowns but they were not nearly as robust.

Hopp explains that the advanced speakers are less sensitive to case information and verbal agreement compared to the native and near-native speakers. Even though the near-native speakers patterned with the native speakers, they had significantly slower RTs. This indicates that they are not yet identical in processing abilities. Additionally, there was found to be no L1 effects for the near-native speakers because the L1 Russian and L1 English speakers performed the same.

Hopp (2006) completed a similar study that looked at L1 speakers of English or Dutch who had advanced to near-native proficiency in their L2 of German. It is important to note, that unlike German, neither English nor Dutch have case markings on full NPs or allow pre-subject scrambling of objects. There were also 20 native German speakers as a control group. Based on a proficiency test, the L2 participants were divided into two groups: advanced or near-native. Participants completed a self-paced reading task, and a speeded grammatical judgement for sentences with subject-object ambiguities. The self-paced reading task is the most relevant to the current study and will be the focus. The testing sentences were disambiguated by either case or number marking on the verb. Half had SO word order, while the other half were OS. The sentences were divided into 7 segments, which would appear segment to segment at the press of a button. To ensure comprehension, participants also answered a yes/no comprehension statement. Below in (41) and (42) are examples of the experimental items, and (43) is an example of how they were segmented.

(41) a. Er denkt, dass **der** Physiker am Freitag **den** Chemiker gegrüsst hat.

He thinks that the$_{NOM}$ physicist on Friday the$_{ACC}$ Chemist greeted has

b. Er denkt, dass **den** Physiker am Freitag **der** Chemiker gegrüsst hat.

He thinks that the$_{ACC}$ physicist on Friday the$_{NOM}$ Chemist greeted has

(42) a. Sie sagt, dass **die** Baronin am Freitag **die** Bankiers eingeladen **hat**.

She says that the baroness$_{SG}$ on Friday the bankers$_{PL}$ invited has

b. Sie sagt, dass **die** Baronin am Freitag **die** Bankiers eingeladen **haben**.

She says that the baroness$_{SG}$ on Friday the bankers$_{PL}$ invited have

(43) Matrix COMP NP1 Adverbial NP2 V-part V-fin

Er denkt | dass | der Physiker | am Freitag | den Chemiker | gegrüsst | hat. (Hopp, 2006)

All groups were found to prefer SO word order to OS word order. As in Hopp (2015), the advanced speakers failed to achieve processing RTs similar to the native speakers. The advanced speakers had no local specific slowdowns for the sentences with OS word order. The near-native speakers again patterned with the native speakers and had slowdowns on the segment where disambiguation occurred. Native speakers had slower RTs with experimental items that had OS word order. There were also specific slowdowns depending on the disambiguating element, appearing after the NP2 (case) or clause finally (verbal agreement). In the regards to sentences that were disambiguated by case, slowdowns occurred on the NP where the case information was present as well as the segment immediately following. In cases of verbal disambiguation both native and near-native speakers had slowdowns on the final segment where disambiguation occurred. Hopp found that regardless of proficiency the L2 speakers were more strongly garden pathed for verbal disambiguation than case disambiguation. These results were similar to that of the native speakers. The advanced speakers did have slowdowns when the word order was OS, but there was no locally specific slowdowns. Near native speakers on the other hand, patterned with the native speakers in terms of RTs slowing down in the same locations of the phrase. Hopp found no differences based on the L1 (i.e., both L2 groups performed in a similar

fashion), which suggests proficiency was the main factor. This study did not find any differences based on learners L1 because the phenomena being examined does not exist in either English or Dutch. Since there is no group of L2 speakers from a case marking L1 background, it is impossible to see if there are any L1 effects present.

2.5 Frameworks of L2 Processing

In this section I will discuss the two theoretical frameworks within which I will examine my data. In section 2.5.1 I will detail the Full Transfer Full Access hypothesis (FTFA) which is based on UG models and argues that full native like attainment in (late) L2 acquisition is possible. The Shallow Structure Hypothesis will then be discussed in 2.5.2; a model which argues that native like attainment is highly unlikely as L2 speakers are using different processes than those of native speakers.

2.5.1 Full Transfer Full Access

The Full Transfer Full Access hypothesis (Schwartz & Sprouse, 1994, 1996) is a model designed to explain L2 acquisition from the initial state to the final grammar. The model predicts that, "learners can assign 'deep' syntactic parses to input and the grammar is restructured when it cannot assign a parse to L2 input strings" (Rankin, 2014). The hypothesis suggests that L2 learners have full access to UG, hence the "Full Access" in the title. The initial state consists of the copy of the L1 grammar (White 2003). After the initial state there are various interlanguage grammars, which change as learners acquire more of the L2 grammar. Interlanguage grammar (IL) refers to the grammars that exist in between the initial state and the final grammar. IL grammars are frequently changing to adapt to the input that learners experience. Learners can have several IL grammars before they arrive at the final grammar. It is important to note that the L2 learners will not necessarily acquire their second language in the same way or with the same final result as a native speaker does, even though they have access to UG. Below is Figure 2, from White (2003) displaying how L2 acquisition would take place according

to the Full Access Full Transfer hypothesis. It demonstrates how learners begin with a copy of their L1 as the initial state once they have been exposed to Primary Language Data (PLD), which can be seen in the box labeled with S_0. From there, their initial state becomes their first IL grammar (ILG_I), which then continues to evolve as the learner becomes more experienced to their next IL grammar (ILG_n), until they eventually arrive at their final grammar (IL S_s). During the entire process the speaker has access to UG, which is shown with the double-ended arrows linking the UG to the grammar boxes.

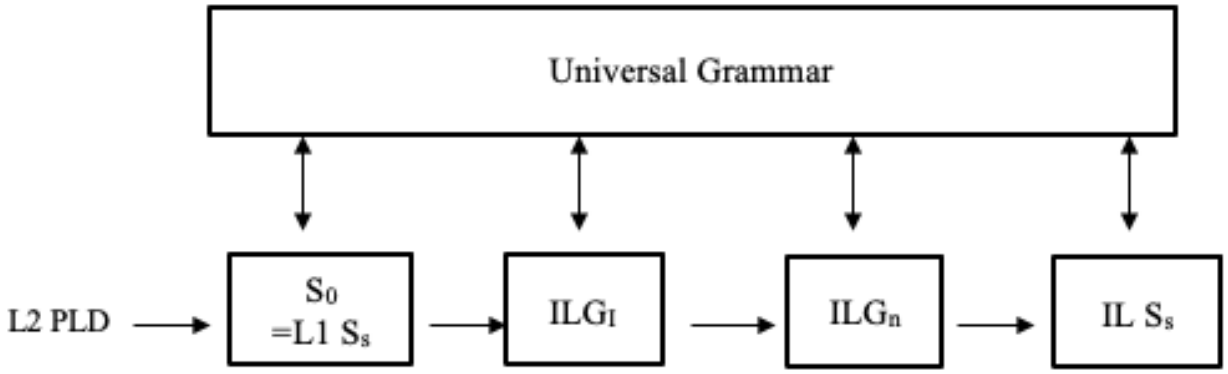


Figure 2: UG Grammar model (White, 2003)

While some researchers claim that late L2 grammars are not constrained by UG (e.g., Meisel, 2009), White theorizes that if L2 learners have acquired "abstract properties that could not have been induced from the input, this is strongly indicative that principles of UG constrain interlanguage grammars, parallel to the situation in L1 acquisition" (White, 2003). It can still be true that UG is involved even if L2 competency is different from that of native speakers. White sets out the following criteria that are needed if the interlanguage grammar is constrained by UG

i) [The phenomenon] must not be something that could be acquired by observation of the L2 input, including statistical inferencing based on frequency of occurrence, on the basis of analogy, or on the basis of instruction.

ii) [The phenomenon] must be underdetermined by the L1 grammar as well. In this way, transfer of surface properties can be ruled out as an explanation of any knowledge that L2 learners attain (White, 2003 p. 23)

White cites a study by Pérez-Leroux and Glass (1997) investigating the Overt-Pronoun Constraint (OPC) in L2 Spanish learners with English as their L1. Pérez-Leroux and Glass theorized that since English is a [- null subject] language, learners would not be able to get the information needed from their L1, therefore if participants were able to distinguish which contexts where an overt pronoun is allowed, then theoretically they have displayed their ability to access UG. The results found intermediate and beginner learners still made mistakes, but had overall acquired the OCP, while advanced learners were consistently correct. These results therefore support the theory that interlanguage grammar is constrained by the OPC at all levels of SLA.

Now that the potential role of UG in interlanguage grammars has been addressed, the Full Access Full Transfer hypothesis will be discussed in further detail. According to the Full Access Full Transfer hypothesis, the entire L1 grammar is copied (with the exception of specific lexical items) to be the initial state that L2 learners start with before they are exposed to L2 input. The learner is not stuck with representations from their initial state. When their L1 grammar is unable to accommodate the L2 input they are able to use UG to change the parameters, functional categories, and feature values, in order to have an interlanguage grammar that matches more with the L2 input (White, 2003).

Hopp's (2006) study (mentioned above in 2.4.2) supports the idea that L2 and native speakers have access to the same processes. Hopp investigated subject-object ambiguity processing in L2 German speakers with different L1s. Twenty participants had English as their L1, while 20 had Dutch as their L1. Neither Dutch nor English allow for case marking to appear on full NPs or allow pre-subject scrambling of objects. Participants were categorized as advanced or near-native. Hopp had participants

complete a self-paced reading task and a speeded grammaticality judgement for sentences with subject-object ambiguities. The sentences that participants read were disambiguated by either case or verbal agreement. Half of the sentences had an SO word order, while the other half were OS. Native, near-native, and advanced speakers were all found to prefer SO word order to OS word order. The advanced speakers failed to achieve native like processing, as they lacked local specific slowdowns when reading OS word order. Near-native speakers patterned with the native speakers by having slowdowns on the disambiguating element. Hopp found that regardless of proficiency, L2 speakers were more strongly garden-pathed for verbal disambiguation than case disambiguation, similar to the native speakers. The lack of influence from the L1 is likely due to the advanced proficiency of the participants. Importantly, it appears that the native and near-native speakers are using the same processes, which support the Full Transfer Full Access hypothesis.

Hopp (2010) provides further support of the Full Access Full Transfer hypothesis. This study examined speakers of high and near-native proficiency participation in processing studies. Participants had one of three languages as their L1 (English, Dutch, or Russian) and had German as their L2. The L2 German speakers were divided into two groups, advanced and near-native. Native speakers also participated as a control. Hopp used both online and offline methods, such as grammaticality judgement tasks and self-paced reading tasks. These tasks targeted the speaker's knowledge of case marking, verbal agreement, and gender concord. Hopp found that all 3 groups (advanced, near-native, and native speakers) all preferred SR to OR order, and had lower comprehension with the ORs. The near-native speakers patterned with the native speakers. There was no difference based on L1 in the near-native speakers, although they did find that speakers' L1 played a role in the advanced speaker's performance. Hopp deduced that the results of the experiments show that the near-native speakers have acquired target-like knowledge. It's possible that the advanced speakers have also acquired this knowledge, but they are not

able to reliably access it in real- time comprehension. Because the near-native speakers have acquired target-like knowledge, it suggests that it is possible for late L2 learners to acquire native-likeness. This finding is incompatible with the critical period and suggests that full acquisition is possible. Additionally, the findings that L1 had an effect on learners L2 at advanced stages supports the FTFA Hypothesis.

Further in support of the FTFA hypothesis is Prévost (2009) analysis of the study by Bartning and Schlyter (2004). Prévost cites Bartning and Schlyter as an example of a study showing that French L2 speakers acquire embedded clauses and RC relatively early in the acquisition process. First acquired are juxtaposed clauses with connectors, followed by the acquisition of subordinate clauses. This early acquisition indicates a strong presence of C in participants' IL grammar. The early acquisition of CP could be a result of learners transferring CP from their L1 over to their L2 grammar. However, a criticism of this view is that many of the sentences cited as evidence of the presence of CP are in fact routine sentences, and therefore may not be novel constructions but rather learners repetitions.

2.5.2 Shallow Structure Hypothesis

The Shallow Structure Hypothesis (SSH) (Clahsen & Felser, 2006, 2006a) accounts for second language processing. According to Clahsen and Felser, learners' native-like abilities are restricted to local domains, like word segmentation or the morphosyntactic agreement of components that are adjacent, for processing (Clahsen & Felser, 2006a p. 111). L2 learners use primarily surface and semantic information to process their second language. Notably, learners do have access to 'deep' pathways, but rely more on 'shallow' methods. (Clahsen & Felser, 2006, 2006a). The SSH predicts that L2 speakers will have qualitatively different processing results from native speakers. Clahsen and Felser (2006) also suggest that a lack of influence from the learners' L1 could also indicate shallow processing (p. 566).

In Clahsen and Felser's earlier work (2006, 2006a), the Shallow Structure Hypothesis initially saw no role for the L1 in L2 syntactic processing, "rather than computing syntactic parsing during L2 processing, learners over rely on universal lexical and pragmatic strategies" (Rankin, 2014). The SSH is based on multiple pathway models of language processing, specifically dual pathway models. The processing system is used differently depending on whether the speaker is processing their native language or their L2 (Clahsen & Felser, 2006). Clahsen and Felser explain that the main claim of the SSH, is that L2 speakers process their L2 differently than native speakers. In more recent work on the SSH, Clahsen and Felser (2018) do agree that there seems to be some transfer from the L1, but unlike Schwartz and Sprouse (1994; 1996) they do not assume that there is full transfer of grammatical rules from the L1; and that the way in which L2 speakers learn their L2 is different from their L1 despite having access to the same processing system. They agree that there are transfer effects in regards to the areas that are phonological, orthographical, morpho-lexical, and lexico-semantic (Clahsen & Felser, 2006), but that the results regarding L1 transfer of syntactic properties are mixed. The absence of transfer could be due to mapping incompatibility between the L1 and L2 representations (Clahsen & Felser, 2006 p. 566). Both Kontola & van Gompel (2011) and Meijer & Fox Tree (2003) found results in their priming experiments to support the idea that at least some morphosyntactic structures are transferred; whereas Macdonald (2000) and Montrul (2004) found evidence to the contrary. Kontola & van Gompel (2011) used syntactic priming to study participants with Swedish L1 who had English as an L2. These authors looked specifically at sentence fragments with double object constructions versus object-preposition constructions. Priming effects were found suggesting that there is some syntactic transfer between languages. Meijer & Fox Tree (2003) also used syntactic priming experiments with Spanish-English bilinguals, to examine effects on word order: specifically NP-NP constructions versus NP-PP constructions, double negation versus single negation, and the placement of direct object

pronouns in relation to the verb. They found that there were priming effects from one language to the other, suggesting that there is some transfer from the L1 to participants' L2.

The SSH theorizes that rather than using morphosyntax, second language speakers rely more heavily on semantic, pragmatic, probabilistic, or surface-level information when processing their second language. In addition, L2 learners have reduced automaticity when processing sentences. Though highly proficient L2 processing may appear native-like, it does not mean that L2 learners are using the same processes. According to Clahsen and Felser, learners who performed the same as native speakers in offline tasks did not perform like native speakers during on-line processing of morphosyntactic phenomena (Clahsen & Felser, 2006). This conclusion is based on ERP and brain imaging studies that found differences between the native and nonnative speakers. There have been several ERP studies that have not found left-lateralized anterior negativity (LAN) effects that are seen with native speakers, in the results of nonnative speakers which suggests the L2 speakers are processing differently from the native speakers, and are less automatic. Native speakers typically have a LAN early on in processing, and a later posterior positivity (P600) at around 600ms post onset. The negative wave that peaks around 400ms possibly indicates lexical-semantic processing. These features can also appear in L2 results, but sometimes are delayed or reduced in amplitude. Often the P600 appears but not the LAN in studies investigating L2 acquisition. These results suggest that automaticity is reduced in L2 processing, and therefore L2 speakers' processing differs from that of native speakers (Clahsen & Felser, 2006). Clahsen and Felser (2006) posit that a possible cause of the reduced automaticity is due to the drain that having to identify words and phrases in the L2 has on working memory resources. Brain imaging studies have found significant differences in which areas are activated when participants are listening to their first language versus their second. Although the differences found in brain imaging studies were significantly decreased as proficiency increases (Clahsen & Felser, 2006), Clahsen and Felser conclude

that this is significant evidence that L2 learners use different processes than native speakers. In 2018, Clahsen and Felser clarify their position, that although they think it is unlikely for L2 speakers to achieve fully native like processing, they were not going to claim that it was impossible to do so (Clahsen & Felser, 2018 p. 698).

Proficiency is found to have an effect within the SSH. As learners increase in proficiency so does their automaticity in processing, resulting in faster processing. It is important to note that proficiency does not impact all aspects of language processing equally, for example learners who have achieved fully native-like processing in offline tasks failed to indicate native-like procedural processing of morphosyntactic phenomena (Clahsen & Felser, 2006 p. 568). However, brain imaging studies have found an increase of activity in the Broca's region in high proficiency speakers (Clahsen & Felser, 2006). Clahsen and Felser suggest that as proficiency increases learners might master word level processing and morphosyntactic feature matching more easily, which would make performance more native-like. Late L2 learners have been found to achieve native-like processing in the domains of lexical-semantics during sentence comprehension, as well as in processing gender concord within the NP, and subject-verb agreement (Clahsen & Felser, 2006 p. 564). Verissimo (2018) found that the age of acquisition (AOA) also had an effect on participants' ability to acquire inflectional morphology. Verissimo conducted a priming study focused on early, simultaneous, and late Turkish-German bilinguals. He found that as the AOA increased beyond age 5, priming effects decreased only in the context of inflectional primes. The decrease in priming effects supports the SSH's prediction that inflectional morphology specifically is not able to be transferred from participants' L1and that it remains vulnerable in L2 learners with late AOA.

Another factor that is relevant to the debate overall concerns the computational resources that are available during L2 processing. The SSH aims to account for the differences between L1 and L2

processing that could not be explained solely by a lack of computational resources or the absence of automatization (Clahsen & Felser, 2006). It could be that L2 processing is more costly than processing in the native language (Gibson, 1998; Fiebach, Schlesewsky & Friederici, 2002; Clahsen & Felser, 2006; Dekydtspotter, Schwartz & Sprouse, 2006; Struys et al., 2019). It is due to the costly nature of L2 processing that processing is less automatic. Theoretically, if it is more costly to retrieve grammatical features from procedural memory, that could explain why L2 learners rely more on their declarative memory where words and phrases are stored, as it costs them less to access (Ullman, 2004, 2005; as cited in Clahsen & Felser, 2006). Lexical processing has also been found to be more costly in the L2 than the L1 (Hopp, 2017).

Further in support of the SSH is Prévost's (2009), review of Hawkins (1989) study in which Hawlins examined French L2 learners with English L1. Rather than divide participants into groups based on proficiency, Hawkins divided participants into groups based on the number of years they had completed in formal French instruction. Hawkins argued that if learners are guided by superficial mechanism's they should have more difficulty with sentences which have a long distance between the RP and the gap, a hypothesis that is compatible with the SSH. Additionally, participants should select *qui* rather than *que* when presented with ORSI sentences, as the appearance of the RP near the verb is the same word order used in SR. If participants are relying on more superficial mechanisms they will process SR and ORSI in the same way due to their similar word orders. Hawkins also predicted that participants would have more difficulty with OR (with *que*) than SR (with *qui*). Participants were asked to complete a written elicited production task, the results of which found that learners had the highest accuracy with SR (with *qui),* followed by OR (with *que)*. In the context of stylistic inversion, performance increased on *que* with proficiency from 30.5% accuracy for the group with the least amount of formal instruction, to 47.% accuracy for the most instructed group. Ultimately, participants

did show a sensitivity to distance, having an easier time processing when the gap was shorter. This sensitivity to distance, as well as the poor performance on ORSI sentences suggests that the learners are using more superficial mechanisms. Furthermore, participants increased difficulty with *que* compared to *qui* can be attributed to learners difficulty with inflectional information, which is predicted by the SSH. Although one major criticism of Hawkins (1998) is the lack of native speakers included in the study for comparison. Another criticism is the lack of precessing data (such as RTs).

Distance appears to play a factor in learners ability to achieve native-likeness. Nonlocal dependencies, which have a higher complexity, are found to be processed by high proficiency learners differently than native speakers. Nonlocal dependencies include *wh*-questions and other clauses where there is a long distance dependency spanning 3 clauses, or clauses which have non canonical word order, such as ORSI. It appears the more complex a clause is, the more learners make use of 'shallow' parsing, relying on semantics as well as associated and surface information (Clahsen & Felser, 2006). A key feature of the SSH is that regardless of how native-like results appear, or automatic processing becomes, L2 learners are incapable of actually achieving native proficiency since they use fundamentally different methods of processing (Clahsen & Felser, 2006 p. 504).

2.6 Research Questions and Predictions

Ecall that the main objective of the current study is to better understand how L2 proficiency affects L2 learners of French when processing subject and object relative clauses in their second language. The aim is to also investigate the role played by potential transfer on learners processing relative clauses. This study will examine low-to-intermediate proficiency speakers, which differs from other studies such as Hopp (2006, 2010) that focus on advanced-to-near native proficiency speakers. Specifically, the current study seeks to address the following research question:

(44) What is the impact of L1 transfer and proficiency on the processing of relative clauses in L2 learners with low-to-intermediate proficiency?

Based on the literature reviewed above (FTFA, SSH, Prideaux and Baker), the following predictions are proposed. The first prediction is supported by all models and can be seen below in (1).

(1) Participants will perform better in online and offline measures with SR than they will with OR or ORSI, and will have a stronger performance for OR than ORSI.

In this case, better performance is measured by higher accuracy on comprehension questions and faster processing times. This prediction is based on the results of Hopp (2006, 2010), who found that L2 speakers display a subject/object processing asymmetry, similar to the asymmetry observed in native speakers (e.g., for French, Frauenfelder et al. (1980); Schelstraete and Degand (1998)). Hopp (2006, 2010) looked at subject-object asymmetry with canonical OSV word order in the object relative clause, whereas Frauenfelder et al.(1980) and Schelstraete and Degand (1998) considered ORSI OVS performance in relation to SR and found that ORSI's performance was significantly weaker than that of SR.

Prediction (2) is based on White's (2003) review of the FTFA, as well as Hopp (2006, 2010). According to the FTFA, learners can transfer language knowledge from their L1. However, since the ORSI structure requires two properties which are not present in English, those properties being inverted word order (i.e.. OVS instead of the more canonical OSV) and the *qui/que* distinction, participants are not able to process this structure based on transferred L1 properties alone. Therefore, in order to be able to process the ORSI structure, participants will need to have acquired the relevant morphosyntactic information involved in processing the *qui/que* distinction and will also need to have acquired the inverted word order. According to the FTFA, L1 and L2 development and processing are constrained by similar mechanisms, therefore, it is possible that L2 speakers will recognize the structural

differences between ORSI and SR. However, proficiency is expected to play a crucial role here. It is possible that only participants with greater proficiency will be capable of properly processing the ORSI structure, since more proficient learners will presumably have had more exposure to the *qui/que* alternation and inverted word order than less proficient learners.

(2) Participants with better proficiency will have better off-line comprehension scores and show sensitivity to *que* in ORSI, as evidenced by slower RTs. Participants' RT and performance will be best/fastest for SR followed by OR then ORSI and improve as proficiency increases.

The SSH (Clahsen and Felser, 2006, 2018) does not make the same assumptions as the FTFA concerning L1 transfer and instead hypothesizes that L2 speakers rely less on morphosyntactic processes in their L2, and use other information such as linear word order (e.g., NP1 is the subject) to understand the sentence. As stated above, processing the SR/ORSI structural distinction relies on the processing of the *qui/que* alternation, an inflectional agreement distinction. If L2 speakers are less likely to rely on this type of morphosyntactic information when confronted with L2 data (e.g., Verissimo, 2018), then they will process ORSI and SR structures similarly at all proficiency levels. This leads to the prediction that can be seen in (3) below.

(3) Participants' reaction times will show no evidence of processing the morphosyntactic information on *que,* which will result in the ORSI structure being processed like the SR structure. Attributing a subject reading to NP1 via linear word order considerations will lead to an off-line question performance pattern of SR > OR/ORSI, which will not change with proficiency.

Chapter 3: Method

3.1 Introduction

In this chapter I will discuss the method (3.2) used in the current study, starting with section 3.2.1 which focuses on the recruitment process and the relevant information about the participants of this study. In section 3.2.2 I will describe the reasoning behind the selection of a self-paced reading task as a means of experimentation. I will also describe the task itself in more detail in this section, as well as in 3.2.3. Finally, the procedure is described in section 3.2.4. Examples of what participants saw during the experiment are provided in this section, as seen in figures 3 and 4.

3.2 Method

3.2.1 Participants

This study was approved by the Interdisciplinary Committee for Research Ethics at Memorial University as a part of the project "Processing of relative clauses in L2 French and L2 German in adult learners with L1 English" (file number: 20201153). Participants are all students at Memorial University, the majority of which are students of French in the Modern Languages, Literatures and Cultures Department. They were recruited through various means including: posters advertising the study posted around Memorial University campus, and word of mouth. Ultimately 10 participants were recruited and participated in the study. Participants were on average in their second year of university: four being in their second year, three in their first year, and two participants were fourth year or higher. Participants' ages ranged between 19 to 23, with the mean age being 20 years. Three participants were male, while the rest identified as female. Participants had between 3 and 13 years exposure to their second language. The average length of exposure was 8 years. All participants but one considered French their second language. One participant considers French their third language, while the other participant was a native speaker of French.

Participants were paid $5 as is typical in these types of experiments. All participants signed an informed consent form and completed a questionnaire before testing. The questionnaire was comprised of questions regarding their age and language background. As a part of the questionnaire, participants rated their ability using a Likert scale. The Likert scale asked participants to grade their proficiency on a scale of 0 to 5, with 0 being virtually no fluency, and 5 being native proficiency. Most participants rated themselves as a 2 or 3 out of 5, with some variation. The results from their performance on the proficiency test was used as the measure of language proficiency. Proficiency in the second language was measured via a written test, which included a multiple choice and a Cloze test..

3.2.2 Self-Paced Reading Task

A self-paced reading task was used to examine participants' online processing abilities. The advantages of self-paced reading tasks are that longer response times are thought to reflect processing difficulties (Marinis, 2010). Marinis states that this could be due to a variety of reasons such as ungrammaticality, violations of participants' expectations, or forcing a process of reanalysis. Self-paced reading tasks are used to evaluate various linguistic phenomena. In particular, theycan be used to examine the processing of temporarily ambiguous sentences and filler gap dependencies, both of which are relevant to the current study. A linear non-cumulative style of self-paced reading task was used, which will be described in further detail below. This style was chosen because non-cumulative tasks have more accurate processing results due to participants' inability to go back and re-read previous parts of the sentence. Additionally, linear non-cumulative tasks are commonplace in other similar studies. It should be noted that participants could make predictions about the sentence based on how many words are left in the sentence by counting the remaining dashes. This is mitigated by making all the experimental items have a similar length. The inclusion of comprehension questions in self-paced reading tasks is for the purpose of keeping participants focused on actually reading and understanding the sentence.

The task was run using the program Open Sesame (Mathôt, Schreij & Theeuwes, 2012), which was installed on a desktop computer. Instructions were provided on the screen first in English, then again in French. Participants were able to complete a short practice test before moving on to the actual test. Participants would press the spacebar and a segment would appear on the monitor. An example of what the participants saw is provided as Figure 3 and 4 in section 2.3.4. Segments are essentially one word of the sentence, with the exception of NPs which were kept with their determiner. Participants are unable to go back and re-read previous segments and must continue forward. Once participants have completed the sentence a short comprehension sentence appears on the screen (see examples 48-50 in 3.2.3). It is a phrase that refers to the sentence they just read, and participants must decide if it is true of not. Participants then press either 'w' or 'p' on their keyboard to indicate whether the statement is true (w) or false (p). Red and green stickers were placed on the keys for participants' ease.

3.2.3 Stimuli

The test has 36 experimental items (12 SR, 12 OR, and 12 ORSI) and 64 fillers. RTs that are shorter than 10ms or longer than 6000ms were discarded. Additionally, data which was collected from sentences with failed comprehension questions was included in the aggregation of data (Hopp, 2006). The data was included because this study is focusing on the processing of relative clauses in participants' L2, not just the sentences for which they answer comprehension questions correctly. RTs were collected by the computer program and measure the amount of time that passes between button presses.

The sentences were created by the research team and then reviewed by several native speakers. The relative clauses in French were loosely based on the English items from Gordon et al. (2004, see examples). The vocabulary for the French sentences were taken from the introductory textbook used in French courses at Memorial (Amon, Muyskens & Hadley, 2007) or were very close cognates with

English. This was done to ensure that the lexical items were recognizable and easier to process (Hopp, 2017). The '/' which appears in the examples below represents the segmentation of the phrases.

(45) L'infirmier/qui/soigne/le chirurgien /prend /une décision/dans/ le couloir. (SR)
The nurse/that-nom/heals/ the surgeon /makes/a decision /in/ the hall way.
'The nurse that heals the surgeon makes a decision in the hallway'

(46) Le policier/que/le peintre/cache/regarde/une émission/à/ la télévision. (OR)
The policeman/that-acc/the painter/hides/watches/a show/on/the television
'The policeman that the painter hides watches a show on the television'

(47) Le conseiller/que/rejette/le maître/développe/son argument/dans/le bureau. (ORSI)
The councillor/ that-acc/ rejects/ the master/ develops/ his argument/ in/ the office
'The councillor that the master rejects develops his argument in the office'

Another important consideration when creating the sentences was that the relative clauses needed to be center-embedded, so that extra material could be added at the end of the sentence in order for potential spillover effects to be observed. Final segments have been argued to involve 'wrap-up' effects that lead to longer RTs (Kuperman et al., 2010). Central positioned relative clauses are also more difficult to process (Gibson, 1998) and thus should lead to a greater subject-object asymmetry. The spillover effect takes place when a participant moves on to the next word before fully processing the word preceding it (Dekydtspotter et al., 2006). The spillover effect causes a slowdown of processing on the following word (aka longer RTs) while the processor catches up (Just et al., 1982). It is more common to occur when higher level processes are required, such as inference making (Just et al., 1982). Furthermore, center-embedded sentences allow for the disambiguating form to appear earlier in the sentence, thus reducing the role of working memory (Hopp, 2014, and sources cited therein). Since the ORs in French and English finish with a verb, the clauses must be center-embedded so that the effect can be seen (Just et al., 1982). In prior work, slower RTs have been found on the embedded verb, and when the verb appears clause finally, these effects would not be seen, as nothing would follow. With the clause center

embedded, there are more segments after the verb where any spillover effects can be observed. Comprehension questions were crafted to be statements based on the sentence the participant just read, which require a true or false response. The statements were shorter than the sentences they were based on. Examples of the comprehension questions for (45-47) are shown below in (48-50). The full list of experimental items and fillers with glosses can be viewed in the appendix.

(48) Le chirugien soigne l'infirmier.

‘The surgeon heals the nurse’

(49) Le peintre cache le policier.

‘The painter hides the policeman’

(50) Le maître rejette le conseiller.

‘The master rejects the counselor’

3.2.4 Procedure

Participants completed testing in the Speech Sciences and Language Acquisition Lab at Memorial University of Newfoundland. They sat at a desk in front of a computer that was at eye level. First, participants filled out a participant questionnaire and informed consent form. They were then asked to complete the self-paced reading test on the computer. They were given instructions in English to read the sentences for comprehension and to go at their own speed. They were also instructed on which buttons to press. All the instructions were also repeated on the screen in French. They were then instructed to begin the practice session which was comprised of 6 practice items. At the end of the practice session, participants were asked if they wanted more practice, or to continue on to the test. If the participant wanted more practice, they would then press the red key and redo the practice session. Participants that wanted to continue on to the test would press the green key and the test would begin.

Participants would then press the spacebar to view the first segment. They would press the spacebar again and would view the second segment, and so on and so forth until the sentence had been completed. An example of the screen that participants saw is shown in figure 3 below.

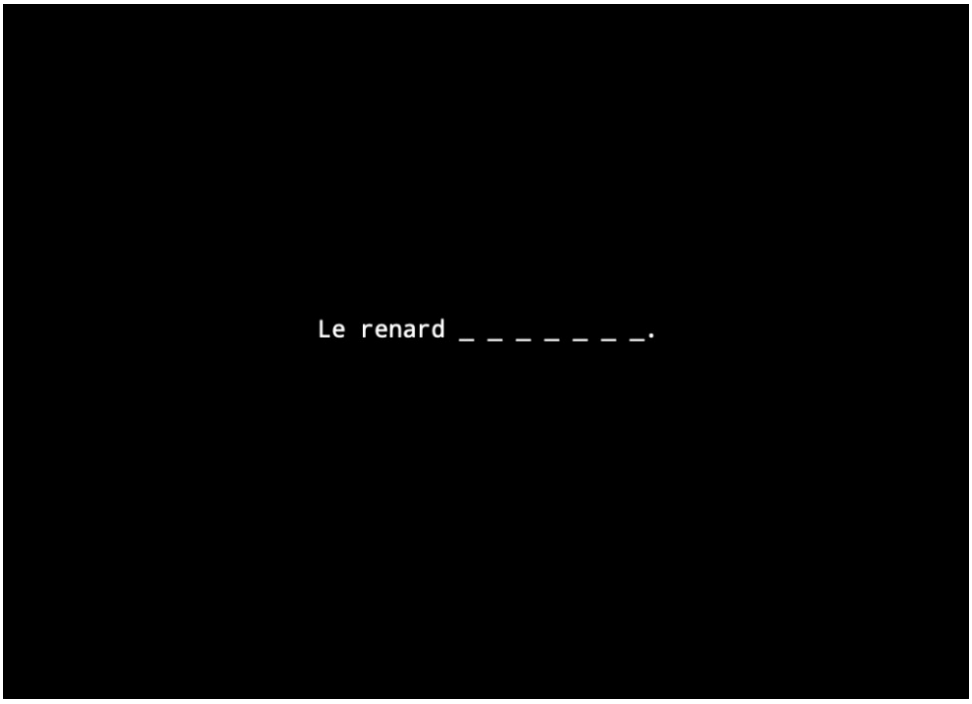


Figure 3: Beginning of experimental item in Open Sesame.

Figure 4: Comprehension statement in Open Sesame.

All sentences had a comprehension statement, which would appear in full on the screen (examples 48-50). Participants would enter their response to the comprehension question (‘green’ or ‘red’) and then the next item would begin. This continued until the test had been completed. The experimenter would then give the participants the written proficiency test and a pencil, which was two separate tests on paper. One was multiple choice, the other was the Cloze task (fill_in-the-blank). Once completed, they gave their tests to the supervisor, and were paid $5.

Chapter 4: Results

4.1 Introduction

This chapter will focus on the results produced by this study. First in Section 4.2, I will discuss the data analysis that was chosen, as well as lay out the variables which are being considered in the analysis. Following this I will discuss the descriptive data in Section 4.3, specifically proficiency (4.3.1) and then structure (4.3.2). In Section 4.3.3 I will present the findings of the mixed effects logistic regression. The reaction time (RT) data will be presented in 4.3.4. Finally, I will conclude this chapter with a summary of the findings in 4.4.

4.2 Data Analysis

Before analysis could begin, the results of the native speaker was removed from the dataset because the current study is solely examining the processing of L2 speakers. All other participants' data was included in the study. Statistical analysis will focus on the likelihood of a participant obtaining a correct response or an incorrect response to the comprehension questions, as well as any areas where slowdowns occur. Therefore, statistical analyses were completed using mixed-effect logistic regression, with comprehension question response (correct or incorrect) as the response variable and sentence structure (SR, OR, ORSI) and proficiency (proficiency test scores) as explanatory variables. A secondary analysis was completed by looking at the RT data. The explanatory variables remain the same, however RT was used as the response variable. Additionally, the models were run with random effects for participants to account for the fact that there are multiple observations for each participant. Results from the mixed model appear in terms of an odds ratio (ExpB) which determines the likelihood of 1 (correct response) versus 0 (incorrect response). The random effects model then estimates the mean of a distribution of effects. In this case a random effect could be a number of things that varies across participants that are not included in the model.

4.3 Descriptive Data

In this section, I will present the descriptive data first for the explanatory variables of proficiency and sentence structure. In section 4.3.1 the scores from the proficiency test administered to participants, will be presented along with a brief discussion of what they mean in regards to this study. Sentence structure will be presented in a similar manner in section 4.3.2, also with a brief discussion.

4.3.1 Proficiency Scores

Participants were fairly consistent in their performance on the proficiency test, with an overall mean score of 60.8% (36 out of 60) as can be seen below in Table (3). Participants performed numerically better on the Cloze portion of the test (63%) versus the vocabulary portion (58%). Half the participants scored above a 65%, while the other half were below. Therefore, participants had either a low or intermediate proficiency in their L2. The mean score is classified as intermediate proficiency according to the grading schema detailed below. The lowest score achieved was a 23.3% (14 out of 60) indicating that that participant had a low proficiency. The highest score was 85% (51 out of 60) indicating a higher level of proficiency.

Table 3

Mean proficiency scores (%)

	proficiency
Mean	60.8
Standard Deviation	17.2
Minimum	23.3
Maximum	85.0

The specific grading schema for the test is as follows: to be considered low proficiency participants had to score between 0 to 40%. (0 to 24 out of 60) To be considered intermediate, speakers had a score of 41 to 76% (25 to 45 out of 60). To be considered advanced speakers scored 77% to 100% (46 to 60 out of 60) correct. The majority of participants had scores in the 30's which indicated they had an intermediate proficiency level according to grading schema provided above. There was 1 low proficiency speaker with a score of 14, and 1 advanced speaker with a score of 51. These scores indicate that the majority of participants in this study have an Intermediate level proficiency, which provides a better understanding of the overall proficiency of the group. However, proficiency was used as a continuous variable in the statistical analyses that follow.

4.3.2 Comprehension Questions: Structure

The table below (4) provides the results of the performance of the participants on the comprehension questions. As expected, the SR structure had the most correct responses, with participants giving the correct response 79.6% of the time. OR had the second highest amount of correct responses at 64.8%. ORSI had the lowest rate of correct responses at 39%.

Table 4

Correct comprehension question responses by structure

Structure	**Percentage %**	**Standard Error**
Subject Relatives (SR)	79.6%	0.05
Object Relatives (OR)	64.8%	0.05
Object Relatives with Stylistic Inversion (ORSI)	38.9%	0.04

4.3.3 Mixed Effects Logistic Regression

The following tables present the results of a mixed-effects logistic regression. The fixed effects omnibus tests are presented in Table (5). Table (6) presents the results of the model with both the fixed effects and random components.

Table 5

Fixed Effect Omnibus Test

	X^2	df	p
Structure	36.9	2.00	<.001
Proficiency	12.1	1.00	<.001
Structure*proficiency	14.7	2.00	<.001

In this statistical analysis both proficiency and structure were the variables examined and a significant main effect was found for both (see Table 5). This indicates that, as expected, both sentence structure and a speaker's proficiency in their second language affected their processing and comprehension of relative clauses.

Table 6

Fixed effects

					95% Confidence Interval		Exp(B)	
Names	**Effect**	**Estimate**	**SE**	**exp(B)**	**Lower**	**Upper**	**z**	**p**
(Intercept)	(Intercept)	0.4965	0.2134	1.643	1.081	2.496	2.33	0.020
Structure1	ORSI - OR	-1.4513	0.3435	0.234	0.119	0.459	-4.22	< .001
Structure2	SR - OR	0.6713	0.3334	1.957	1.018	3.761	2.01	0.044
proficiency	proficiency	0.0465	0.0133	1.048	1.021	1.075	3.48	< .001
Structure1 ✻ proficiency	ORSI - OR ✻ proficiency	0.0319	0.0253	1.032	0.982	1.085	1.26	0.208
Structure2 ✻ proficiency	SR - OR ✻ proficiency	-0.0589	0.0211	0.943	0.905	0.983	-2.79	0.005

Random components

Groups	**Name**	**Variance**	**ICC**
subject_nr	(Intercept)	0.467	0.179
Residuals		1.000	

Note. N=324; groups: subject_nr=9; R^2=0; AIC=353.29; BIC=379.76

In Table (7), the post hoc comparisons for the categorical variable Structure are presented. Table (7) presents the likelihood of participants achieving the correct response depending on sentence structure. In Table (7), when comparing the results for the OR sentence structure to those of the ORSI sentence structure, it was found that participants were 4.29 times more likely to give the correct response after reading a sentence with OR structure compared to ORSI structure. Furthermore, participants were 2.36 times more likely to give the correct response after reading an SR sentence compared to an OR one.

Finally, participants were 8.3 times more likely to give the correct response when they read sentences with an SR structure compared to ORSI structure. To sum up, participants were most likely to give the correct response after reading sentences with SR sentence structures, followed by OR structures and finally ORSI structures.

Table 7

Post Hoc Comparisons – Structure in Comprehension Question Performance

Comparison						
Structure		**Structure**	**exp(B)**	**SE**	**z**	**P_{holm}**
OR	-	ORSI	4.269	1.4664	4.22	<.001
OR	-	SR	0.511	0.1704	-2.01	0.132
ORSI	-	SR	0.120	0.0426	-5.96	<.001

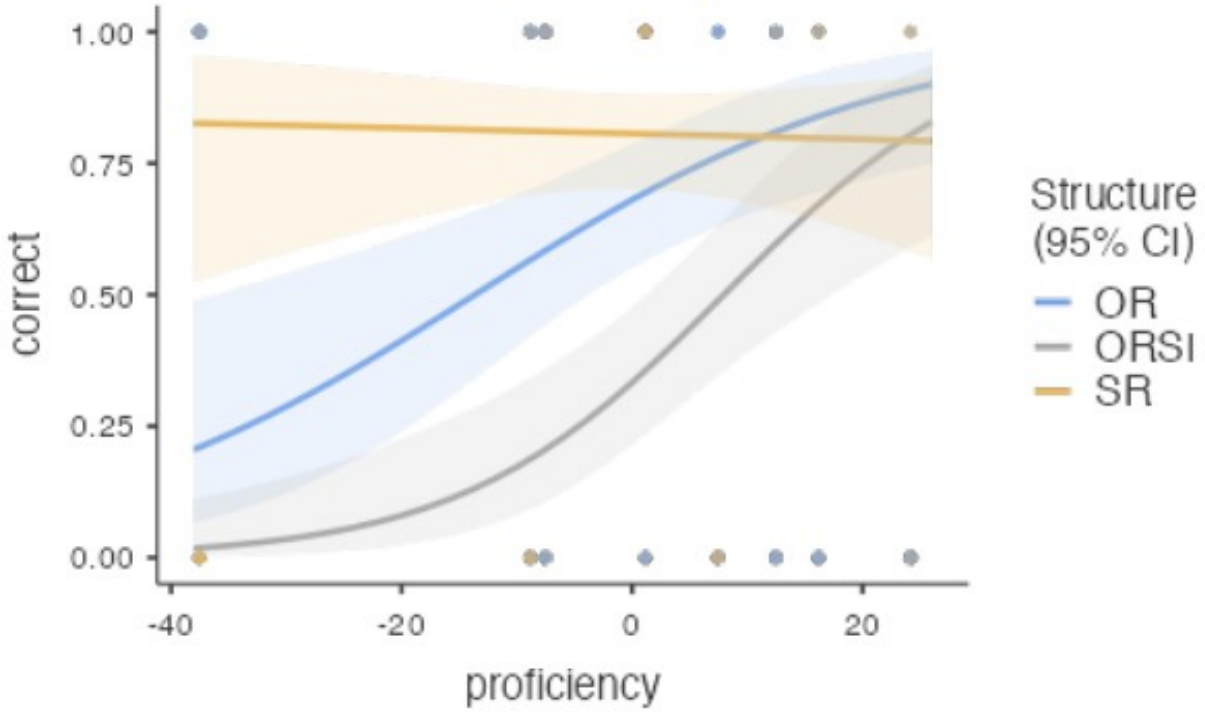


Figure 5: Plot of interaction between proficiency and structure for comprehension questions.

There is a significant interaction between structure and proficiency (see Table 6 above). Specifically, proficiency has been found to have a significant effect for OR and ORSI structures. As can be seen in Figure 5, participants performed consistently well on SRs, regardless of proficiency level. However, participants with a lower proficiency tended to perform worse on OR and ORSI clauses. The performance on these clauses improved as proficiency increased.

4.3.4 Response Time Data

This section will discuss the analysis of the response time data, wherein structure and proficiency were once again the variables being examined. The amount of time spent reading each segment of the sentences is what will be analyzed in the following data. For convenience an example of the segmentation of the sentences is repeated here from Chapter 3 (Method):

(51) L'infirmier/qui/soigne/le chirurgien /prend /une décision/dans/ le couloir. (SR)
The nurse/that-nom/heals/ the surgeon /makes/a decision /in/ the hall way.

'The nurse that heals the surgeon makes a decision in the hallway'

(52) Le policier/que/le peintre/cache/regarde/une émission/à/ la télévision. (OR)

The policeman/that-acc/the painter/hides/watches/a show/on/the television

'The policeman that the painter hides watches a show on the television'

(53) Le conseiller/que/rejette/le maître/développe/son argument/dans/le bureau. (ORSI)

The councillor/ that-acc/ rejects/ the master/ develops/ his argument/ in/ the office

'The councillor that the master rejects develops his argument in the office'

Segment 4 is of particular interest, as that is where differences are expected to appear. As can be seen above, Segment 4 is the embedded noun in the SR and ORSI structures. In ORs, Segment 4 is the embedded verb. This difference is shown below in Figure 6 as the space between the orange and grey line.

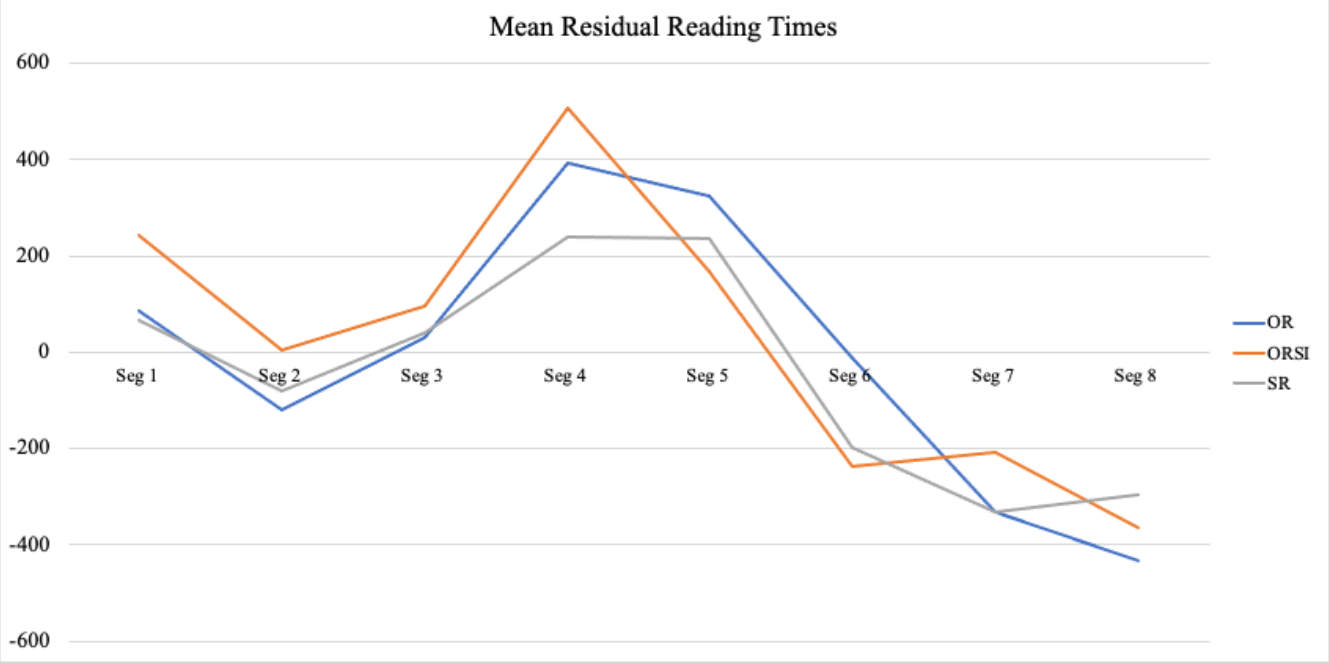


Figure 6: Mean residual reading times of segments

Residual reading times were log-transformed before being submitted to statistical analyses. A linear mixed model was used to analyze the effect of Structure (SR, OR, ORSI) on reading times. A separate model was run for each segment. Only structure was found to have a significant effect and only for

Segment 4. There was no main effect of Proficiency on reading times and the interaction between Structure and Proficiency was not significant. Because the effect of Proficiency was not significant and because the interaction between Structure and Proficiency was not significant, only the analysis with Structure was retained.

Below are the tables with the results of the statistical tests for residual reading times of segment 4. Tables (8-9) present the results of a mixed linear model. The fixed effects omnibus tests are presented in Table (8). Table (9) presents the results of the model with both the fixed effects and random components.

Table 8

Fixed Effect Omnibus tests

	F	**Num df**	**Den df**	**p**
Structure	5.72	2	235	0.004

Note. Satterwhaite method for degrees of freedom

Table 9: Mixed Effects Linear Model: Fixed Effects Parameter Estimates of RT Data

				95% CI				
Names	**Effect**	**Estimate**	**SE**	**Lower**	**Upper**	**df**	**t**	**p**
(Intercept)	(Intercept)	0.12	0.03	0.05	0.18	8.32	3.51	0.01
Structure1	ORSI - OR	0.03	0.03	-0.02	0.09	229.68	1.15	0.25
Structure2	SR - OR	-0.07	0.03	-0.12	-0.01	245.58	-2.21	0.03

Random Components

Groups	**Name**	**SD**	**Variance**	**ICC**
items	(Intercept)	0.06	0.00	0.08
subject_nr	(Intercept)	0.09	0.01	0.17
Residual		0.20	0.04	

Note. N=316; groups: items 83, subject_nr 9; R^2=0.25; AIC = -63.92; BIC = -25.73

When examining the RT data, only structure was found to be significant. In Table (10), the post hoc results for the Structure variable are presented. These results indicate the relationship between structures.

Table 10

Post Hoc Comparisons - Structure

Comparison							
Structure		**Structure**	**Difference**	**SE**	**t**	**df**	**P_{holm}**
OR	-	ORSI	-0.0346	0.0304	-1.14	241	0.767
OR	-	SR	0.0657	0.0300	2.19	255	0.088
ORSI	-	SR	0.1003	0.0305	3.29	242	0.003

As presented above in Table (10), participants have a tendency to have slowdowns when reading OR compared to SR. Similarly, they are more likely to have slowdowns when reading ORSI compared to SR. Participants are more likely to have slowdowns when reading OR compared to ORSI. As expected participants spent the least amount of time reading the SR, while having greater slowdowns for OR and ORSI structures thus suggesting that complexity does play a factor. ORSI is the most complex clause and has the highest slowdowns on Segment 4 (embedded noun). It could be that due to its similarity to SR, participants begin processing ORSI as an SR before reassessing at Segment 4 which shows significant slowdowns before speeding back up. To sum up, participants had the least amount of slowdowns overall when reading SR followed by OR, and finally ORSI.

4.4 Summary of the findings

To summarize, the results of the analysis of the comprehension questions found that the effects of Proficiency and Structure were significant, with there being an interaction between the two. Participants had the most difficulty with ORSI clauses followed by OR indicated by the decrease in correct responses. Meanwhile, SR were found to have consistently successful responses. As proficiency

increased participants' performance on ORSI and OR clauses increased. Conversely, the RT data found only Structure to have a significant effect on Segment 4, which is either the embedded verb (OR) or the embedded noun (ORSI and SR). Proficiency was not able to be included in the final model due to a lack of significance. On Segment 4 ORSI had the greatest slowdowns, followed by OR. Overall OR had the greatest likelihood of slowdowns occurring, followed by ORSI. Like with comprehension questions, participants consistently performed better on SR clauses.

The RT data shows that ORSI is not being processed the same as SR, as participants have significant slowdowns on Segment 4 for ORSI, that are not present in the results of SR. This suggests that participants are aware of the difference between ORSI and SR, yet still have more difficulty achieving correct responses for ORSI.

Both comprehension question and RT data are necessary to achieve a full analysis. By analyzing only one or the other, an incomplete picture is formed which misleads any conclusions that are formed. The comprehension questions investigate participants' offline processing, while RT data looks at their online processing. Comprehension questions data shows that participants on a whole have more difficult understanding ORSI clauses. RT data shows that participants have significant slowdowns on Segment 4 indicating difficulty processing, however processing difficulties do not necessarily mean lack of comprehension. Ultimately, the results show that participants have the most difficulty processing ORSI, followed by OR, and have no problem processing SR regardless of proficiency.

Chapter 5 Discussion

5.1. Introduction

In this chapter I will discuss the results of this study and how they add to the literature on processing in L2. The results will be analyzed according to the models established by Prideaux and Baker (2.3.4), the FTFA (2.5.1), and the SSH (2.5.2). For convenience I have repeated the research question again below (51):

> (54) What is the impact of L1 transfer and proficiency on the processing of relative clauses in L2 learners with low-to-intermediate proficiency?

To begin to answer these questions, I will discuss the results in terms of the frameworks discussed in chapter 2. I will discuss the SLA frameworks starting with the FTFA in 5.2 where I will also address predictions (2), and the SSH and prediction (3) in 5.3. Finally, I will summarize the implications created by this study then I will discuss the limitations this study encountered.

As mentioned above here are the three predictions repeated for convenience:

> (1) Participants will perform better in online and offline measures with SR than they will with OR or ORSI, and will have a stronger performance for OR than ORSI.
>
> (2) Participants with better proficiency will have better off-line comprehension scores and show sensitivity to *que* in ORSI, as evidenced by slower RTs. Participants' RT and performance will be best/fastest for SR followed by OR then ORSI and improve as proficiency increases.
>
> (3) Participants' reaction times will show no evidence of processing the morphosyntactic information on *que,* which will result in the ORSI structure being processed like the SR structure. Attributing a subject reading to NP1 via linear word order considerations will lead to an off-line question performance pattern of SR > OR/ORSI, which will not change with proficiency.

In regards to prediction (1), the results support it. Participants had faster RTs and had the most correct responses on the comprehension questions when the sentence was SR compared to OR and ORSI. Analyses of the RT data revealed a significant effect of structure, specifically on segment 4. Segment 4 is the embedded noun (SR and ORSI) or verb (OR), and where the SR structure was associated with the fastest response times of the three structures. These slowdowns indicate where participants seem to have the most difficulty with processing the clause. The longer the amount of time spent on Segment 4, the longer, and presumably more difficulty participants had with reanalysis of the clause. ORSI had the slowest RT of the three clauses on Segment 4, indicating that participants had more difficulty with reanalysis of the clause whose word order does not exist in their native language.

According to prediction (2) I expected to see an effect of proficiency in the offline measures. There was indeed an effect of proficiency on the offline measures: Participants' comprehension question performance improved for the OR and ORSI structures as their proficiency improved. However, the RT data revealed more significant slowdowns on segment 4 for ORSI than for SR, indicating that processing is not identical between ORSI and SR, suggesting that even lower proficiency learners were processing agreement information on the RP in the ORSI structure. Slowdowns on Segment 4 were found to be greatest for ORSI and OR structures, and smaller when the structure was SR. The trend in Figure 2 supports prediction 2: The SR structure was read the fastest, followed by OR and finally ORSI. In the offline measures, participants once again had the strongest performance for SR, followed by OR, and finally ORSI had the weakest performance.

According to prediction (3), L2 learners will not rely on morphosyntactic information (i.e., inflectional agreement on the RP) while processing the ORSI structure. Furthermore, neither offline and online performance on ORSI will improve with proficiency. Based solely on the offline measures it appears that participants are not processing the morphosyntactic information. However and crucially, the RT

data suggest that something else is occurring, , therefore emphasizing that the RT data is needed to fully interpret the offline measures. Specifically, in the RT data there are slowdowns on Segment 4 which were slowest when the clause was ORSI, and fastest for SR. These slowdowns indicate that the morphosyntactic information on the RP is being processed, suggesting that participants do differentiate between the SR and ORSI structures. The same interpretation is not readily available for the comprehension question data. It is unclear exactly why ORSI is lower in the comprehension question results, a number of reasons could be at play. It's possible that some participants are guessing due to the complexity of the ORSI structure or that some participants are are arriving at the correct parse, but respond incorrectly to the comprehension questions due to memory constraints. Ultimately, the RT data suggests that the information on the RP is being processed.

5.2 FTFA

In this section I will discuss the results in regards to the FTFA framework. The results showed that this prediction (2) is mostly correct. The comprehension question results indicated that participants were treating ORSI the same as SR because participants only scored 38.9% correct when the sentence was ORSI compared to the 79.6% correct for SR. This means that it is possible that participants are treating ORSI as an SR structure about 60% of the time. These results could suggest one of two things, either that participants are guessing and performing at chance; or that participants are using word order cues. The RT data indicates that participants are sensitive to the SR/ORSI distinction by having having greater localized slowdowns on segment 4 (embedded verb/noun) for ORSI, than for SR. The poor performance in offline measure on ORSI can therefore be attributed to the complexity of the sentence. As a result of the transfer of word order properties of RC, participants do not necessarily need to understand the *qui/que* distinction to still understand the SR or OR. The Subject-Object distinction exists in English, so it is very likely that this was transferred to participants' L2 grammar. The grammar

transferred from their L1 is sufficient for comprehension. OR had lower accuracy than SR but was still relatively successful at 64.8%. Participants' difficulty with ORSI is where possible transfer effects are most likely to be visible. In Shelstraete and Degands' (1998) study, the native speakers did have a more difficult time with ORSI (error rate of 24.17%), but their results were fairly close to the results of OR (error rate of 25.56%), a difference which was not statistically significant. In the current study, differences in off-line comprehension were statistically significant between the ORSI and OR structures. ORSI is the only structure that truly requires L2 speakers to make use of the morphological information on the RP. The lack of success in offline comprehension indicates that participants have not reliably acquired the ability to make use of this information even if the RT data suggest that they are acknowledging it. While transfer plays a part in L2 processing it appears that there are other factors at play (e.g. memory costs and integration costs) which are impossible to disentangle using the current results.

Further in support of prediction (2) is the fact that there is evidence of proficiency having an effect on performance. As previously discussed, the participants of this study have been determined to have intermediate proficiency in their L2 French. There is some variation within the intermediate classification as some participants were considered low-intermediate, whereas others could be considered high intermediate. It was expected that this variation in abilities would have an effect on participants' performance for online and offline measures similar to how Hopp (2006, 2010) found effects based on proficiency. These effects were found in the current study through participants' performance on the comprehension questions. Structure was found to be a significant factor. Participants had the strongest offline performance when the sentence had an SR structure, followed by OR then ORSI. As participants' proficiency increased so did their comprehension abilities. Unlike in Hopp's studies whose participants were advanced to near-native, a significant effect of proficiency was

not found on RTs in the current study, although it is possible that this was due to a lack of statistical power. Hopp (2010) found that the lower proficiency group (advanced, in his study) did have slowdowns that were less robust than those of native speakers but still similar. Hopp (2006) found that advanced speaker participants did not have any localized slowdowns and did not pattern with the native speakers. The results of this current study fall somewhere between the two. Our participants did have slowdowns but did not pattern entirely like how native speakers would be expected to perform. Indeed the results did not pattern exactly with the results from Schelstraete and Degand (1998) where there were localized slowdowns on the fourth segment (the embedded noun/verb) but only for OR structure. In Schelstraete and Degand (1998), ORSI and SR had near identical results in RT. The results of this study did appear to reveal localized slowdowns on the embedded verb or noun (Segment 4) for OR and ORSI structure in particular. Interestingly, ORSI and OR are the only structures found to be affected by proficiency in the offline measures. The results from the comprehension questions in combination with these inferences made about the RT data suggest that participants' proficiency does play a role in their processing abilities of OR and ORSI. As it stands participants' performance improved in offline measures for the OR structure as their proficiency improved. The asymmetry was still expected, just not the improvement with proficiency. Likely, as participants' proficiency increases they are able to free up more resources to help with the processing of OR and ORSI which are more complex than SR.

The RT data both supports and disproves the above argument. There are slowdowns appearing on the fourth segment which is either the NP1 (OR) or embedded verb (SR/ORSI) depending on the structure. These slowdowns could indicate that participants are at the very least acknowledging the case information on *qui* and *que,* even if they are not fully processing it correctly. These slowdowns occur in areas that were expected such as the embedded noun or verb, according to Schelstraete and Degand (1998) as well as Frauenfelder et al.(1980), and Hopp (2006, 2010). The participants of the current

study do pattern somewhat like the native speakers in other studies (Frauenfelder et al., 1980; Shelstraete and Degand, 1998) indicating that the L2ers have begun to adopt native like processes into their IL even if they have not mastered them yet.

5.3 SSH

I will now move on to examining the results in terms of the SSH. Provided below is the prediction made for the SSH repeated for convenience:

> (3) Participants will show no evidence of processing the morphosyntactic information on *que*. Attributing a subject reading to NP1 via linear word order considerations will lead to an off-line question performance pattern of SR > OR/ORSI, which will not change with proficiency.

Where the FTFA considers the slowdowns with ORSI as evidence of transfer; within the framework of the SSH it is considered a result of their using word order to process the sentence failing them. According to the SSH, L2ers use different processes than native speakers to comprehend sentences in their L2. L2 speakers rely less on morphosyntactic processes in their second language, and this would be at the heart of the greater difficulty that our participants had with ORSI sentences. The comprehension question data suggests that participants are treating ORSI the same as SR. This result is expected because it was predicted that they would rely on word order rather than morphology to process the ORSI structure. Compared to other studies, participants did not pattern exactly as native speakers in other studies. In Holmes and O'Regan (1981), the part of the sentences where localized slowdowns occurred changed depending on the type of sentence they were reading, as slowdowns would occur more strongly on the embedded verb. The participants of this study did have slowdowns on the verb but also on the noun, specifically on segment 4. The location of the slowdowns did not change between structures, but there was a significant difference in RT. Specifically, SR barely had a slowdown on segment 4, whereas OR and ORSI both had bigger slowdowns. The slowdown for the OR

structure was shorter than the ORSI slowdown by about 100 ms. In other studies such as Schelstraete and Degand (1998), ORSI and SR had similar slowdowns which were very short compared to slowdowns when the structure was OR. The fact that they do not pattern exactly like other studies suggests that participants are using different methods of processing.

However, it was expected that performance would not improve with proficiency should the SSH prove true as stated in prediction (3). The participants of this study acquired French after the boundary age of 5 put forward by Verissimo (2018), and such should have more difficulty acquiring inflectional morphology such as *que*. The results of this study do not reflect this as participants' performance on comprehension questions did improve as their proficiency did. Additionally, as localized slowdowns did occur relatively close to the RP it is possible that this is an indication that participants are processing the morphosyntactic information that appears on *qui* and *que*. Thus, these findings do not support lend support to the SSH.

5.4 Implications

Further investigation is needed before any conclusive statements can be made, however certain inferences can be made based on the results of this study. As with most modern processing accounts, Prideaux and Baker (1987), predicts the subject/object asymmetry observed in the data. Prideaux and Baker's (1987) account focuses on strategies which can be ranked differently based on the context. The most relevant strategies to this thesis are CLOSURE and NORMAL FORM. CLOSURE claims that "in processing a particular linguistic unit (phrase, clause, etc) the language user (speaker or hearer) attempts to obtain closure on that unit as early as possible" (Prideaux and Baker, 1987). NORMAL FORM claims "the language user assumes that the unit being processed is in its 'normal' or 'canonical' form unless the unit is overtly marked to the contrary" (Prideaux and Baker, 1987).This approach while not widely used, was chosen for its universality. This allows it to apply regardless of the native

language. Prideaux and Bakers strategies are not language specific, but rather use the speakers' knowledge of the language to apply from an independent position. This approach is also rather flexible allowing for violations or exceptions which other approaches might struggle to account for. For example CLOSURE is very similar to the more widely used AFS, which predict an incorrect outcome. The AFS predicts that speakers will attempt to complete the clause by filling the gap as soon as is possible. Since ORSI has inverted word order, the AFS incorrectly predicts that ORSI would be processed faster than OR, which has not found to be the case. By using Prideaux and Baker's approach with the CLOSURE and NORMAL FORM strategies, I am able to account for the departure from canonical word order in ORSI. CLOSURE assumes that the speaker attempts to close the clause as soon as is possible, leading to a preference for subject interpretations. Neither AFS nor CLOSURE predict the difficulties that were found with ORSI compared to OR. The inclusion of the second strategy NORMAL FORM makes it so that the correct prediction is possible. NORMAL FORM predicts that clauses which violate the typical word order are more difficult to process. In this case, ORSI violates the typical word order and would therefore be processed more slowly.

CLOSURE and NORMAL FORM both predicted that participants would have an easier time with SR than OR or ORSI. CLOSURE because it is similar to the AFS, assumes that speakers attempt to close the clause as soon as is possible, in this situation forcing a subject interpretation. When reading SR, the subject interpretation is correct therefore no reanalysis is needed, resulting in faster RT and higher accuracy with comprehension questions. NORMAL FORM is needed because it accounts for factors that the AFS and CLOSURE are unable to. NORMAL FORM predicts the strongest performance with the SR structure as it respects canonical word order. The NORMAL FORM constraint led to the prediction that participants would have the most difficulty with ORSI because it has the most violations against canonical word order. French is primarily an SV language, and SR and OR both follow that

word order by having the subject appear before the verb. ORSI makes use of stylistic inversion which results in a VS word order and is therefore a violation of NORMAL FORM. Both of these predictions were supported, as participants did have the fastest RTs for SR, as well as the highest comprehension accuracy. This supports Prideaux and Bakers proposal that CLOSURE and NORMAL FORM are the strongest most relevant strategies in online processing. Further evaluation would be needed to see if there is a difference in strength between the two strategies. Further study is needed to make any conclusive statements, a potential area of further study would be to complete the original plan of this thesis and compare the results of German L2 speakers to French L2 speakers. German would be particularly interesting to compare to French because German does not have a word order asymmetry: relative clauses are disambiguated through case information on the RP or nominal or verbal agreement. Word order remains the same regardless of whether a clause is SR or OR. Additionally, Germans relative clauses are not structured the same as relative clauses in English, therefore it is possible that transfer effects would be more visible. Below is an example of OR and SR clauses.

(55) The dog [that the man saw ___] has brown fur.

(56) The dog [that ____saw the man] has brown fur.

(57) Der Mann, [den der Hund sieht _____]
The man [who.ACC the.NOM dog sees.3PS _____]
'The man whom the dog sees.'

(58) Der Mann, [der _____ den Hund sieht]
The man [who.NOM _____ the.ACC dog sees.3PS]
'The man who sees the dog.' (Rankin 2014)

The preference for SR also suggests that the relative clause structures were transferred from the participants' L1 English to their L2 French, such as the subject-object processing asymmetry. This is

further supported by the poor performance on ORSI sentences as it is not possible for their word order to be transferred from English. Participants appeared to acknowledge the morphological information necessary on *que* through greater localized slowdowns on the segments following the RP. It is not clear how much of participants' difficulty with comprehension is because of transfer effects rather than complexity. This is a phenomena that requires further study. A higher rate of correct responses indicates that participants had an easier time processing the clause. A lower rate indicates that participants had a more difficult time processing, and therefore struggled more on the comprehension questions. In the data, ORSI had consistently the lowest scores of the three structures, indicating that participants had a more difficult time processing the clause that had a word order that is ungrammatical in their native language.

According to the FTFA this suggests that they have begun to acquire the morphosyntactic processes needed in their IL, even if they have not mastered it yet. The poor performance on ORSI compared to SR and OR could also be due to participants' word order strategies failing them. This would be in accordance with the SSH, which suggests that L2ers are unable to process morphosyntax in their L2 and must rely on other strategies such as word order. The evidence of this study does not fully support the SSH, as participants' performance did improve with proficiency, whereas under the SSH their abilities should not improve but rather just get faster. To summarize, the results of this study contribute to the discussion of L2 processing and suggest a preference for the FTFA over the SSH, although that cannot be conclusively decided.

5.5 Limitations

In this section I will discuss the limitations that this study encountered. The first and most obvious being the small number of participants leading to a lack of statistical power. The reason for the small participant pool is discussed in the COVID-19 impact statement. Future studies could benefit from

repeating this study with a larger pool of participants. In a similar fashion, limitations were also encountered through the lack of low proficiency and high proficiency speakers as well as a lack of native speakers to have as a control. This can once again be solved by repeating the study with a larger pool of participants. Future studies should also endeavour to complete data collection for German in addition to French so that a great comparison can be drawn.

Another limitation is encountered through the self paced reading task as it relies on participants' memory as well as language abilities. Future studies could improve upon this by either using an eye-tracking test or simply further controlling for the memory costs participants encounter. The stimuli did control for memory effects to a certain level, however it could be helpful to future studies to extend said control. An example of a way in which memory effects could be further controlled is by the inclusion of a working memory matched group. Additionally the inclusion of both incorrect and correct responses in the statistical analysis limited the amount of information that can be found in the results. In future studies it could be helpful to also run a statistical analysis on only the correct responses to understand better how participants process sentences which they comprehend.

5.6 Conclusion

To conclude, while there are limitations to this study, it contributes to the ongoing research into second language acquisition. Specifically, it contributes to the area of second language acquisition that focuses specifically on L2 speakers of French with English L1's processing abilities, as well as the processing of relative clauses. More broadly this study also contributes to the discussion surrounding L2 processing abilities in general. This study contributes by focusing on lower proficiency individuals, which are often not represented in other studies. This study provides a starting point to better understand how speakers process their second language at all stages of acquisition.

Appendix A

The experimental items are presented below. Each sentence had four possible variations which is demonstrated in (1). The variations were divided up into 4 different tests.

1. a. Le médecin qui déteste le dentiste obtient une promotion à la clinique. (SR)
   'The doctor that hates the dentist gets a promotion at the clinic'
   b. Le dentiste qui déteste le médecin obtient une promotion à la clinique. (SR)
   'The dentist that hates the doctor gets a promotion at the clinic'
   c. Le dentiste que le médecin déteste obtient une promotion à la clinique. (OR)
   'The dentist that the doctor hates gets a promotion at the clinic'
   d. Le médecin que le dentiste déteste obtient une promotion à la clinique. (OR)
   'The doctor that the dentist hates gets a promotion at the clinic'
2. L'enseignant qui regarde le chercheur rédige un rapport dans sa classe. (SR)
   'The teacher that watches the researcher writes a report in his class'
3. Le cousin qui suit l'oncle attrape un ballon dans le jardin. (SR)
   'The cousin that follows the uncle catches a ball in the garden'
4. Le ministre que le sénateur critique cherche une solution pour le gouvernement. (OR)
   'The minister that the senator criticizes searches a solution for the government'
5. Le monsieur qui déteste le serveur prend une décision à chaque fois. (SR)
   'The gentleman that hates the waiter makes a decision each time'
6. Le pâtissier qui supervise le boulanger regarde un film au cinéma. (SR)
   'The pastry chef that supervises the baker watches a movie at the theatre'
7. Le charpentier que protège le comptable possède un tableau dans sa chambre. (ORSI)
   'The carpenter that the accountant protects possesses a painting in his room'
8. Le philosophe que l'anthropologue fréquente prépare une présentation dans son bureau. (OR)
   'The philosopher that the anthropologist frequents prepares a presentation in his office'
9. Le hockeyeur que touche le footballeur enlève son maillot après le match. (ORSI)
   'The hockey player that the football player touches removes his jersey after the game'

10. Le chauffeur qui punit l'ingénieur possède une voiture dans son garage. (SR)

    'The driver that punishes the engineer possesses a car in his garage'

11. L'électricien qui connaît le maçon répare une maison dans l'avenue. (SR)

    'The electrician that knows the mason repairs a house on the avenue'

12. L'architecte que l'administration blâme imagine un projet pour sa ville. (OR)

    'The architect that the administration blames imagines a project for his town'

13. L'enfant que l'adolescent rencontre lit son livre dans la librairie. (OR)

    'The child that the teenager meets reads his book in the book store'

14. Le cousin que dessine le beau-frère ramasse une fleur dans le champ. (OR)

    'The cousin that draws the brother-in-law picks a flower in the field'

15. Le beau-père qui dispute l'oncle mange un sandwich devant la porte. (SR)

    'The father-in-law that argues with the uncle eats a sandwich in front of the door'

16. L'artiste qui défend le sculpteur fabrique un cadeau dans son atelier. (SR)

    'The artist that defends the sculptor makes a present in his workshop'

17. Le voyageur que le conducteur embête mange un sandwich dans le wagon. (OR)

    'The traveller that the conductor annoys eats a sandwich in the car'

18. L'instituteur que rencontre le directeur adore son cheval pour la compétition. (ORSI)

    'The teacher that the director meets adores his horse for the competition'

19. Le marchand qui punit le commercial reçoit un cadeaux dans une boîte. (SR)

    'The merchant that punishes the trader receives a present in a box'

20. L'hôtelier qui juge l'écrivain achète un chapeau dans la boutique. (SR)

    'The hotelier that judges the writer buys a hat in the boutique'

21. L'empereur qui conseille le président regarde un film dans le salon. (SR)

    'The emperor that advises the president watches a movie in the living room'

22. Le technicien que le pompier regarde habite un appartement avec son frère. (OR)

    'The technician that the firefighter watches lives in an apartment with his brother'

23. Le lieutenant qui soutient le général commence une tâche avec ses soldats. (SR)

    'The lieutenant that supports the general starts a task with his soldiers.'

24. L'agriculteur qui forme l'ingénieur calcule son estimation à la ferme. (SR)

'The farmer that trains the engineer calculates his estimate on the farm'

25. Le secrétaire qui respecte l'assistant construit une maison à la campagne. (SR)

'The secretary that respects the assistant builds a house in the countryside'

26. Le pêcheur que contacte le marin répare son bateau sur la plage. (ORSI)

'The fisherman that the sailor contacts repairs his boat on the beach'

27. L'infirmier qui soigne le chirurgien prend une décision dans le couloir. (SR)

'The nurse that heals the surgeon makes a decision in the hallway'

28. Le musicien que le compositeur décrit écoute une chanson dans la voiture. (OR)

'The musician that the composer describes listens to a song in the car'

29. L'avocat que le juge critique gagne un salaire avec son métier. (OR)

The lawyer that the judge criticizes earns a salary with his profession'

30. Le cycliste qui salue le joueur attend une pause dans la course. (SR)

'The cyclist that greets the player waits for a pause in the race'

31. Le conseiller que rejette le maître développe son argument dans le bureau. (ORSI)

'The councillor that the master rejects develops his argument in the office'

32. Le réalisateur que l'acteur reconnaît organise une soirée dans sa maison. (OR)

'The director that the actor recognizes organizes a party at his house'

33. Le directeur que le professeur respecte écrit un livre dans le parc. (OR)

'The principal that the teacher respects writes a book in the park'

34. Le photographe qui déçoit le guitariste porte un sac dans ses bras. (SR)

'The photographer that deceives the guitarist carries a bag in his arms'

35. Le gymnaste que le patineur conseille veut un prix pour son travail. (OR)

'The gymnast that the skater advises wants an award for his work'

36. Le policier que le peintre cache regarde une émission à la télévision. (OR)

'The policeman that the painter hides watches a show on the television'

Appendix B

The filler items are presented below. As with the experimental items each sentence had 4 possible variations which were divided up into 4 different tests. An example of the 4 variations is provided in (1).

1. L'écrivain imagine que le journaliste va boire une bière au bar.

   ‘The writer imagines that the journalist will drink a beer at the bar’

2. Le passager considère que le cowboy va garder des perles chez lui.

   ‘The passengers thinks that the cowboy will keep the pearls at his place’

3. Le professeur dit que le directeur va manger des frites au restaurant.

   ‘The professor said that the director will eat the fries at the restaurant’

4. Le suspect se fait critique par le pirate pendant l'évènement.

   ‘The suspect is critiqued by the pirate during the event’

5. Le passager se fait poursuivre par le cowboy dans le train.

   ‘The passengers is followed by the cowboy in the train’

6. Le sorcier se fait griffer par le dragon dans le château.

   ‘The sorceror is scratched by the dragon in the castle’

7. Le soldat a été observé par le gardien depuis le jardin.

   ‘The soldier was observed by the guard from the garden’

8. Le garagiste presume que le pilote veut mettre des fleurs chez lui.

   ‘The mechanic presumes that the pilot wants to put the flowers in his house’

9. Le héros assure que le guerrier veut combattre ses ennemis sur le terrain.

   ‘The hero ensures that the warrior wants to fight his enemies on the ground’

10. L'architecte se fait frapper par le contrôleur dans le couloir.

    ‘The architect was hit by the supervisor in the hallway’

11. Le pionnier se fait pousser par l'explorateur dans la forêt.

    ‘The pioneer was pushed by the explorer in the forest’

12. Le patron croit que le restaurateur veut couper du papier ce soir.

‘The patron believes that the restorer wants to cut some paper tonight’

13. Le garagiste a été choisi par le pilote pendant la pause.

‘The mechanic was chosen by the pilot during the break’

14. L'enseignant a été observé par le chef depuis la fenêtre.

‘The teacher was observed by the chief from the window’

15. Le concierge se fait remarquer par l'ambassadeur dans l'ascenseur.

‘The concierge was noticed by the ambassador in the elevator’

16. Le spéculateur considère que l'explorateur va porter un chapeau ce soir.

‘The investigator thinks that the explorer will wear a hat tonight’

17. Le serveur a été dessiné par le candidat contre son désir.

‘The server was drawn by the candidate against his wishes’

18. Le délégué se fait élire par le représentant dans la cour.

‘The delegate is elected by the representative in the hall’

19. Le cinéaste se fait aimer par le fleuriste depuis un an.

‘The filmmaker is liked by the florist since a year ago’

20. L'humoriste a été récompensé par le jardinier pendant le spectacle.

‘The comedian was compensated by the gardener during the spectacle’

21. Le hacker dit que le voleur veut gagner des dollars au casino.

‘The hacker said that the thief wants to win dollars at the casino’

22. Le joueur apprend que le nageur va regarder des films cet été.

‘The player learns that the swimmer wants to watch movies this summer’

23. Le roi a été défendu par l'empereur depuis un an.

‘The kings was defended by the emperor since a year ago’

24. Le général a été critiqué par l'inspecteur pendant la visite.

‘The general was criticized by the inspector during the visit’

25. Le chimiste croit que le banquier veut entreprendre des activités cette semaine.

‘The chemist believes that the banker wants to undertakes some activities this week’

26. Le boulanger affirme que le pâtissier va manger les desserts en cachette.

‘The baker affirms that the pastry chef will eat the desserts in secret’

27. Le facteur estime que le boucher veut vendre ses bijoux au collectionneur.

‘The postman estimates that the butcher wants to sell his jewelry to the collector’

28. Le patron a été respecté par le restaurateur pendant la réunion.

‘The patron was respected by the restorer during the reunion’

29. Le général imagine que l'inspecteur veut nettoyer la poussière cet après-midi.

‘The general imagines that the inspector wants to clean the dust this afternoon’

30. Le vendeur se fait avoir par le client à la caisse.

‘The vendor gets tricked by the client at the cash register’

31. Le chasseur sent que le pirate va prendre des fruits aujourd'hui.

‘The hunter feels that the pirate will take the fruits today’

32. L'anthropologue reconnait que le philosophe va changer sa façon de travailler.

‘The anthropologist recognizes that the philosopher will change his method of working’

33. Le vendeur croit que le client va ramasser des fraises au printemps.

‘The vendor believes that the clients will pick strawberries in spring’

34. Le spectateur suppose que le navigateur veut manger son gâteau ce matin.

‘The spectator supposes that the navigator wants to eat his cake this morning’

35. Le soldat pense que le gardien veut acheter des jouets en France.

‘The soldier thinks that the guard wants to buy toys in France’

36. Le cinéaste présume que le fleuriste va mesurer du tissu au magasin.

‘The filmmaker presumes that the florist will measure fabric at the store’

37. Le magicien pense que le géant va gratter le dos de son frère.

‘The magician thinks that the giant will scratch his brothers back’

38. Le commercial a été appelé par le technicien depuis le bureau. ‘The merchant was called by the technician from the office’

39. L'auteur estime que le comédien veut repeindre son plancher demain.

‘The author estimate that the comedian wants to repaint his floor tomorrow’

40. Le concierge conclut que l'ambassadeur va enregistrer la conversation la prochaine fois.

‘The concierge concludes that the ambassador will record the conversation the next time’

41. Le cinéaste se fait transporter par le pilote à l'aéroport.

‘The filmmaker is transported by the pilot at the airport’

42. Le maître découvre que le juge veut couper ses cheveux demain.

‘The master discovers that the judge wants to cut his hair tomorrow’

43. Le hacker se fait contrôler par l'agent dans la rue.

‘The hacker is controlled by the agent in the street’

44. Le conducteur se fait pousser par le chauffeur dans le camion.

‘The conductor is pushed by the driver in the truck’

45. Le frère suppose que le beau-frère veut voler l'argent dans la maison.

‘The brother supposes that the brother-in-law wants to steal the money in the house’

46. Le partenaire a été refusé par l'officier à l'assemblée.

‘The partner was refused by the officer at the assembly’

47. Le clown a été sauvé par l'ambulancier sur la scène.

‘The clown was saved by the paramedic on the scene’

48. L'auteur a été surveillé par le comédien depuis son jardin.

‘The author was surveilled by the comedian from his garden’

49. Le commercial conclut que le technicien veut superviser des documentaires la semaine prochaine.

‘The merchant concludes that the technician wants to watch documentaries next week’

50. Le criminel a été surpris par le voleur à son arrivée.

‘The criminal was surprised by the thief’s arrival’

51. L'écrivain se fait influencer par le journaliste pendant l'entretien.

‘The writer is influenced by the journalist during the interview’

52. Le cavalier pense que le poète va écrire des lettres l'année prochaine.

‘The jockey thinks that the poet will write letters next year’

53. Le musicien suppose que le vétérinaire va chercher des scorpions dans la forêt.

‘The musician supposes that the veterinarian will look for scorpions in the forest’

54. Le serveur dit que le candidat veut offrir des livres aux autres.

‘The server said that the candidate wants to offer books to the others’

55. Le fiancé admet que le père veut organiser son mariage à la plage.

‘The fiancé admits that the father wants to organize his marriage at the beach’

56. Le professeur se fait punir par le directeur pendant la réunion.

‘The professor is punished by the director during the reunion’

57. Le directeur se fait rejeter par le responsable dans l'entreprise.

‘The director is rejected by the manager in the buisness’

58. Le détective a été confessé par le prêtre dans l'église.

‘The detective was confessed by the priest in the church’

59. Le joueur se fait évaluer par le nageur dans la piscine.

‘The player is evaluated by the swimmer in the pool’

60. Le conducteur prédit que le chauffeur va fumer ses cigarettes après-demain.

‘The conductor predicts that the driver will smoke his cigarettes the day after next’

61. Le glacier déclare que le banquier veut profiter du succès de son entreprise.

‘The glacier declared that the banker wants to profit from the success of his enterprises’

62. L'architecte suppose que le contrôleur va chercher des bonbons ce jeudi.

‘The architect supposes that the supervisor will look for candies this Thursday’

63. L'avocat a été désavantagé par le banquier durant l'année.

‘The lawyer was disadvantaged by the banker during the year’

64. L'entraîneur a été employé par le vétérinaire après les vacances.

‘The trainer was employed by the veterinarian after vacation’

References

A., & Hadley, A. O. (2019). Vis-a-vis : beginning French (Seventh edition.). McGraw-Hill Education.

Bader, M., & Meng, M. (1999). Subject-object ambiguities in German embedded clauses: An across-the-board comparison. *Journal of Psycholinguistic Research*, *28*(2), 121–143.

Clahsen, H., & Felser, C. (2006a). Grammatical processing in language learners. *Applied Psycholinguistics*, *27*(01), 3–42.

Clahsen, H., & Felser, C. (2006b). How native-like is non-native language processing? *Trends in Cognitive Sciences*, *10*(12), 564–570.

Clahsen, H., & Felser, C. (2018). some notes on the Shallow Structure Hypothesis. *Studies in Second Language Acquisition*, *40*(3), 693–706.

Clifton, C., Frazier, L. (1989). Comprehending Sentences with Long-Distance Dependencies. In: Carlson, G.N., Tanenhaus, M.K. (eds) Linguistic Structure in Language Processing. Studies in Theoretical Psycholinguistics, vol 7. Springer, Dordrecht.

Dekydtspotter, L., Schwartz, B. D., & Sprouse, R. A. (2006). The comparative fallacy in L2 processing research. In M. G. O'Brien, C. Shea, & J. Archibald (Eds.), *Proceedings of the 8th Generative Approaches to Second Language Acquisition Conference (GASLA 2006)* (pp. 33–40). Cascadilla Proceedings Project.

Fiebach, C. J., Schlesewsky, M., & Friederici, A. D. (2002). Separating syntactic memory costs and syntactic integration costs during parsing: The processing of German *WH*-questions. *Journal of Memory and Language*, *47*(2), 250–272.

Frauenfelder, U., Segui, J., & Mehler, J. (1980). Monitoring around the relative clause. *Journal of Verbal Learning and Verbal Behavior*, *19*(3), 328–337.

Friedmann, N., Belletti, A., & Rizzi, L. (2009). Relativized relatives: Types of intervention in the acquisition of A-bar dependencies. *Lingua*, *119*, 67–88.

Gibson, E. (1998). Linguistic complexity: Locality of syntactic dependencies. *Cognition*, *68*(1), 1–76.

Gibson, E., Schütze, C. T., & Salomon, A. (1996). The relationship between the frequency and the processing complexity of linguistic structure. *Journal of Psycholinguistic Research*, *25*(1), 59–92.

Gordon, P. C., Hendrick, R., & Johnson, M. (2001). Memory interference during language processing. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *27*(6), 1411–1423.

Gordon, P. C., Hendrick, R., & Johnson, M. (2004). Effects of noun phrase type on sentence complexity. *Journal of Memory and Language*, *51*(1), 97–114.

Grondin, N., & White, L. (1996). Functional categories in child L2 acquisition of French. *Language Acquisition*, *5*(1), 1–34.

Hansen, B. M. (2016). *The structure of modern standard French: A student grammar*. Oxford University Press.

Havik, E., Roberts, L., Hout, R. van, Schreuder, R., & Haverkort, M. (2009). Processing subject-object ambiguities in the L2: A self-paced reading study with German L2 learners of Dutch. *Language Learning*, *59*(1), 73–112.

Holmes, V. M., & O'Regan, J. K. (1981). Eye fixation patterns during the reading of relative-clause sentences. *Journal of Verbal Learning and Verbal Behavior*, *20*(4), 417–430.

Hopp, H. (2006). Syntactic features and reanalysis in near-native processing. *Second Language Research*, *22*(3), 369–397.

Hopp, H. (2010). Ultimate attainment in L2 inflection: Performance similarities between non-native and native speakers. *Lingua*, *120*(4), 901–931.

Hopp, H. (2013). Grammatical gender in adult L2 acquisition: Relations between lexical and syntactic variability. *Second Language Research*, *29*(1), 33–56.

Hopp, H. (2014). Working memory effects in the L2 processing of ambiguous relative clauses. *Language Acquisition*, *21*(3), 250–278.

Hopp, H. (2015). Individual differences in the second language processing of object–subject ambiguities. *Applied Psycholinguistics*, *36*(2), 129–173.

Hopp, H. (2016). The timing of lexical and syntactic processes in second language sentence comprehension. *Applied Psycholinguistics*, *37*(5), 1253–1280.

Just, Carpenter, P. A., & Woolley, J. D. (1982). Paradigms and processes in reading comprehension. *Journal of Experimental Psychology. General*, *111*(2), 228–238.

Kantola, L., & van Gompel, R. P. G. (2011). Between- and within-language priming is the same: Evidence for shared bilingual syntactic representations. *Memory & Cognition*, *39*(2), 276–290.

Kayne, R. (1976). French relative 'que.' In F. Hensey & M. Luján (Eds.), *Current Studies in Romance Linguistics* (pp. 255–299). Georgetown University Press.

Kayne, R., & Pollock, J.-Y. (1978a). Stylistic inversion, successive cyclicity, and move NP in French. *Linguistic Inquiry*, *9*(4), 595–621.

Kayne, R. S. (2010). *Comparisons and Contrasts*. Oxford University Press, Incorporated.

Kuperman, V., Dambacher, M., Nuthmann, A., & Kliegl, R. (2010). The effect of word position on eye-movements in sentence and paragraph reading. *The Quarterly Journal of Experimental Psychology*, *63*(9), 1838–1857.

Lahousse, K. (2006). NP subject inversion in French: Two types, two configurations. *Lingua*, *116*(4), 424–461.

Marinis, T. (2010). Using on-line processing methods in language acquisition research. *Experimental methods in language acquisition research*, *34*.

Mathôt, S., Schreij, D., & Theeuwes, J. (2012). OpenSesame: An open-source, graphical experiment builder for the social sciences. *Behavior Research Methods*, *44*(2), 314–324.

Mcdonald, J. L. (2000). Grammaticality judgments in a second language: Influences of age of acquisition and native language. *Applied Psycholinguistics*, *21*(3), 395–423.

Meijer, P. J. A., & Fox Tree, J. E. (2003). Building syntactic structures in speaking: A bilingual exploration. *Experimental Psychology*, *50*(3), 184–195.

Meisel, J. M. (2009). Second language acquisition in early childhood. *Zeitschrift Für Sprachwissenschaft*, *28*(1), 5–34.

Meng, M., & Bader, M. (2000). Mode of disambiguation and garden-path strength: An investigation of subject-object ambiguities in German. *Language and Speech*, *43*(1), 43–74.

Montrul, S. (2004). Psycholinguistic evidence for split intransitivity in Spanish second language acquisition. *Applied Psycholinguistics*, *25*(2), 239–267.

Prévost, P. (2009). *Acquisition of French: The development of inflectional morphology and syntax in L1 acquisition, bilingualism, and L2 acquisition*. John Benjamins Publishing Company.

Prévost, P., Tuller, L., Galloux, A., & Barthez, M.-A. (2017). Complexity and production/comprehension asymmetries in the acquisition of *wh*-questions in French: Comparing second language acquisition and language impairment in children. In E. Blom, L. Cornips, & J. Schaeffer (Eds.), *Studies in Bilingualism* (Vol. 52, pp. 231–258). John Benjamins Publishing Company.

Prideaux, G. D., & Baker, W. J. (1987). *Strategies and Structures: The processing of relative clauses*. John Benjamins Publishing Company.

Rankin, T. (2014). Word order and case in the comprehension of L2 German by L1 English speakers. *EUROSLA Yearbook: Annual Conference of the European Second Language Association*, *14*, 201–224.

Schelstraete, M. A., & Degand, L. (1998). Assignment of grammatical functions in French relative clauses. *Language Sciences*, *20*(2), 163–188.

Schriefers, H., Friederici, A. D., & Kuhn, K. (1995). The processing of locally ambiguous relative clauses in German. *Journal of Memory and Language*, *34*(4), 499–520.

Schwartz, B. D., & Sprouse, R. A. (1996). L2 cognitive states and the Full Transfer/Full Access model. *Second Language Research*, *12*(1), 40–72.

Sportiche, D. (2011). French relative qui. *Linguistic Inquiry*, *42*(1), 83–124.

Struys, Surmont, J., Van de Craen, P., Kepinska, O., & Van den Noort, M. (2019). Bilingual language control across modalities: The relationship between mixed-language comprehension and production. *Linguistic Approaches to Bilingualism*, *9*(4-5).

Ullman, M. (2004) Contributions of memory circuits to language: the declarative/procedural model. Cognition 92, 231–270

Ullman, M. (2005) A cognitive neuroscience perspective on second language acquisition: the declarative/procedural model. In Mind and Context in Adult Second Language Acquisition: Methods, Theory, and Practice (Sanz, C., ed.), pp. 141–178, Georgetown University Press

White, L. (1987). Markedness and second language acquisition: The question of transfer. *Studies in Second Language Acquisition*, *9*(3), 261–285.

White, L. (1990). Second language acquisition and Universal Grammar. *Studies in Second Language Acquisition*, *12*(2), 121–133.