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Processing and Comprehension of L2 English Relative Clauses by Farsi Speakers

Pouran Seifi

**university of
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faculty of arts

The research reported in this dissertation has been carried out under the auspices of the Center for Language and Cognition Groningen (CLCG) of the Faculty of Arts of the University of Groningen.

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Processing and Comprehension of L2 English Relative Clauses by Farsi Speakers

PhD thesis

to obtain the degree of PhD at the
University of Groningen
on the authority of the
Rector Magnificus Prof. C. Wijmenga
and in accordance with
the decision by the College of Deans.

This thesis will be defended in public on

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To my family

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Groningen May 13, 2021

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Abbreviations

CAH	Contrastive Analysis Hypothesis
COMP	Complementizer / <i>ke</i> /
IMP	Imperative
INF	Infinitive
L1	First language
L2	Second language
NEG	Negation
NP	Noun phrase
NPs	Noun phrases
OM	Object marker
OO	Object modifying, object extracted
OR	Object relative clause
OS	Object modifying, subject extracted
PL	Plural
PRF	Perfect
PST	Past
SG	Singular
SLA	Second language acquisition
SO	Subject modifying, object extracted
SOV	Subject-object-verb
SS	Subject modifying, subject extracted
SVO	Subject-verb-object
VP	Verb phrase
VSO	Verb-subject-object
ā	Long vowel / <i>a</i> /
DO	Direct object
SU	Subject
FP	First-pass
NPAH	Noun phrase accessibility hierarchy
FUT	Future
PTCP	Participle
OBL	Oblique
NP1	Antecedent
PRS	Present

Non-Res	Non-restrictive
RPD	Regression path duration
§	/sh/ as in <i>shake</i>
GEN	Genitive
Res	Restrictive
FPtr	First-pass total
NP2	Embedded noun phrase
RC	Relative clause
Relpron	Relative pronoun
Ç	/ch/ as in <i>chair</i>
RES	Restrictive
RP	Resumptive pronoun
SR	Subject relative clause
INDF	Indefinite
Subjunctive	SBJV
TRT	Total reading time

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Chapter 1

Chapter 1

Introduction

This introduction sets the scene for the dissertation, which is about Iranian learners of English and how they process English relative clauses. First, we discuss the context in which Farsi learners learn English and then examine the need for second language exposure and the role of transfer. Then, we explain why it is interesting to look at relative clauses in particular and what it tells us about learning a foreign language. It presents a general introduction to relative clauses in English, Farsi and Dutch, and introduces theories of relative clause processing before outlining the remainder of the thesis.

1.1 The Iranian Learners' Context

The world is becoming more and more internationally oriented. The result of this is that knowledge of English becomes essential for many people. English is the leading academic language and students from around the world are increasingly studying abroad at universities where English is the primary language. The academic performance and prospects of students depend on their comprehension of English. Hence, it is crucial to acquire knowledge about the processing of English by students speaking languages like Farsi that is fundamentally different from English to find out where they have specific difficulty.

In the linguistically diverse country of Iran, Farsi is the only official language, and it is the language that is used for education throughout the country. However, the majority of Iranians speak in a different first language. It is estimated that Azerbaijani Turkish with some variants of Turkish languages like Turkmen, Qashqai, Khorasani, and Khalaj are the majority of languages spoken in Iran. Additionally, languages spoken in Iran include Kurdish, Arabic, Gilaki, Baluchi, Luri, and some other Farsi dialects. It is worth mentioning that the majority of these non-Farsi speakers are only literate in the Farsi language. They use their mother language orally, but they cannot write or read in their first language.

English as a foreign language can be the second or third language for Iranian students depending on their mother language. For Farsi speakers, English is the second language; however, for non-Farsi speakers, for instance, Turks, English is the third language.

English is a foreign language for the language learners in Iran because it is learned only in the educational context in a Farsi speaking environment without having access to native English speakers. It is worth adding that Arabic is also taught at schools, but it is mainly for being able to read the Quran. Initially, Arabic is taught by practising the pronunciation of the words. Later, in high school, Arabic teaching is focused on grammar and vocabulary, but there is no space for listening and speaking skills. The

second motive for learning Arabic is that it is a module in the university entrance examination. The purpose of learning Arabic is only for religious reasons, and it is not a means for future academic and professional success for all prospective students.

Although students begin to learn English from the seventh grade, in private schools, students may have some extracurricular English courses. People who can afford the high expenses of these schools choose this opportunity for their children for their academic and professional future. English is a compulsory course at school, and it is a module tested in the highly competitive university entrance examinations. It is offered as a general course in undergraduate programs and as a specialised course in the postgraduate programs to enrich the students' vocabulary domain in their fields. Postgraduate students must have a good command of the English grammar and vocabulary to be able to read articles in English in their fields or to write an essay in English to publish in international journals. The immediate need for learning English skills is pervasive among students who intend to pursue their education at universities abroad or people who are determined to migrate. For the majority of Iranian students, however, English is a foreign language, and they do not perceive it as a helpful course to their daily life in the future because they have no opportunity of travelling abroad.

Iranian students are not exposed to any English other than two hours at school per week and a two-credit course at the universities unless they enrol for an English course out of school, which is limited as well. Students scarcely hear authentic English language around them because not many English speaking foreigners reside in Iran. Press TV is the only 24-hour English- and French-language news and documentary network in Iran, but it is not very appealing for students because of the content. Accordingly, it does not provide them with a chance of exposure to English. Cartoons and movies are translated and dubbed into the Farsi language; therefore, watching a program in English via national TV is not an option, unless the family has an illegal satellite. Students in schools and

language institutions learn what to say in a laboratory-like condition, but most of them never get a chance to utilise their English knowledge, and they quickly forget their English knowledge.

Little exposure to a language entails less automatisisation and therefore more processing difficulties for the learners, and probably more transfer from L1 into the target language. To comprehend and produce a language, language learners go through processing the sentences in that language. In so doing, they have to overcome the processing difficulties posed by the syntax of the target language. In this book, we will focus on one of the grammar components, namely, relative clauses. Relative clauses have attracted a tremendous amount of attention and interest because of their unique syntactic properties and frequency of daily application. Although there are common properties among relative clauses in all languages, every language has diverse relative clause structures. The majority of relative clause studies in the first language (L1) and second language (L2) are focused on the English language.

In the present study, we will use relative clauses as a test case to investigate language transfer in L1 Farsi L2 English speakers. To fill the gap in the literature concerning the processing of relative clauses in the L1 by Farsi speakers, we will explore how Farsi speakers process Farsi relative clause sentences. Regarding that Farsi speakers have less exposure to English and their first language structure is very different from English in terms of relative clauses, we investigate possible relative clause processing and comprehension difficulties in L2 English. Moreover, we are keen to find out whether L1 Farsi transfers into L2 while processing and comprehending English relative clause sentences. Additionally, given the structural similarities between Farsi and Dutch in terms of relative clause structure and canonical word order, we will compare L2 English relative clause processing by two groups of Farsi and Dutch speakers to compare potential transfer effects and to investigate whether English language proficiency and exposure to English influence language transfer.

1.2 Second Language Acquisition and Language Exposure

Second language acquisition (SLA) can be defined as learning or acquiring a second language when first language acquisition has been fulfilled. In addition, SLA is a scientific discipline that addresses the systematic study of how people learn another language in addition to their native language. SLA may be different from learning a foreign language; for instance, an Iranian child whose native language is Turkish starts acquiring Farsi when he/she goes to primary school in Iran. Farsi is learned by the process of second language acquisition because that student learns Farsi in an environment with lots of input from the native speakers and the media. The same student starts learning English at the same school, but the difference is that there is no English environment, and the English input is minimal compared to Farsi. Therefore, second language acquisition means acquiring a language with several inputs, exposure to the target language and interaction with native speakers.

Language exposure plays an essential role in language learning. In the following paragraphs, we will bring some studies that indicate the importance and benefit of language exposure in second language acquisition. As Paradis (2010) states, a constructivist approach to language acquisition emphasises the importance of input properties as a mechanism in the acquisition process and, consequently, the variable input experienced by bilingual children should impact their acquisition rates. Paradis investigated the impact of structure complexity, task type, and amount of exposure on the accuracy of English verb morphology with French-English bilingual children and compared them with monolinguals. She aimed to test the predictions of a constructivist approach to bilingual morphosyntactic acquisition, which emphasises the importance of input properties in second language acquisition processes. Her results revealed that in production and grammaticality judgement experiments, bilingual children had lower scores than monolinguals. The parent(s) was/were asked to fill a questionnaire inspecting the languages they use at home, their family language history, the language of the programs their child

watches, and their friends' language use. The combined results revealed the importance of exposure to the target language (English) at home. The children who were exposed mainly to French at home had consistently lower scores than the groups with more exposure to English at home.

A further example of exposure can be seen in Palermo et al.'s (2014) work. They examined the impact of exposure on language learning. They considered the contribution of English exposure at home from family members and in the classroom from teachers and peers to English receptive and expressive vocabulary skills of Spanish-speaking preschoolers. The results suggest that the combined English exposure levels from home and classroom settings were positively associated with children's English vocabulary skills. Moreover, the results showed that home and peer English exposure each made a unique contribution to children's English vocabulary skills. Exposure from family members positively affected the receptive and expressive vocabulary skills of the language learners, but English exposure from peers was only associated with the learners' expressive vocabulary skill. In contrast, interaction with teachers did not affect the learners' vocabulary skills very much.

Lee (2013) also believes that more exposure to the relevant input has a role in the successful processing of L2 relative clauses by Korean learners of English. She investigated the effect of additional input on the second language relative clause processing of L2 learners with a self-paced reading paradigm and input enhancement. The findings of her study revealed that after exposing the participants to four sessions of input on separate days, the comprehension accuracy of object relative clauses improved. Moreover, the reading times in the critical regions in object relative clauses were decreased denoting that the difficulty in processing of the object relative clauses was reduced.

Another interesting study about the effect of exposure on second language learning was conducted by Kuppens (2010). She states that in the Netherlands, Flanders, and the Nordic countries, instead of dubbing or voice-over translation, movies and television programs in English are

provided with subtitles. Accordingly, viewers of these media are exposed to a great deal of English spoken by native speakers. Kuppens (2010) investigated whether the long-term application of media in English influences the incidental acquisition of foreign language skills of Belgian Dutch-speaking children in their last year of primary education. In so doing, she studied the relationship between the self-reported application of subtitled television programs and movies, music, and computer games in English. Moreover, she examined the participants' Dutch-to-English and English-to-Dutch translation skills. Her analyses revealed that the participants who frequently watched subtitled English television programs and movies performed significantly better on both translation tests—besides, playing English computer games also positively affected the scores on the English–Dutch translation test.

1.3 First Language Transfer

Generally, the concept of language transfer refers to the influence of the first language of the learners on their second language learning process. This concept was first introduced in the field of second language acquisition (SLA) in the 1950s as a branch of Applied Linguistics and it was heavily influenced by behaviourist psychology and structural linguistics in terms of methodology and theory (Meriläinen, 2010). Lado (1957) was one of the first scholars who supported the idea that the learners' first language habits influence their L2 learning. His opinion built the basis of the Contrastive Analysis Hypothesis (CAH), which states that linguistic similarities or differences between the learners' L1 and L2 might facilitate or impede language learning. It was believed that all errors that foreign language learners make during language learning are due to the interference of L1 in the process of L2 learning. This difficulty would manifest itself in errors. The proponents of this theory believed that by a systematic comparison of two languages, they could account for all the difficulties that L2 learners encounter. Therefore, following the structural linguistics methods, they conducted a contrastive analysis by comparing

the structures of two languages in detail to find the differences that were believed to cause the errors in L2 production (Meriläinen, 2010).

According to the Behaviourist view of transfer, the degree of transfer depends only on the similarities and differences between L1 and the target language. Therefore, transfer was restricted only to the apparent similarities and differences between the syntactic structures of L1 and L2 (Lu & Yu, 2010). As Meriläinen (2010) describes, after a short period of popularity of CAH, empirical evidence revealed that learners make errors that are not related to their L1, but the learners' individual differences. Their errors are not necessarily cross-linguistic errors predicted by contrastive analysis works.

The theory of mentalism, also called conceptualism or psychologism, which was proposed by Chomsky (1965), asserted that the language ability of humans was innate and everybody would learn a language because of universal grammar in language learning (we are born with a predisposition for learning a language). By the emergence of Chomsky's Universal Grammar and Transformational Generative Grammar, CAH was questioned theoretically. Based on Chomsky's theories, language acquisition was no longer considered as a result of repetition and imitation, but language rules directed by our innate language faculty create a construction of a language (Meriläinen, 2010).

Moreover, Dulay and Burt (1974) state that for constructing L2, children neither rely on the transfer nor do they compare L2 with their L1. Dulay and Burt's (1974) Creative Construction Hypothesis states that, as language learners are exposed to the target language during the process of acquisition, they gradually and inductively reconstruct rules of that language. Accordingly, Dulay et al. (1981, as cited in Karim & Nassaji, 2013) claim that L2 learning follows the same path as L1 acquisition, and the L2 errors are similar to L1 errors. They completely reject the role of L1 transfer into L2.

The theory of Interlanguage by Selinker (1972) combined these opposing ideas of mentalistic and cognitive theory and established SLA as

an independent linguistic system that is constructed by different types of influences like the learner's L1, developmental mechanisms, formal language instruction, and target language. Selinker identified positive and negative transfer as two major types of transfer. In the process of positive transfer, L1 knowledge facilitates the L2 acquisition, but negative transfer works the other way around; L1 knowledge then interferes with and impedes L2 acquisition. Odlin (1989) explains that when the L1 form used in L2 production is not a part of the L2 norm, negative transfer occurs. He adds that by studying learners with different languages and comparing them, we could observe L1 influence on L2 learning. Odlin (1989) later considered transfer as a cross-linguistic process and proposed a comprehensive definition for transfer: "Transfer is the influence resulting from the similarities and differences between the target language and any other language that has been previously acquired" (p. 27). He deliberately includes 'any language' because in some countries an English learner has already learned two languages, his/her L1 mother language and an L2. He/she speaks and/or is literate in one or two languages before learning English as a third language.

In the preceding section, we briefly defined language transfer. In the following section, we will discuss transfer concerning syntax, which is the focus of the present study.

1.3.1 Transfer and L2 Syntax

Transfer has been illustrated at different levels of second language representation, such as the phonological (Rintell, 1984), lexical (Hancin-Bhatt & Nagy, 1994), semantic (Jiang, 2004), syntactic (Mahmoodzadeh, 2012), discourse/pragmatic (Yu, 2004), and sociopragmatic (Hosseini et al., 2015) systems. As Barto-Sisamout et al. (2009) indicate, there is a growing interest in studying whether the transfer of L1 sentence processing can affect real-time reading comprehension. They state that studies related to the different L2 sentence types do not illustrate reliable and consistent results showing L1 transfer (see Barto-Sisamout et al., 2009 for review).

Odlin (1989) holds that experimental studies of language syntax made the subject controversial. The proponents of universal grammar questioned the existence of syntactic transfer since they insisted that language acquisition takes place by universal strategies that are available for everybody and that L1 has no critical role in this process (Meriläinen, 2010). In studies of word order, relative clauses and negation, considerable evidence of positive and negative transfer has been found by Odlin (1989), but these results are not found consistently. Why are syntactic transfer results not so prevalent as in phonetics and the lexicon? One reason might be the learners' avoidance. They avoid structures that are difficult for them or structures that they do not have in their L1. The other reason is that "syntactic transfer cannot be detected easily in production errors. Less frequently occurring grammatical patterns may be easier for learners to avoid than more frequently occurring phonemes or lexical elements" (Meriläinen, 2010, p. 23). However, a syntactic transfer cannot be avoided in reading processes, and they can be manifested clearly as long reading times in on-line reading experiments.

Word-order patterns as syntactic patterns were studied extensively in SLA research. These studies are advantageous for understanding transfer, discourse and any factor that affects L2 learning (Odlin, 1989). The basic word order in the majority of languages is SVO (subject-verb-object), SOV (subject-object-verb), or VSO (verb-subject-object). However, some languages such as Russian with an SVO word order like English have a flexible word order in different functions. Emphasis on the importance of subject, object, verb changes the order of these elements in a sentence. Therefore, according to the rigidity or flexibility of their word order, languages with basic SVO, SOV, or VSO word order can be subcategorised. For instance, English (SVO) and Farsi (SOV) have a rigid word order, but Turkish (SOV), Dutch (SOV), and Russian (SVO) have a flexible word order. The flexibility of target language word order creates difficulties in L2 production and comprehension for learners who have an L1 with a rigid word order (Odlin, 1989). The word order in English

subject and object relative clause sentences changes from SVO as in '*the girl that likes the boy*' to OSV as in '*the girl that the boy likes*'. As the word order in the Farsi language is fixed in both relative clauses, it is expected that Farsi speakers may have difficulty in comprehending English relative clauses.

It is said that cross-linguistic differences in the linguistic cues of L1 and L2 influence L2 sentence comprehension. The Competition Model developed by (Bates & MacWhinney, 1982, 1989) is one of the systematic input-based approaches in language learning theories that involves the effect of transfer in L2 learning. This model is based on both language acquisition and processing theory in psycholinguistics and suggests that learners interpret the meaning of a sentence by comparing some linguistic cues through the competition of underlying cognitive mechanisms inside a productive linguistic environment. The competition model is designed to quantify the distributional properties of the input that controls language learning and language processing. The primary claim of the model concerning the input is that language comprehension is based on the reliability and detection of the reliability of a series of cues. Furthermore, the availability of these cues determines the strength of cues in comprehension. The learners take into account various linguistic cues in the sentence context, such as word order, morphology, and semantic characteristics like animacy to compute a probabilistic value for each interpretation, eventually choosing the interpretation with the highest likelihood. Language learning, in the beginning, heavily relies on L1 transfer. "Whatever can transfer will" (MacWhinney, 2005, p.17). Languages differ in the importance of linguistic cues signalling the meaning of a sentence. For example, in English, the canonical word order in relative clause sentences illustrates the type of the relative clause. However, in Farsi, the word order cannot be a helpful cue because the word order in both types of relative clauses is the same. Therefore, in Farsi, morphological cues, such as the object marker and resumptive pronouns, help a reader to find out the meaning of the relative clause sentences.

In considering the effect of cue strength on sentence processing, McDonald (1987) found that English and Dutch native speakers apply syntactic and semantic cues like word order, prepositions, inflections, and animacy to interpret the sentences in their first language to various degrees. For example, in the construction with noun phrase (NP) + verb phrase (VP) + noun phrase (NP), English speakers rely mainly on word order, whereas Dutch speakers rely on case inflection. McDonald compared the cue usage of English/Dutch and Dutch/English L2 learners. She tested dative constructions, simple (NP+VP+NP) sentences and relative clauses and found that the cue usage in the first language transfers from the native language to the second language. However, by increasing second language exposure, the L1 transfer decreases, and the language learners start using the L2 cues in sentence processing and interpretation.

1.4 Sentence Processing in L1 and L2

According to Roberts (2013), bilingual sentence processing has been a topic of interest recently, and researchers started comparing bilinguals' L2 input comprehension in real-time with native speakers. She states that the L2 speakers' grammatical processing is different from native speakers' parsing to some extent. "It is consistently observed that differences between bilingual and native speakers – and the greatest observed processing difficulties – lie in the application of grammatical information during real-time sentence comprehension" (p.222).

Language learners should process linguistic input in real-time to acquire that language successfully (Clahsen & Felser, 2006). Clahsen and Felser state that language production and comprehension of language learners is not known exactly. They compared different populations - mature native speakers, child first language and adult second language learners- by applying behavioural and ERP experiments within different domains of morphology and syntax. They indicated that in the sentence processing domain, the sentence processing of adult second language learners showed noticeable differences with native speakers. Whereas

during parsing, lexical-semantic cues guided the second language learners in a way similar to the native speakers, in syntactic information, they were less similar to native speakers. They suggested that non-native comprehenders do not use syntactic information as much as native speakers do during parsing and the computation of syntactic representations are not as deep as that of native speakers. However, second language learners apply lexical-semantic and pragmatic information to the same extent as native speakers.

To comprehend and produce language forms, a language learner should process them by acquiring L2 language strategies that help them overcome the processing difficulties that the target language grammar pose. Relative clauses are one of the grammatical structures that help us to understand some of the difficulties in sentence processing. Because of their universality and frequency of usage in daily life in all languages, relative clauses in L1 and L2 are especially interesting to investigate (Izumi, 2003).

1.5 Theoretical Accounts of Relative Clause Processing

A relative clause or an adjective clause is a type of subordinate clause that adds extra detail about a noun. Every relative clause contains an element whose interpretation is provided with the head noun or antecedent, meaning that there is an anaphoric relation between the relativised element and the antecedent.

The majority of psycholinguistic studies focus on restrictive English relative clauses. For example, in a relative clause sentence such as '*The neighbour [that called you] left home*', the information in the relative clause is integrated into the matrix sentence. In restrictive or integrated relative clauses, presupposed information is used to identify the referent of a noun phrase. However, a non-restrictive or supplementary relative clause is a way of presenting new information based on the assumption that a referent can already be identified as in '*The neighbour, whom you called, left home*'. According to Huddleston et al. (2002), a supplementary relative clause is not fully integrated into a matrix clause and it adds only extra

information about an antecedent. Moreover, it is separated from the rest of a sentence prosodically or by punctuation. There are extraposed relatives, such as ‘*A handsome boy walked into the class [who looked like Sayan]*’ where the relative clause is not attached directly to the modified antecedent.

Many (psycho)linguistic studies have shown that the processing of subject relative clauses of the form ‘*The professor that saw the students was going to the class*’ is easier than object relative clauses of the form ‘*The professor that the students saw going to the class*’. The contrast between subject and object relative clauses provides a rich bed for understanding the cognitive mechanism that enables us to find out the processing and comprehension of syntactically complex sentences.

Different theoretical accounts of relative clause processing characterise the difficulty or easiness of processing subject and object extracted relative clauses. In the following section, some of the theories that may help us to explain the reason for relative clause hierarchy and the subject/object relative clause processing and comprehension asymmetry by L1 and L2 speakers will be briefly introduced.

1.5.1 The Noun Phrase Accessibility Hierarchy

Based on the typology of 50 languages, Keenan and Comrie (1977) state that the world languages hold diverse strategies to relativise the grammatical functions of subject, direct object, indirect object, oblique, and object of comparison in a sentence. They propose that relativisability of different grammatical functions are usually positioned in the following hierarchy (1).

1)

Subject > Direct object > Indirect object > Oblique > Genitive > Object of comparison

A relativised noun phrase in the subject position is more accessible than in the direct object, indirect object, oblique, genitive, and object of comparison position. These positions indicate a set of possible grammatical distinctions in any language. Some languages may not have all those positions. However, this hierarchy has its constraints. It says that all languages must allow relativising subjects. A language can be free in the relativisation of the rest of the positions. Keenan and Comrie (1977) assert that a language may have primary relativisation constraints, and it must have a strategy for making relative clauses. If that strategy can be applied to a low position in the hierarchy, then it is used to the higher positions as well. They believe that hierarchy constraints can predict relative clause formation in a wide variety of languages. They propose that the accessibility hierarchy directly reflects the psychological ease of comprehension. That is, the lower a position is on the accessibility hierarchy (i.e., the more to the right in (1)), the harder it is to understand the relative clause formed on that position. They conclude that the comprehension of object relative clauses is harder than that of subject relative clauses, which is also reflected in the hierarchy in (1).

1.5.2 Active Filler Strategy

Based on the syntactic structure of the relative clauses, the Active Filler Strategy proposed by Frazier (1987) states that as soon as the parser encounters a filler (a relative pronoun), a gap (empty category *e*) will be posited in the position of a subject relative clause, which is the earliest possible filler-gap construction. This strategy works for subject relative clauses correctly (2), but for object relative clauses, it causes processing difficulty (3). The presence of an embedded noun phrase right after the relative pronoun (*the baby*) makes the parser has to discard the initial analysis. The reanalysis of the position of the gap increases the processing complexity.

2) [The woman that *e* loved] the baby

3) [The woman that the baby loved *e*]

1.5.3 Structural Distance Hypothesis

Based on the Structural Distance Hypothesis (O’Grady et al., 2003), the structural distance between a relativized antecedent and a gap correlates with the difficulty or easiness of processing a relative clause. The structural distance corresponds to the number of syntactic nodes or projections which intervenes between the antecedent and the gap. Accordingly, the structural distance between the antecedent and gap in the subject relative clause as in (4) is always shorter than that in the object relative clause (5) because the gap is embedded deeper in the object relative clause. In the subject relative clause, the position of gap *e* is located in the inflection phrase whilst the gap is embedded in the verb phrase in the object relative clause. Therefore, Structural Distance Hypothesis predicts a subject relative clause advantage.

4)

The woman that *e* liked the children.

The woman [*CP* that [*IP* *e* [*VP* liked the children]]].

number of nodes between the gap and the antecedent = 2 (CP, IP)

5)

The woman that the children liked *e*.

The woman [*CP* that [*IP* the children [*VP* liked *e*]]]].

number of nodes between the antecedent and gap = 3 (CP, IP, VP)

In the following paragraph, the Structural Distance Hypothesis is considered in the Farsi relative clauses. Example (6), which is a subject relative, has the shortest distance between the head noun and gap; there two projections between the head noun and gap. The verb inflection and the filler denote the same number and person in this example. In example (7), there are three projections between the head noun and gap, but in Farsi,

the gap is not embedded deeper as in the English object relative because it is located before the verb. The verb inflection and the filler does not denote the same number and person in this example. Therefore, Structural Distance Hypothesis may not be applicable to a possible processing asymmetry in Farsi subject and object relative clauses as precisely as that in the English relative clauses. (examples in Farsi are written and read from right to left).

6)

زنی که بچه هارا دوست داشت.

zan-i ke e baçehā rā dust dāšt.

woman-RES COMP child.PL OM friend have-PST.3SG.

‘The woman who(that) liked the children’

the woman [CP ke [IP e [VP the children rā liked]].

number of nodes between the head noun and gap = 2 (CP, IP)

7)

زنی که بچه ها دوست داشتند.

zan-i ke baçehā e dust dāštand.

woman-RES COMP child.PL friend have-PST.3PL.

‘The woman whom(that) the children liked.’

The woman [CP ke [IP the children [VP e liked]].

number of nodes between the head noun and gap = 3 (CP, IP, VP)

1.5.4 Canonical Word Order Theory

According to the Canonical Word Order theory proposed by MacDonald and Christiansen (2002), processing will be challenging if the canonical word order of the L1 relative clause is different from the target language. As explained in the typological section, the word order of English (SVO), Farsi (SOV), and Dutch (SOV) in embedded subject relative clauses is the same as the canonical word order of these languages. In object relative clauses this order changes into OSV in English by changing the place of

the NP and VP. However, in Farsi object relative clauses, the place of NP and VP does not alter. In both subject and object relative clauses, the order of the noun phrase and verb phrase is NP VP. In the relative clauses with a transitive verb, an object marker after the NP differentiates the subject from object relatives.

The relativisation strategies of English, Farsi, and Dutch concerning subject and object relative clauses have in common that relative clauses are almost always post-nominal (although in extraposed relative clauses, the matrix verb comes between the antecedent and the relative clause, it is still post-nominal). However, English is different from Farsi and Dutch in terms of word order. English has an SVO word order, but Farsi and Dutch have an SOV word order. English and Dutch have gapped relative clauses, but in Farsi, depending on the type of relative clause, there may be a resumptive pronoun. The corpus study (Chapter 3) shows that although resumptive pronouns are possible in object relative clauses, gaps are prevalent.

1.5.4.1 Word Order in English Relative Clauses

Depending on the animacy of an antecedent, the relative pronouns ‘*who*’ or ‘*which*’ introduces a subject relative clause (8a and 6b). ‘*Who*’ follows an animate (human being) and ‘*which*’ an inanimate antecedent. The relative pronoun or clause subordinator (Huddleston et al., 2002) ‘*that*’ introduces both animate and inanimate antecedents. Most studies on relative clause processing use the relative pronoun ‘*that*’.

8)

- a. [*The man who/that called you*] is my father.
- b. [*The house which/that costs a lot*] is ancient.

In terms of word order, the canonical word order SVO is maintained in subject relative clauses because the antecedent precedes the relative clause verb [*The man called you*], [*The house costs a lot*].

Depending on the animacy of an antecedent, in object relative clauses the relative pronoun ‘*whom*’ or ‘*which*’ links the antecedent to the relative clause as in example (9).

9)

[*The boy whom/ that I know*] came to the class.

In the object relative clause (9), the object precedes the subject. Therefore, the object relative clause has the OSV word order.

1.5.4.2 Word order in Farsi relative clauses

Regardless of animacy, gender or function of the antecedent, the complementizer /*ke*/ introduces all types of Farsi relative clauses. In subject relative clauses with a transitive verb, the object marker, /*rā*/, follows the embedded noun phrase (10a). If the relativised noun is the object of the matrix sentence, the object marker /*rā*/ may appear after the antecedent or after the relative clause verb (10b).

10) a.

زنی که ظرفهارا می‌شوید خواهر من است.

zan-i ke zarfhā rā mişuyad xāhare
woman-RES COMO dish.PL OM wash-PRS.3SG sister-EZ
man ast.

I be-PRS.3SG.

‘[The woman who is doing the dishes] is my sister.’

10) b.

من دیشب کتابی که روی میز است را خواندم.

man dişab [ketāb-i ke ruy-e miz ast]
I last night [book-RES COMP on-EZ table be-PRS.3SG
rā xāndam.
OM read- PST.1SG.

‘I read [the book which/that is on the desk] last night.’

In the subject relative clauses, in terms of word order, the canonical SOV order of the Farsi language (*the woman the dishes rā is washing.*) is maintained since the antecedent ‘*the woman*’ precedes the object and the subsequent arguments.

Farsi is a pro-drop language, so the subject of an object relative clause (11a) can be dropped (11b).

11) a.

پسری که من می‌شناسم به کلاس آمد.
pesar-i ke man mišenāsam be kelās āmad.
boy-RES COMP I know-PRS.1SG to class come-PST.3SG.
‘The boy whom I know came to the class.’

11) b.

پسری که می‌شناسم به کلاس آمد.
pesar-i ke mišenāsam be kelās āmad.
boy-RES COMP know-PRS.1SG to class come-PST.3SG.
‘The boy whom I know came to the class.’

In sum, in English, a subject relative clause can be changed into an object one by changing the place of an embedded noun phrase and verb phrase (NP+VP/ VP+NP), but in Farsi in both types, the place of an embedded noun phrase and a verb phrase is not altered (NP+VP). In relative clauses with a transitive verb, the subject and object relative clauses are differentiated by an object marker after the object in the subject relatives.

1.5.4.3 Word Order in Dutch Relative Clauses

Subject and object relative clauses in Dutch are verb-final: Less strictly than in Farsi, because you can have all kinds of material after the verb. Nevertheless, the subject and the object must precede it. The relative pronoun is the same in both cases [die] as in the examples (12a, 12b). The canonical word order is SOV in Dutch sentences, but we cannot distinguish subject relative clauses as (12a) from object relative clauses as (12b). Only the number marking on the auxiliary [heeft] in (12a) and [hebben] in (12b) do distinguish them.

12) a.

Morgen zal de professor, die de studenten ontmoet heeft, de diploma's uitreiken.

Tomorrow will the professor, that the students met has, the diplomas present.

'Tomorrow the professor, who has met the students, will present the diplomas.'

12) b.

Morgen zal de professor, die de studenten ontmoet hebben, de diploma's uitreiken.

Tomorrow will the professor, that the students met have, the diplomas present.

'Tomorrow the professor, whom the students have met, will present the diplomas.'

(Mak, 2006, p.467)

So, the word order in the subject and object relative clauses is NP+NP+VP and there is no object marker as in Farsi. If the number of subject and object is the same, then the number of the auxiliary verb will not help distinguish the subject and object relatives, hence they are structurally globally

ambiguous. In other words, the order of an embedded noun phrase and verb phrase inside a Dutch object or a subject relative is fixed (NP+VP).

1.5.5 Semantic-pragmatic and Memory-based Models

The general notion is that processing a subject relative clause sentence is easier than processing an object relative clause. Some studies (e.g., Mak et al., 2002, 2006 and 2008; Traxler et al., 2002) focus on semantic and pragmatic factors, such as animacy, topichood, and discourse on the choice of the subject or object relatives in English and Dutch. Traxler et al. (2002) and Mak et al. (2002) found that object relative clauses with an animate antecedent and inanimate embedded noun phrase are more challenging to comprehend than subject relative clauses with the same animacy condition. Mak et al. (2002 & 2006) stated that the preference of subject or object relative clauses not only depends on topic status and animacy of the subject and object in the relative clause sentences. Object relative clauses with an inanimate antecedent and an animate NP in the relative clause are processed equally easily as subject relative clauses. On the basis of their results, they propose the Topichood Hypothesis of relative clause processing indicating that depending on the animacy and topicality of an antecedent, readers choose one of the noun phrases in the relative clauses as a subject. Mak et al. (2008) show that when an embedded noun phrase refers to the discourse topic, even without any explicit cue, the difficulty of object relative clauses is reduced.

Another model, Perspective-shift (MacWhinney & Pleh, 1988), focuses on sentence-internal relationships. A subject's role is to show the clause perspective since inherently subjects are more salient than objects. Communication is interrupted when interruptions, lack of shared knowledge, complexity and discontinuity take place. Processing an SS (subject-modified, subject-extracted) relative clause as in '*The actor that watched the director forgot a line.*' does not require any perspective shift because the subject of the matrix clause and the relative clause is the same. However, in SO (Subject-modified, object-extracted) relative clauses as in

'The actor that the director watched forgot a line.', two perspective shifts are required: one from the perspective of the subject of matrix clause to the relative clause subject. After processing the relative clause, the second perspective shift occurs, the perspective of the relative clause goes back to the matrix subject.

The similarity-based account, which is a memory-based model, was proposed by Gordon et al. (2006). Based on this model, when the noun phrases (NPs) in an object-extracted relative clause have similar representations (for example, both of them are animate /inanimate or full NPs), the demand on the memory retrieval and storage increases. The results of a lot of memory-based studies indicate that when the available memory traces are similar, the speed and accuracy in memory retrieval decrease. The gap in the relative clause sentences demands retrieval of a noun phrase from memory to fill syntactic or semantic requirements that the verb poses. The similarity of noun phrase type representations illustrates the reason for the difference in processing subject and object relative clauses (Gordon et al., 2001). Gordon and Lowder (2012) argue that parsers have a limited cognitive capacity for processing. Some syntactic structures, such as object relative clauses, exceed this capacity and slow down the processing or cause miscomprehension.

1.5.6 Frequency-based Approaches

Generally, it is believed that people can easily understand structures that they frequently encounter. Therefore, it might be argued that frequent patterns in language might be easier to encode and retrieve than less frequent ones. According to Hutton and Kidd (2011), the asymmetry of relative clause processing in L1 and L2 has been explained by capacity-limit and frequency-based theories. Some complex structures like object relative clauses exceed the limited cognitive capacity of a reader, hence, they reduce the processing pace and comprehension accuracy rate. Frequency-based theories, on the other hand, argue that the frequency of a structure determines its processing speed and comprehension accuracy.

Roland et al. (2007) state that many language comprehension models have claimed that the ease of processing and relative accessibility of some lexical items and sentences are related to their distributional frequencies.

The common assumption among constraint-based, competition, expectation-driven, probabilistic models is that the distributional frequencies of structures, words and the experience of the comprehender are essential in language processing. Based on constraint-based approaches (Gennari & MacDonald, 2008), syntactic and semantic structures continuously work in parallel. During comprehension, the competition between alternative structures goes in parallel. However, the frequency of structures helps the competing structures so that activation of infrequent structures is complicated. They posit that the difficulty of relative clause processing might be related to their frequency.

A frequency-based approach to the subject-object processing asymmetry has been proposed by MacDonald and Christiansen (2002). They argue that experience plays an important role in acquisition and processing. The word order in object relatives is very infrequent or irregular in English, whereas the word order in a subject relative is canonical (subject-verb-object) and regular. They put their idea under the term Frequency $\times$ Regularity approach and state that we can change the frequency of any structure like relative clauses by a higher rate of exposure. Consequently, as a result of higher exposure, relative clause processing speed will be increased.

1.6 Empirical Studies in the Processing of Relative Clauses

In general, the language processing literature shows that processing object relative clauses of the type illustrated in (12) is more complicated than subject relative clauses as in (11).

11)

The actor that annoyed the actress a lot ignored the director.

The actor that the actress annoyed a lot ignored the director.

This effect has been found in various languages, irrespective of word order and placement of the head (final or initial) in post-nominal and prenominal. These languages include English (e.g., Gibson, 1998; Grodner & Gibson, 2005; King & Just, 1991; King & Kutas, 1995; Staub, 2010; Staub et al., 2017; Traxler et al., 2002), Dutch (e.g., Frazier, 1987; Mak et al., 2002, 2006), German (e.g., Mecklinger et al., 1995), Spanish (e.g., Betancort et al., 2009), French (e.g., Holmes & O'Regan, 1981), Chinese (e.g., Chen et al., 2008; Gibson & Wu, 2013; Hsiao & Gibson, 2003;), Japanese (e.g., Ishizuka et al., 2003; Ueno & Garnsey, 2008), Turkish (e.g., Aydin, 2007; Kükürt, 2004), and Korean (e.g., Kwon et al., 2013). However, there are a few exceptions in the literature: for example, object relative clause preference has been reported for Basque (e.g., Carreiras et al., 2010) and some Chinese studies (e.g., Cui, 2013; Wu et al., 2010).

A diversity of on-line and off-line testing methods such as eye-tracking, self-paced reading paradigm, corpus, grammaticality judgement, and word selection tasks have been used in the relative clause processing research in post-nominal and prenominal relative clause languages. In post-nominal relative clause languages, the results of processing experiments with animate referents and full noun phrases converge, but the comprehension results do not converge. In the majority of these experiments, comprehension verifying statements are used for catching the attention of the readers and for data trimming. As Duffeler (2017) states the results of processing experiments in post-nominal relative clause studies have not presented convincing evidence that this processing advantage of subject relative clauses translates into a comprehension one. She claims that several factors, such as animacy of noun phrases, frequency and category (noun or pronoun) influence the processing and comprehension of the relative clauses. The other factor that reduces the

object relative clause comprehension difficulty is a resumption in the Farsi relative clause sentences.

Rahmany et al. (2014) investigated the role of resumption in the interpretation of object relative clauses in L1 Farsi children. They applied a referent selection task in their experiment to test comprehension of subject relative clauses, object relative clause with a gap, and object relative clauses containing a resumptive pronoun or an enclitic. The results showed the facilitative effect of a resumptive element (pronoun or enclitic) on children's object relative clause processing. In other words, the object relative clauses with a resumptive pronoun or enclitic were comprehended more accurately than the gapped subject and object relative clauses. Accordingly, they stated that resumption in Farsi relative clauses sentences reduces the processing burden by providing local cues.

1.7 Relative Clause Processing by L2 Learners

Studies examining relative clause processing by second language learners have been using different off-line and on-line methods, and different results have been reported up to now. The majority of them have indicated some effects of L1 transfer on L2 processing and have shown difficulty in object relative clauses and, in some cases, also in subject relative clauses. In this section, some L2 relative clause processing studies are presented and discussed.

Coene and Duffeler (2014) administered a listening comprehension test to French-speaking learners of English. Their results revealed no difference in the comprehension of subject and object relative clauses. On the contrary, an eye-tracking study by Bulut et al. (2016) on Turkish learners of English showed an asymmetry in both reading patterns and accuracy in L2 English subject and object relative clauses, which indicates that processing object relatives is difficult for L1 Turkish learners of English.

An important role for the L1 was found by Mitsugi et al. (2010) who conducted a self-paced reading experiment accompanied with

comprehension questions. By applying subject, object, and passive relative clauses in their experiment, they investigated whether L1 Korean and L1 English learners of Japanese apply the cues of case-marking and morphology marker in passes relatives. English learners of Japanese had to switch from word order cue in English into case-marking suffixes in parsing the Japanese relative clauses. Their results suggested that object relatives were more difficult to process than subject relatives for native Japanese speakers. L1 Korean learners of Japanese demonstrated native-like performance as they processed object relative clauses more slowly than subject and passive relatives. However, L1 English speakers did not show any asymmetry between subject and object relative clauses and they could not use the local cues in the passive relatives. Moreover, the response accuracy of the comprehension questions for English speakers was less than for Korean speakers. The long reading times and inaccurate cue detection lead the English speakers to non-native like relative clause processing.

Cui (2013) conducted a self-paced reading task and an off-line questionnaire to examine processing and comprehension of the gapped and modifying subject and object Mandarin relative clauses (SS, SO, OS, OO). Native speakers of Mandarin (L1) were compared to speakers of head-initial languages (English, Spanish, and French) and those of head-final languages (Korean and Japanese), who learned Mandarin. The results revealed that the L2 learners processed the Mandarin relative clauses differently from native speakers. The native speakers read the antecedent of the subject relatives more slowly than that of the object relatives only in subject modifying relative clauses (SS). The reading times of the L2 learners as a whole, however, did not show a definite object relative clause processing difficulty, but the head-initial group (English, Spanish, and French) was found to process the antecedent of the subject relative clauses faster than that of the object relative clauses. Regarding the total reading times of the relative clauses, L1 and L2 learners demonstrated a main effect for the matrix position. Native speakers processed object positions (OO,

OS) in the matrix clauses more slowly, but L2 learners read relative clauses in the matrix subject positions (SS, SO) more slowly. In contrast to the processing of relative clauses, the results of the off-line questionnaire showed that subject relative clauses were more complicated than object relatives for both native speakers and L2 learners.

1.7.1 Empirical Studies on the Comprehension of English

Relative Clauses by Farsi Speakers

Yarmohammadi and Rashidi (2009) explain that in Farsi, the particle /*ke*/ acts only as a connective, and the pronoun element needs to be specified at the appropriate place in the relative clause. However, in English, words like *who*, *whom*, *which* are both connective and pronoun. L1 Farsi learners of L2 English, often add an extra pronoun in the clause and produce interlingual errors. Moreover, /*ke*/ is the only connective used for all the relative particles in Farsi. One can expect errors such as '*I saw the man* which was here yesterday*'. These types of errors can be categorised as intralingual (errors resulting from L1 transfer). Farsi speakers often add unnecessary words mistakenly to a clause or an incorrect clause signal either in form or meaning. They use an unnecessary double subject in the relative clauses: *He bought a book which* it is about birds. She told only the friend who *she was at the meeting.*

Rezaeian et al. (2015) investigated the appropriateness of the Interpretability Hypothesis in the acquisition of resumptive pronouns by Farsi speakers. According to the Interpretability Hypothesis, some features in second language learning are not available to adult learners of a language. Resumptive pronouns are one of the features that are not allowed in English but are hard to avoid for adult second language learners (Tsimpli & Dimitrakoupoulou, 2007). So, Rezaeian et al. (2015) studied the acquisition of this ability to avoid resumptive pronouns in English by Farsi-speaking learners of English by applying a grammaticality judgement and production tasks. Their participants, who were at different levels of English language proficiency, had different interpretations regarding the

grammaticality of a resumptive pronoun in subject, object and oblique relative clauses. They found that L1 Farsi L2 English learners at lower levels used resumptive pronouns less in oblique than object relative clauses, which was not in line with the L1 transfer. They even observed the use of a resumptive pronoun by participants in subject relatives, which is not allowed in Farsi. Advanced learners were not as competent as native speakers but better than the beginner levels. Their findings were in line with the Interpretability Hypothesis: The Farsi speakers try the easiest way to acquire L2 by transferring L1. As applying a resumptive pronoun may decrease the memory load, they generalise it in all three relative clause types.

Farsi and Zarei (2013) investigated the extent to which Farsi speakers make errors in encountering English relative clauses by a multiple-choice test. They concluded that Farsi L2 learners had a problem in distinguishing between restrictive and non-restrictive relative clauses. These learners also had difficulties in the correct application of relative pronouns, deletion of pronouns in reduced forms, and object pronouns. They made mainly interlingual errors (L1 transfer).

Focusing on English relative clauses, Enjavinezhad and Paramasivam (2014) investigated the development of the interlanguage grammar of Farsi speakers acquiring English at different proficiency levels. They predicted that abandoning resumptive pronouns in L2 relative clauses would be problematic for Farsi speakers. They applied a grammaticality judgement task including direct object, indirect object, the object of the preposition, genitive object, and object of comparative relative clauses with a resumptive pronoun. The tendencies within two groups of advanced and intermediate L2 speakers on the grammaticality judgement task fitted well with the predictions made by the Full Transfer Full Access hypothesis, maintaining that in the initial stages of L2 learning, L1 grammar transfers to L2, and Universal grammar is available for L2 learners. Moreover, the advanced L2 learners could successfully abandon resumptive pronouns in English relative clauses.

As can be seen in the preceding experiments, the researchers mostly applied off-line methods in their experiments, and most of their results suggested that Farsi speakers transfer their L1 on L2 English. They apply a resumptive pronoun in English relative clauses, which is a morphological cue in some Farsi relatives, whereas they cannot differentiate English relative pronouns which are morphological cues in English. We may conclude that Farsi-speaking learners of English should either learn the strategies explicitly for English relative clause processing or receive enough input for L2 relative clause processing.

To the extent of our knowledge, little is known about how Farsi speakers process relative clauses in Farsi as their native language and English as a foreign language. We believe that this is the first work that investigates how relative clauses are processed on-line in the Farsi language with post-nominal relative clause and fixed relative clause word order by Farsi speakers. We want to directly compare this with English relative clause processing by the same participants. We will also compare L2 processing by Farsi and Dutch speakers, whose first languages are typologically similar regarding the relative clause sentences. Since the language processing literature in some languages does not show a convergent trend in terms of relative clause comprehension, we will investigate the relative clause comprehension by Farsi speakers in an off-line survey experiment as well. We aim to answer the following question in this dissertation:

1. What are the crucial differences between English and Farsi in terms of syntax that may influence Farsi speakers' English learning?
2. Which relative clause types are frequent in the Farsi language? Which factors influence the frequency of the relative clauses in the Farsi language?
3. Is there any processing asymmetry between Farsi object and subject relative clauses by L1 Farsi speakers?

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4. Is the frequency distribution of Farsi restrictive and non-restrictive object and subject relative clauses reflected in their processing by L1 Farsi speakers?
 5. How do Farsi-speakers process English subject and object relative clauses in *that*-clause and *who(m)*-clause conditions? Is there a cross-linguistic effect of L1 Farsi on the L2 English relative clause processing?
 6. How do Dutch participants process English subject and object relative clauses in *that*-clause and *who(m)*-clause conditions? Do Farsi-speakers and Dutch process English relative clauses similarly?
 7. How do Farsi speakers comprehend English subject and object relative clauses in *that*-clause and *who(m)*-clause conditions? Does the English language proficiency of the Farsi speakers influence their comprehension of the subject and object relative clauses in *that*-clause and *who(m)*-clause conditions?

We hypothesise that processing Farsi restrictive and non-restrictive subject and object relative clauses follow the frequency distribution of relative clauses in the Farsi corpus. Second, we hypothesized that processing English relative clauses in *that*-clause and *who(m)*-clause conditions by Farsi speakers and Dutch is influenced by the structure of relative clauses in their native language. Third, comprehension of English subject and object relative clauses in *that*-clause and *who(m)*-clause conditions by Farsi speakers is influenced by their English language proficiency.

To answer the research questions in this dissertation, we will first present a brief linguistic contrastive analysis of English and Farsi syntax. Then, we will conduct a corpus study, three eye-tracking experiments, and one survey study. The outline of the dissertation is presented in the following sections.

Chapter 2 presents a brief overview of the Farsi language as an introduction to the remainder of the dissertation. After providing a brief

language profile and explanation of some general features of Farsi syntax, the focus will be on relative clause constructions and their realisations in the Farsi language. We will continue by discussing relative clauses in detail, including the distinction between restrictive and non-restrictive relative clauses, resumptive pronouns, the restrictive relative clause markers, and the object marker.

In **Chapter 3**, we will explore in detail the frequency distribution of relative clauses in the Farsi language by conducting a corpus study. The results will be used in setting up an experiment to compare the processing of relative clauses in English and Farsi. The corpus study will investigate to what extent the possible syntactic forms may be used. Frequency distribution of different types of relative clauses, restrictive, non-restrictive relatives, and the effect of animacy of noun phrases and resumptive pronouns will be studied.

Chapter 4 includes an on-line experiment with an eye-tracking instrument. We will study how Farsi speakers process Farsi subject and object relative clauses within two conditions of restrictive and non-restrictive types.

Chapter 5 includes an on-line experiment with an eye-tracking instrument. We will investigate whether there is a subject-object asymmetry in relative clause processing by Farsi speakers in L2 English with two conditions of *that*-clause and *who(m)*-clause relatives. Moreover, we will investigate whether there is a cross-linguistic influence of L1 Farsi on L2 English in the processing of relative clauses.

Chapter 6 includes an on-line experiment with an eye-tracking instrument. We will test Dutch participants' processing of English relative clauses to learn whether Farsi speakers and Dutch with similar word order in their L1 process L2 English relative clauses similarly or differently.

In **Chapter 7**, by applying an off-line method, we will test the comprehension of the L2 English relative clauses with or without a morphological cue by Farsi learners of English. Moreover, the reaction

time for choosing the answers and reading times of the relative clause sentences will be analysed.

In **Chapter 8**, the research questions will be revisited briefly. The main findings of this dissertation will be summarized and related to the applied processing theories. Finally, some pedagogical implications and a conclusion will be presented.

Chapter 2

Chapter 2

Farsi Syntax

This chapter presents a brief overview of the Farsi language as an introduction to the remainder of the dissertation. In the following sections, the focus will be on Farsi relative clauses, their processing and comprehension. The current chapter will focus on relative clause constructions and their realizations in the Farsi language. Therefore, after providing a brief language profile and explaining some general features of Farsi syntax, we will continue by discussing relative clauses in detail, including resumptive pronouns, restrictive relative clause markers, and object markers.

2.1 Persian and Farsi

Persian is a member of the Indo-Iranian branch of Indo-European languages. The term Persian derives from Greek *Persis*. West and East Iranian languages comprise the Iranian group of the Indo-Iranian branch of the Indo-European family of languages. Indo-Iranian languages are spoken in a wide area stretching from eastern Turkey and eastern Iraq to western India (Windfuhr, 2009). According to Payne and Mahmoodi-Bakhtiari (2017), “the distinction of the Eastern and Western Iranian languages lies in the basic geographical distribution of the main speakers of these languages, on the east or the west of Kavir and Lut desserts in Iran” (p. 441). The languages like Balochi, Zaza, Persian[Farsi], Kurdi, and Gorani which are spoken in Iran are called Western Iranian languages. The languages like Yaghnobi, Shuhni, and Wakhi which are spoken in Tajikistan, Afghanistan and Western China are called Eastern Iranian languages.

There are three major dialect divisions of Persian: Farsi in Iran, Dari spoken in Afghanistan, and Tajik which is a variant spoken in Tajikistan in Central Asia. These three variants are mutually intelligible, and despite the influence of neighbouring Turkic languages, Farsi and Dari remained quite similar (Windfuhr, 2009). According to Windfuhr (2009), bilingualism and multilingualism are frequent in Iranian speaking districts. Turkic languages and their dialects are the most widely spoken language beside Farsi.

According to Karimi (n.d.), “the unmarked usage of *Persian*, referring to *Farsi*, gives the impression that this variant is the main version, and the other two have derived from it. This is not true linguistically though: the syntactic properties of *Tajiki* and *Dari*, for example, are closer to the syntax of the earlier stages of *Persian* than *Farsi* is” (para, 4). Although Persian is used as the English equivalent of the Farsi language, this is misleading. Accordingly, since the present investigation concerns the variant of Persian spoken in Iran, we consistently apply the term Farsi throughout.

Farsi is the only legitimate official language used for all government communication and documentation, the media, and as the language of instruction in schools and universities. The Farsi speaking population of Iran constitutes almost 36% of the total population and is mainly concentrated in central and eastern Iran. According to the latest estimates, the Farsi speakers and those speaking very close dialects of Farsi such as Luri, Bakhtiari, Lak, Kurdish, Gilak, Taleshi, and Mazandarani make up around half of the total population. The other half is composed of speakers of non-Iranian languages such as [mainly] Turkic, Arabic, and Assyrian (Asgharzadeh, 2007).

Throughout history, Farsi has been written with several scripts, including Old cuneiform, Pahlavi, Aramaic, and Avestan. However, after the Islamic conquest of the Sassanid Empire in 642 CE, Arabic became the language of the government, culture, and religion and influenced the Farsi script. Modern Farsi consists of 32 letters, written in a version of the Arabic script (consisting of 28 letters). In Farsi, words are written from right to left, while numbers are written from left to right. It is entirely written cursively, that is, the majority of letters in a word are connected. Therefore, the appearance of a letter changes depending on its position. Short vowels are not spelt out, which means that the context determines the pronunciation and meaning of many words. Arabic loan words are written with their original spelling, though they are often pronounced quite differently in Farsi (Iran chamber society, 2020).

2.2 Farsi Syntax

In this section, we will present a brief overview of Farsi syntax. We will concentrate on constructions and aspects directly related to relative clauses: the word order, pronouns, compounds, and straightforward verbs, tenses, voice, subject-verb agreement, head initial constructions, relative clauses, resumptive pronouns, and different types of particle *ی* /-i/ and particle *را* /rā/. It is necessary to mention that examples in this chapter are in Farsi. Therefore, to make the examples tangible for non-Farsi speakers,

we will provide examples in Farsi, which is written from right to left, followed by the transcription in the next line, the gloss in the third line, and the translation of the example in English in the last line. The glosses follow The Leipzig Glossing Rules: Conventions for interlinear morpheme-by-morpheme glosses (Comrie et al., 2008). The abbreviations outlined in Table 2.1 will be used in the glosses throughout the chapters where it is necessary.

Table 2. 1 *List of Abbreviations Used in the Glosses.*

COMP	complementizer /ke/	PRS	present
SG	singular	FUT	future
PL	plural	RES	restrictive
OM	object marker	ā	long vowel /a/
INF	infinitive	š	/sh/ as in <i>shake</i>
PST	past	ç	/ch/ as in <i>chair</i>
PRF	perfect	INDF	indefinite
IMP	imperative	PTCP	participle
NEG	negation	subjunctive	SBJV

2.2.1 Subject

Farsi is a pro-drop language; the subject of a sentence is sometimes not apparent until the end of a verb, which is at the end of a sentence. Therefore, Farsi is a null-subject language that makes sentences without any evident subjects. Interestingly, information about the subject can be retained from the inflexion on the verb as the example (1) illustrates.

1)

(ما) مدرسه میرویم.

(mā) madrese miravim.

(We) school go-PRS.3PL.

‘We go to school.’

The verb is marked for tense and aspect and usually agrees with the subject in person and number (see example 2). There is one exception to this issue, which will be explained in chapter 3.

2)

(ما) کیک خوردیم.

(mā) keik xordim.

(We) cake eat-PST.3PL.

‘We ate cake.’

The personal pronoun, /mā/ ‘we’ at the beginning of the sentence (2) is subject and the parentheses show that the subject is optional. The second word (from the right), ‘cake’, is the object and the last word /xordim/, ‘ate’ is the verb.

2.2.2 Object and Object Marker

Yousef and Torabi (2013) mention that a preposition به /be/ ‘to’ occurs before an indirect object in Farsi, while a direct object never has a preposition. So, indirect objects are more easily recognizable in Farsi than in English. When both direct and indirect objects are present, the direct one usually occurs first. In English the indirect object can be expressed in two ways: [*give someone something*] or [*give something to someone*], but in Farsi, only the second version can be used, [*give something to someone*]. Example sentence (3) from Taghvaipour (2005) demonstrates a typical word order in Farsi (subject, direct object, indirect object, and verb). In example (3), ‘teacher’ is the subject, ‘book’ is the object which is followed by the object marker /rā/ (more details follow below), ‘to me’, the indirect object, and ‘gave’ is the verb.

3)

معلم کتاب را به من داد.

moallem ktāb rā be man dād.

teacher book OM to I give-PST.3SG.

‘The teacher gave me the book.’

In Farsi, a transitive verb with a direct object takes an object marker postposition ر /*rā*/ in a formal register and the variants of ‘*ro*’ or ‘*o*’ are used as a more colloquial form. However, there is controversy over the definiteness of the object marker. The studies of Lambton (1979), Lazard (1992), Mahootian and Gebhardt (1997), Sadeghi (1970), Windfuhr (2011), and Yousef and Torabi (2013) qualify the postposition ر /*rā*/ as a definite object marker and imply that all definite objects in Farsi must be marked with /*rā*/.

It is important to mention that indefinite nouns are marked with either the suffix ی /-i/, the numeral /*yek*/, ‘one’, or a combination of both. The unstressed suffix ی /-i/ can be added to a plural or singular noun phrase. Before a singular indefinite noun, the word /*yek*/, ‘one’ can be used to show indefiniteness (Yousef & Torabi, 2013). Lack of any indefinite marker implies that a noun is definite. Therefore, there is not a definite article in Farsi like ‘*the*’ in English. Samvelian (2018) states that personal pronouns, proper nouns, and noun phrases that are marked definite by a demonstrative must have an object marker, as in (4). Omission of /*rā*/ in the following case yields the sentence ungrammatical.

4)

آن زن را / آینور را / شما را دیدم.

ān zan rā / āynour rā / šoma rā didam.

that woman OM/ Aynour OM/ you OM see-PST.1SG.

‘I saw that woman / Aynour / you.’

Samvelian (2018) adds that definiteness is a sufficient condition for the direct object to be marked with /*rā*/ . Still, it is not a necessary condition because in some cases, an indefinite object takes the object marker /*rā*/, as

in example (5). The sentence in (5) would still be grammatical in case /*rā*/ is omitted.

5)

زهرا دختری را در مغازه دید.

Zahrā doxtar-i rā dar magāze did.

Zahra girl-INDF OM in store see-PST.3SG.

‘Zahra saw a girl in the store’.

However, some scholars like (Browne, 1970; Karimi, 1989 as cited in Samvelian, 2018) claim that specificity of the object determines the necessity of an object marker rather than being definite or indefinite (Samvelian, 2018). In example (6), the noun ‘bird’ comes with یک /*yek*/ ‘one’ and ی /*-i*/ that are indefinite markers. Therefore, based on Browne (1970), را /*rā*/ cannot be a definite marker. Yousof and Torabi (2013) mention that the combined way of (*yek* + *-i*) in making an indefinite noun colloquial in spoken language, but this construction is not used in the written genre.

6)

او یک پرندۀ ای را شکار کرد.

u yek parandei rā šekār kard

he /she one bird-INDF OM hunt do-PST.3SG.

‘He /she hunted a bird.’

Specificity of an object noun phrase is not the only condition for having the object marker /*rā*/. There are many cases of generic nouns as objects which take an object marker like in example (7) (Dabir-Moghaddam, 1992; Ghomeshi, 1997 as cited in Samevelian, 2018).

7)

اینجا جشنها را در خیابان میگیرند.

injā jašnhā rā dar xiyābān migirand.
 here celebration.PL OM in street hold-PRS.3PL.
 ‘Here the celebrations are held in the street’. (Lit. They hold the
 celebrations in the street).

Therefore, we may conclude that the object marker /rā/ can occur with a definite, an indefinite, a specific, or a general noun in a sentence that has a transitive verb.

2.2.3 Pronouns

There are two types of pronouns in Farsi, personal/free pronouns and bound pronouns/pronominal enclitics. Unlike in English, Farsi personal pronouns are not called subject pronouns because all of them may either function as a subject or object of a sentence, and they can also be used in a possessive construction. In Table 2.2, the free pronouns are shown in Farsi in the first row. In the second and third row, the transcription and English equivalents of the free pronouns are added.

Table 2. 2 *Personal Free Pronouns, Their Transcriptions, and English Equivalents.*

Number Person	Singular	Plural
1 st	من /man/ ‘I’	ما /mā/ ‘we’
2 nd	تو /to/ ‘you’	شما /šoma/ ‘you’
3 rd	او / u/ ‘he/she’	ایشان, آنها / anhā, išan/ ‘they’

The demonstrative pronoun آن /ān/, ‘that’, is used to mean ‘it’. The personal pronouns are by their nature definite and consequently take را /rā/ (Lambton, 1979).

In Table 2.3, Farsi and English pronouns are contrasted based on their function as a subject, object, possessive pronoun, and possessive adjective.

Table 2.3 *Farsi and English Pronouns Based on Their Functions in the Farsi Sentences.*

Pronoun function	Example
Subject	من معلم هستم. Man moallem hastam. I teacher be-PRS.1SG 'I am a teacher.'
Object	رضا من را دید. Rezā man rā did. Reza I OM see-PST.3SG. 'Reza saw me .'
Possessive Adjective	علی کتاب من را پس داد. Ali ketāb-e man rā pas dād. Ali book-EZ I OM again give-PST.3SG. 'Ali returned my book.'
Possessive pronoun	این ماشین مال من است. In māšin māl-e man ast. This car belong-EZ I be-PRS.3SG. 'This car is mine (this car belongs to me).'

As illustrated in Table 2.3, the pronoun *من* /*man*/, 'I' stays constant, whereas in English the pronoun changes according to its usage in the sentence (*I, me, my, and, mine*). It is worth mentioning that as a sign of respect, in Farsi the second person plural *شما* /*šoma*/, 'you', is used instead of the singular *تو* /*to*/, 'you' (like *vous* in French instead of *tu*). In the formal form, *آنها* /*anhā*/ and informal form, *ایشان* /*išān* / represent 'they'. When a younger person or a person of an inferior status talks to someone older or from a higher rank, the first person plural 'we' is applied instead of 'I' to show humility and respect.

The other type of pronouns is personal endings or pronominal enclitics which cannot come in a subject position (8) in a matrix sentence or any subordinate clause. Bound pronouns are the endings for pronouns which are used in the object (9) and possessive (10).

Table 2. 4 *Bound Pronouns or Pronominal Enclitics in Farsi.*

Number	Pronominal enclitics
Singular	م- /m/ 'my'
	ت- /at/ 'your'
	ش- /aʃ/ 'his/her'
Plural	مان- /mān/ 'our'
	تان- /tān/ 'your'
	شان- /ʃān/ 'their'

8)

*م یک دکتر هستم.

*m yek doctor hastam.

enclitic.1SG one doctor be-PRS.1SG

* 'I am a doctor.'

9)

سینا مرا به مهمانان معرفی کرد.

sinā marā be mihmanan moarrefī kard.

Sinā I-OM to guest-PL introduction do-PST.3SG.

'Sina introduced me to the guests.'

10)

دوستان هلندی است.

dustemān holandi ast.

friend-EZ-our Dutch be-PRS.1SG.

‘Our friend is Dutch.’

2.2.4 Verbs

Verbs usually occur at the end of a sentence. A simple verb consists of only one word. However, a compound verb consists of two parts, a non-verbal and a simple verb, for example, کار کردن /*kār kardan*/, ‘to work’. Verbs may be transitive or intransitive like in English. Some verbs have a complement that describes the subject, and almost all verbs of being, seeming, becoming (copula) need a complement (11).

11)

دوستم مریض است.

dustam mariz ast.

friend-my sick be-PRS.3SG.

‘My friend is sick.’

In verbs that have an object of a preposition, the second part affected is preceded by a preposition (12).

12)

از من پرسیدند.

az man porsidand.

from I ask-PST.3PL.

‘They asked me.’ (Lit. ‘They asked from me.’)

An object of a preposition in Farsi can be a direct object as its English equivalent (13). The verb ‘*fear*’ takes an object of a preposition in Farsi, but in English, it takes a direct object.

13)

از کسی ترسیدن

az kasi tarsidan

from someone fear-INF

‘To fear someone.’ (Lit. ‘To fear from someone’)

2.2.5 Subject-Verb Agreement

Between the subject of the sentence and the verb, there is an agreement in person (14) and number (16). In example (15), the first person singular subject /*man*/ ‘I’ does not agree in person with the /-/ third-person singular. In instance (17), the third person plural does not agree in number with /-i/, third-person singular. There is no agreement in gender since Farsi does not have grammatical gender.

14)

من کلید را به او دادم.

man kelid rā be u dādam.

I key OM to him/her give-PST.1SG.

‘I gave the key to her/him.’

15)

*من کلید را به او دادی.

*man kelid rā be u dādi.

***I** key OM to him/her give-PST.3SG.

*(Lit. ‘I the key to her/him you gave.’)

16)

آنها به دانشگاه رفتند.

anhā be danešgāh raftand.

they to university go-PST.3PL.

‘They went to the university.’

17)

*آنها به دانشگاه رفتی.

*anhā be danešgāh rafti.

*they to university go-PST.2SG.

*(Lit. 'They to the university you went.')

It is worth mentioning that inanimate (non-human) plural nouns take a singular verb-ending. In example (18), '*the books*' is a plural noun, but it takes the verb '*is*' with a singular verb ending. We will discuss animacy in detail in Chapter 3 and Chapter 8.

18)

کتابها توی کتابخانه است.

ketābhā tuy-e ketābxane ast.

book-PL in-EZ library be-PRS.3SG .

'The books are in the library.' (Lit. The **books is** in the library.)

2.2.6 Tenses

Farsi has eight of the most common tenses. Four types of tenses--past, present, imperfect, and present subjunctive—have one-word forms. The other tenses-- perfect, perfect subjunctive, pluperfect, and future—have compound word forms. We will explain the most relevant ones--present, past, and future--here. The past form is made by deleting the infinitive suffix ن /an/ and adding the personal endings or inflections in Table 2.5 as in example (19).

19)

خواند

خواندن

xāndan

xānd

read-INF

read- PST.3SG

'To read'

'He/she read'

Table 2. 5 *Personal Endings of the Past Tense in Farsi.*

Number Person	Singular	Plural
1 st	ام /am/ 'I'	ایم /im/ 'we'
2 nd	ی /i/ 'you'	ید /id/ 'you'
3 rd	/-/ 'he/she'	ند /and/ 'they'

The present tense is formed with present prefix (می /mi/) + present stem (by deleting ندن /ndan/, دن /dan/) + present personal endings or inflexions as provided in Table 2.6.

20)

xāndan
read-INF
'To read'

mixānam
read-PRS.1SG
'I read.'

می خوانم

خواندن

Table 2. 6 *The Personal Endings of the Present Tense in Farsi.*

Number Person	Singular	Plural
1 st	م /am/ 'I'	ایم /im/ 'we'
2 nd	ی /i/ 'You'	ید /id/ 'you'
3 rd	د /ad/ 'he/she'	ند /and/ 'they'

As illustrated in Table 2.5 and Table 2.6, the same personal endings are applied to the present and past. The only exception is that the third person singular in the past has no inflectional ending. The future tense is formed with an auxiliary verb as in Table 2.7 (خواه /xāh/ 'to want') + a shortened form of infinitive which looks like simple past tense. The auxiliary verb خواه /xāh/ 'to want' is conjugated in Table 2.7.

21)

من یک کتاب خواهم نوشت.

man yek ketāb xāham nevešt.

I one book want-PRS.1SG write-PST.3SG.

'I will write a book.'

Table 2. 7 *Auxiliary Verbs That are Used in the Future Tense in Farsi.*

Number Person	Singular	Plural
1 st	خواهم /xāham/	خواهیم /xāhim/
2 nd	خواهی /xāhi/	خواهید /xāhid/
3 rd	خواهد /xāhad/	خواهند /xāhand/

2.2.7 Voice

In Farsi, the passive voice is formed with a past participle of the verb + the auxiliary verb شدن /*šodan*/, ‘to become’. The auxiliary verb is conjugated in the target tense. The passive voice of the simple verb ‘to build’ in the past tense for the third person singular is conjugated as in the following example (22).

22)

ساخته شد.

sāxte šod.

build-PTCP become-PST.3SG.

‘It was built.’

2.2.8 Word Order in a Farsi Sentence

As a general rule, Farsi has the canonical word order of SOV (Subject – Object -Verb). In a noun-predicate clause, the regular order is subject-predicate-copula (23), and in a verb-predicate clause, the word order is subject-direct object-verb (24) (Aghaei, 2006).

23)

سینا پسر خوبی است.

Sinā pesare xubi ast.

Sinā boy-EZ good-INDF be-PRS.3SG.

‘Sina is a good boy.’

24)

سایان در را باز کرد.

Sāyān dar rā bāz kard.

Sayan door OM open do-PST.3SG.

‘Sayan opened the door.’

In informal speaking, other word orders may occur, as shown in the following examples adopted from Aghaei (2006). In (25), for example, the word order is SOV, and in (26) it is OSV. However, in (27), the verb is topicalized, and the word order is VOS (Aghaei, 2006, p. 19-20).

25)

ما علی رو به مهمانی دعوت کردیم.

ma Ali ro be mehmani davat kardim.

we Ali OM to party-INDF invitation do-PST.1PL invitation.

‘We invited Ali to a party.’

26)

علی رو ما به مهمانی دعوت کردیم .

Ali ro ma be mehmani davat kardim.

Ali OM we to party-INDF invitation do-PST.1PL.

‘We invited Ali to the party.’

27)

زدم علی رو من.

zadam Ali ro man.

hit-PST.1SG Ali OM I.

‘I hit Ali.’

We mentioned that the canonical word order in Farsi is SOV and declarative sentences mainly follow this canonical SOV word order. Moreover, there are two types of interrogative sentences in Farsi: yes/no and question-word questions. The word order in questions does not change when compared to their declarative equivalents. Only a question word آيا /āyā/ may or may not be added to the beginning of a sentence with a yes/no question form (28). In question-word types (wh-questions in English), a question word is placed within a sentence, and it does not change the main word order of the sentence (29).

28)

روزنامه خریدی؟

ruznāme xaridi?

newspaper buy-PST.2PL?

‘Did you buy the newspaper?’

29)

شما دیروز کجا رفتید؟

šomā diruz koja raftid?

you yesterday where go-PST.2PL?

‘Where did you go yesterday?’

2.2.9 Head-initial and Post-Nominal Structures in Farsi

Regarding noun phrases and prepositional phrases, Farsi is a head-initial and verb-final language. Noun-genitive (30), noun-adjective (31), noun-relative clause structures (32) are examples of post-nominal structures in Farsi. It means that modifiers and possessives come after the antecedent as in the following cases (30 and 31). It is worth mentioning that the *اضافه* /ezafe/ particle /-e/ which is an unstressed short vowel usually links nouns with their modifiers or possessors.

30)

دفتر من

daftar-e man
notebook-EZ I
'My notebook'

31)

یک خانه بزرگ

yek xāneye-e bozorg
one house-EZ big
'A big house'

Relative clauses (32) in Farsi are also post-nominal or head-modifying.

32)

دختری که من دیدم زیبا بود.

doxta-i ke man didam zibā bud.
girl-RES COMP I see-PST.1SG pretty be-PST.3SG.
'The girl whom I saw was pretty.'

In the following section, we will focus on the main linguistic feature of Farsi that will be investigated in detail in the next chapters: relative clauses and resumptive pronouns in Farsi.

2.2.10 Relative Clauses

A relative clause is a subordinate clause that is embedded in a matrix sentence. In the example '*The dog that ate the rawfish died*', '*the dog died*' is the matrix sentence and '*that ate the rawfish*' is a subordinate clause. According to Huddleston et al. (2002), an antecedent (head noun) determines the interpretation of an anaphoric element inside a relative clause structure. In English, the relative pronouns *who*, *whom*, *which*, and *whose* mark a relative clause overtly, and they additionally replace a

subject (33) and an object (34) of the relative clause when these nouns are co-referential with the antecedent. However, the anaphoric element in the relative clauses with ‘*that*’ or bare relatives is covered.

33)

The students **who** sit in the back of the room make noise.

34)

This is the professor **whom** I met at a conference last year.

In Farsi, the complementizer *که* /*ke*/ introduces the relative clause regardless of the function, animacy, and gender of the antecedent in the relative clause (Taghvaipour, 2005). In English, the relative pronoun in object relative clauses can be omitted as in [*the book I bought*]. However, the occurrence of /*ke*/ in the equivalent Farsi structure is obligatory (Aghaei, 2006). Additionally, if the antecedent is definite and the direct object of the matrix sentence and the subject of the relative clause like ‘*that woman*’ in (35) and (36), the presence of an object marker *را* /*rā*/ will be optional. So, example sentences (35) and (36) are identical in meaning and both grammatically correct.

35)

آن زنی را که دیروز آمد دیدم.
ān zan-i rā ke diruz āmad didam.
that woman-RES OM COMP yesterday come-PST.3SG see-PST.1SG.
‘I saw the woman who came yesterday.’

36)

آن زنی که دیروز آمد دیدم.
ān zan-i ke diruz āmad didam.
that woman-RES COMP yesterday come-PST.3SG see-PST.1SG.

‘I saw the woman who came yesterday.’

(Mace, 2003, p.76)

As explained in Chapter 1, the relative clauses can be divided into groups of restrictive (integrated) and non-restrictive (supplementary). A restrictive relative clause is necessary to interpret the antecedent and, hence, it is much more close to the matrix sentence, but in non-restrictive (supplementary) relatives, some extra information is given about the antecedent. In the following section, we will elaborate on these relative clauses in Farsi.

2.2.10.1 Restrictive and Non-restrictive Relative Clauses

According to Lambton (1979), “a restrictive relative clause is closely linked to the antecedent in thoughts, whereas a non-restrictive relative clause does not limit the application of the antecedent, so it is logically an independent proposition” (p.77). Moreover, Langacker and Langacker (2008) indicate that to represent the distinction, a restrictive relative clause is part of the nominal in question, but the non-restrictive is external to it. To put it simply, a restrictive relative clause defines a noun or a noun phrase and adds necessary information about it to the sentence. In contrast, a non-restrictive relative clause adds extra information to the sentence. Two commas separate a non-restrictive English relative clause from the rest of a matrix sentence, but in a Farsi non-restrictive relative clause, punctuation marks are not standardized and are not always applied (Yousef & Torabi, 2013). In Farsi, a restrictive relative clause, which occurs with an antecedent, is marked with the enclitic particle *ـه* /-i/, and there is no major intonation break between a relative clause and an antecedent. As Tabaian (1975) states, ‘an attributive [restrictive] relative clause may modify either a definite or indefinite noun. But an appositive [non-restrictive] relative clause always modifies a definite noun’ (p.79). Example sentences (37) and (38) illustrate a restrictive and non-restrictive relative clause, respectively.

37)

مؤلفی که این کتاب را نوشته است نویسنده خوبی است.

moallem-i ke in ketāb rā nevešte ast
author-RES COMP this book OM write-PRS-PTCP be-PRS.3SG
nevisandeye xubi ast.
writer-EZ good-INDF be-PRS.3SG.

‘The author who has written this book is a good writer.’

38)

مؤلف که این کتاب را نوشته است نویسنده خوبی است.

moallem ke in ketāb rā nevešte ast
author COMP this book OM write-PRS-PTCP be-PRS.3SG
nevisandeye xub-i ast.
writer-EZ good-INDF be-PRS.3SG.

‘The author, who has written this book, is a good writer.’

In Farsi, the antecedent in a matrix sentence may be modified by several clauses, which are joined by the coordinator و /va/, ‘and’ as in example (39) (Tabaian, 1975).

39)

مردی که آمد و با شما صحبت کرد دوست من است.

mard-i ke āmad va bā šomā
man-RES COMP come-PST.3Sg and with you
sohbat kard dust-e man ast.
talking do-PST.3SG friend-EZ I be-PRS.3SG.

‘The man who came and talked to you is my friend.’

In Farsi, in some conditions, any noun in a relative clause that is co-referential with an antecedent can be replaced with a personal pronoun called a resumptive pronoun.

2.2.11 Resumptive Pronoun

A resumptive pronoun is a pronoun inside a relative clause that refers to an antecedent. It is “a pronominal variable that appears in a position from which a movement is proposed to occur” (McKee and McDaniel, 2001, p. 114). McKee and McDaniel (2001) state that in English, resumptive pronouns are generally very limited. They consider resumptive pronouns in English a parsing effect: as the antecedent gets farther from the position to which it relates, the parser has a harder time keeping track of the association. A resumptive pronoun would not be used in a sentence with a short distance between antecedent and trace. Moreover, they argue that extractability is the most important factor that influences the distribution of resumptive pronouns in English relative clauses. For instance, in (40), the trace is not acceptable, but the resumptive pronoun is. However, in (41), the resumptive pronoun is not acceptable, but a trace is.

40)

- a. * That is the girl that I do not know what *t* did.
- b. That is the girl that I do not know what *she* did.

41)

- a. * That is the girl that I like *her*.
- b. That is the girl that I like *t*.

(McKee & McDaniel, 2001, p. 115)

If a personal pronoun is allowed to act resumptively, it occurs in an expected gap. In Farsi, “resumptive pronouns and enclitics are marked for number, and in the third person, singular contexts resumptive pronouns make an animate/inanimate distinction (i.e., she/he vs it)” (Rahmany et al., 2014, p. 939). The following example (42) shows a resumptive pronoun in the indirect object relative clause:

42)

دختری که به او گل دادی آمد.

doxtar-i ke be u gol dādi āmad.
 girl-RES COMP to he/she flower give-PST.2SG come-PST.3SG.
 ‘The girl whom you gave flower came.’

Taghvaipour (2005) shows that resumptive pronouns and gaps are distributed differently in restrictive and non-restrictive Farsi relative clauses (see Table 2.8).

Table 2. 8 *Distribution of Resumptive Pronouns in Restrictive and Non-restrictive Farsi Relative Clauses (adopted from Taghvaipour, 2005).*

	Subject		Direct Object		Genitive		Oblique	
	Res /Non-res		Res /Non-res		Res /Non-res		Res /Non-res	
Gap	yes	yes	yes	no	no	no	yes	no
RP	no	no	yes	yes	yes	yes	yes	yes

Note. Res = restrictive, Non-res = non-restrictive, RP = resumptive pronoun.

In the following section, the distribution of resumptive pronouns in restrictive relative clauses in different Farsi relative positions will be explained.

2.2.11.1 *Resumptive Pronoun in a Subject Position*

As illustrated in Table 2.8, a resumptive pronoun cannot appear in a subject position because it makes the construction unacceptable (43 b).

43) a.

زنی که رفت.

zan-i ke raft.
 woman-RES COMP go-PST.3SG.
 ‘The woman that went.’

43) b.

*زنی که او رفت.

*zan-i ke u raft.

* woman-RES COMP he/she go-PST.3SG.

*'The woman that he/she went.'

Unlike Taghvaipour (2005) who insists that a resumptive pronoun cannot occur in any subject position, Zahedi et al. (2012) have a different opinion. They believe that a gap is preferred in an unmarked subject position, but a resumptive pronoun occurs when this position is focused and shows a sort of uniqueness. As illustrated in example (44), if the subject is emphasized and it displays a kind of distinction, then a resumptive pronoun will be applied.

44)

دکتر رضایی که فقط او بیماری من را معالجه کرد اهل تبریز است.

doktor rezāi ke fagat u bimāriy-e man rā

doctor Rezai COMP only he/she illness-EZ I OM

moāleje kard ahle tabriz ast.

cure do-PST.3SG from Tabriz be-PEST.3SG.

'Dr Rezai, who (is the only one) could cure my illness, is from Tabriz.'

(Lit. Dr Rezai, who (only he) could cure my illness, is from Tabriz.)

In sentence (44), the resumptive pronoun creates a contradiction or distinction between 'Dr Rezai' and other doctors.

2.2.11.2 Resumptive Pronoun in a Direct Object Position

Farsi allows both gap and a resumptive pronoun in the direct object relativized position as in (45) and (46).

45)

یاسمین کتابی که من خریده بودم قرض گرفت.

yāsamīn ketāb-i ke man xaride budam
 Yasamin book-RES COMP I buy-PST-PTCP be-PST.1SG
 garz gereft.
 debt take-PST.3SG.

‘Yasamin borrowed the book that I had bought.’

46)

یاسمین کتابی که من آن را خریده بودم قرض گرفت.

yāsamīn ketāb-i ke man ān rā
 Yasamin book-RES COMP I that OM
 xaride budam garz gereft.
 buy-PST-PTCP be-PST.1SG debt take-PST.3SG.

‘Yasamin borrowed the book that I bought.’ (Lit. Yasamin borrowed the book that I bought it.)

According to Taghvaipour (2005), the presence of a resumptive pronoun is optional in a direct object relative clause, and its absence does not create any problem in the sentence construction.

2.2.11.3 *Resumptive Pronoun in an Object of Preposition (Oblique)*

The object of a preposition or oblique relative clause in (47) contains the resumptive pronoun *him* after the preposition *from*. As illustrated in example (48), the lack of a resumptive pronoun or leaving a gap in the relativized position of the object of a preposition makes the sentence ungrammatical.

47)

پسری که ما از او آدرس پرسیدیم.

pesar-i ke mā az u ādres porsidim.
 boy-RES COMP we from he/she address ask-PST.1PL.

‘The boy whom we asked the address’. (Lit. ‘The boy whom we asked the address from him’.)

47)

پسری که ما از آدرس پرسیدیم.*

* pesar-i ke mā az ādres porsidim.

* boy-RES COMP we from address ask-PST.1PL.

* 'The boy whom we asked the address (from)'.

2.2.11.4 Resumptive Pronoun in a Genitive Position

Taghvaipour (2005) and Zahedi et al. (2012) state that a resumptive pronoun in the possessive relative clause in the position of a possessor is obligatory.

49)

زنی که موهای او بلند است رفت.

zan-i ke muhay-e u boland

woman-RES COMP hair-EZ he/she long

ast raft.

be-PRS.3SG go-PST.3SG.

'The woman whose hair is long went'

50)

زنی که موهایش بلند است رفت.

zan-i ke muhayaş boland

woman-RES COMP hair.PL-enclitic.3SG long

ast raft.

be-PRS.3SG go-PST.3SG.

'The woman whose hair is long went'

The preceding examples (49) and (50) show that a resumptive pronoun should occur in the genitive position and application of a pronominal enclitic /ش/ instead of the free pronoun do not cause any problem.

In the sections that will follow, two types of the particle */-i/* as a restrictive relative marker and indefinite noun marker will be explained. It is unstressed and comes at the end of a noun or a noun-and-adjective expression. It does not occur with a possessive adjective (Mace, 2003).

2.2.12 The Indefinite Noun Marker

In English, if a listener or reader knows a noun, a definite article ‘*the*’ is applied. This definite article is used for both singular and plural nouns. In Farsi, a bare noun indicates that it is a definite noun, as in examples (51) and (52).

51)

فنجان را به من بده.

fenjān rā be man bede.
cup OM to I give-IMP.2SG.
‘Give me the cup.’

52)

دانشگاه از مدرسه بهتر است.

daneṣṣgāh az madrese behtar ast.
university from school better be-PRS.3SG.
‘The university is better than the school.’

According to (Lambton, 1979), indefinite */-i/* can be applied to emphasize a noun or to emphasize an adjective which qualifies a noun as in (53) and (54).

53)

او مرد خوبی است.

u mard-e xub-i ast.
he/she man-EZ good-INDF be-PRS.3SG.
‘He is a good man.’

54)

چنین مرد بزرگی.

çenin mard-e bozorg-i
such man-EZ great-INDF.

‘Such a great man.’

(Lambton, 1979, p.125)

If two indefinite nouns are joined with a preposition (55), only the first one takes the indefinite marker /-i/.

55)

مادری با بچه در خانه نشسته بود.

mādar-i bā baççe dar xāne
mother-INDF with child at home

neşaste bud.

sit-PST-PTCP be-PST.3SG

‘A mother has sat at home with the child.’

2.2.13 The Restrictive Relative Marker

When a noun (56) or a noun-and-adjective phrase (57) is the antecedent of a restrictive relative clause, the enclitic /-i/ is added to it:

56)

مقاله ای که نوشتم.

magāle-i ke neveştam.

paper-RES COMP write-PST.1SG.

‘The paper that I wrote.’

57)

کتاب قدیمی که دارم.

ketāb-e gadim-i ke dāram.

book-EZ old-RES COMP have-PRS.1SG.

‘The old book that I have.’

As mentioned earlier, a restrictive relative clause is distinguished from a non-restrictive one by the enclitic */-i/*, which is called the restrictive marker (Aghaei, 2006). The restrictive marker is homophonous with the indefinite marker */-i/*. Nevertheless, according to Aghaei (2006), there are two main differences between them. First, the restrictive marker is compatible with a definite marker (58), but an indefinite marker is not (59):

58)

آن پسری که کلاه سبز دارد آمد.

ān pesar-i ke kolāhe sabz dārad āmad.

that boy-RES COMP hat-EZ green have-PRS.3SG come-PEST.3SG.

‘That boy who has a green hat came.’

59)

* آن پسری آمد.

* ān pesar-i āmad.

*that boy-NDF come-PST.3SG.

* ‘That a boy came.’

Second, a restrictive marker attaches to the last word of a noun phrase (antecedent) (60), but an indefinite marker can suffix to a head or a modifier of an antecedent (61) (Aghaei, 2006).

60)

پرستار مهربانی که به اتاق آمد.

parastār-e mehrbān-i ke be otāq āmad.

nurse-EZ kind-RES COMP to room come-PST.3SG.

‘A kind nurse that came to the room.’

parastār-i mehrbān be otāq āmad.

nurse-INDF kind to room come-PST.3SG.

‘A kind nurse came to the room.’

In sum, in this chapter, we discussed the Farsi syntax focusing mainly on restrictive and non-restrictive relative clauses, distribution of resumptive pronouns and gaps in different types of Farsi relative clauses, and we compared them with their English counterparts. This chapter is needed to understand the frequency distribution of Farsi relative clauses in a corpus study in the next chapter.

Chapter 3

Chapter 3

The Corpus Study

In the previous chapter, the similarities and differences in the grammatical system of English and Farsi were discussed. The present chapter aims to explore in detail the behaviour of relative clauses in Farsi by conducting a corpus study. The results will give insight into the distribution of relative clauses in the input that speakers of Farsi receive, and what the similarities and differences in this distribution are between English and Farsi. These insights will be used in setting up an experiment to compare the processing of relative clauses in English and Farsi. Chapter 3 is organised as follows: a brief introduction, review of literature, and the aim are presented in Section 3.1 and 3.2. The method and results are detailed in Sections 3.3 and 3.4, respectively. Then, they are followed by a discussion in section 3.5.

3.1 Introduction

Corpus analysis plays a crucial role in providing researchers with the actual patterns of the studied languages. Distributional analysis of relative structures has been applied as an implication for relative clause processing studies in English, Dutch and German, Chinese, Basque and other languages. This chapter will address the distributional information of relative clauses in Farsi. The data will have implications for the relative clause processing study in the Farsi language presented in the next chapter. As described in Chapter 2, there are several differences between English and Farsi in terms of the structure of a sentence and a relative clause. As a reminder, we briefly describe the distinctive features of Farsi relative clauses in this section.

Farsi has a strict SOV word order, so any additional constituent comes between a subject and a verb. A complete sentence description might be a subject, an object of preposition, object, and verb '*He for me one bag bought*'. Like English, Farsi has both transitive and intransitive verbs. An object comes after transitive verbs in English, but it is used before a transitive verb in Farsi. Contrary to English, Farsi has an object marker, /rā/. Regarding noun phrases and prepositional phrases, Farsi is a head-initial language; modifiers and possessives come after the antecedent. Noun-genitive, noun-adjective, and noun-relative clause structures are examples of post-nominal structures in Farsi. The particle Ezafe, which is pronounced as /e/, usually links the nouns with their modifiers or possessors. Therefore, like English, Farsi relative clauses are post-nominal or head-modifying.

An English relative clause is introduced by a relative pronoun like '*who*', '*whom*', '*which*', '*whose*', and '*that*'. In some relative clauses, the relative pronoun can be omitted as in '*The book *I bought yesterday was interesting*'. In Farsi relative clauses, there is no relative pronoun; the invariant complementiser /ke/ links the antecedent to the relative clause and cannot be deleted. Example (1) illustrates an indirect object relative clause.

1)

همسایه‌ای که کلید را به او دادی رفت.

hamsāye-i ke kelid rā be u dādi raft.
neighbor-RES COMP key OM to he/she give-PST.2SG go-PST.3SG
‘The neighbour whom you gave the key (to) left.’ (Lit. ‘The neighbour
whom you gave the key to him/her left.

Restrictive and non-restrictive Farsi relative clauses are differentiated with an obligatory enclitic morpheme (pronominal enclitic) /-i/, which links the antecedent to the following relative clause in restrictive relatives as in example (1). The following sentences represent non-restrictive (2) relative clauses in Farsi, respectively.

2)

همسایه که کلید را به او دادی رفت.

hamsāye ke kelid rā be u dādi raft.
neighbor COMP key OM to he/she give-PST.2SG go-PST.3SG
‘The neighbour, whom you gave the key, left.’ (Lit. ‘The neighbor, whom
you gave the key to him/her, left.

Resumption is another distinctive feature of Farsi relatives. The relativised element inside a Farsi relative clause is represented by a gap or a resumptive pronoun based on the type of the relative clause. The following example (3) shows an obligatory resumptive pronoun in an indirect object relative clause.

3)

دختری که به او گل دادی آمد.

doxtar-i ke be u gol dādi āmad.
girl-RES COMP to he/she flower give-PST.2SG come-PST.3SG.

‘The girl to whom you gave flower came.’ (Lit. The girl whom you gave flower to her came.)

As illustrated in Chapter 1, the Noun Phrase Accessibility Hierarchy proposed by Keenan and Comrie (1977) indicates the relativisability of a noun phrase concerning the grammatical relations between an antecedent and a relative clause. Based on their studies on 50 languages, they proposed that the positions of the relativized noun phrase can be non-randomly different. They claim that the “relativisability of certain positions depends on that of others, and these dependencies are universal” (p.66). The accessibility hierarchy in (4) describes the accessibility of noun phrase positions to relativisation in simple main clauses. Keenan and Comrie propose that all languages must allow relativising subjects, but the rest of the positions can be free in different languages, with the restriction that if a position can be relativised, all positions higher on the scale can also be relativised.

4)

Subject > Direct object > Indirect object > Oblique > Genitive > Object of comparison

3.2 Previous Corpus Studies

In a corpus analysis, Roland and colleagues (2007) provided a comprehensive set of structural frequencies for constructions such as relative clauses, cleft sentences, and subcategorisation frame probabilities in spoken and written English. They focused on structures like relative clauses that have a significant role in psycholinguistic discussions, aphasia, child language acquisition, and they compared their results with some other papers. To compare the frequencies of the relative clauses, they normalised the data by the number of noun phrases in each corpus. The percentage of subject relative clauses was higher in the written corpus than in the spoken corpus. In the spoken corpus, the subject relatives modified noun phrases

with a low content value (e.g., someone, people, something). In all corpora, the subject relatives occurred with low content verbs (e.g., be, have, go, do). In spoken corpora, object relative clauses were more frequent than subject relatives. Passive relative clauses in spoken data were less frequent because the topic of discussion is the speaker and the action of the speaker, so there is no need to emphasise the doer of the action with a passive sentence (Thompson, 1978 as cited in Roland et al., 2007). Roland et al. (2007) observed the differences between subject and object relative clauses concerning the animacy of the antecedent as well. They coded a random sample of 100 relative clauses for animacy and found that when the modified noun phrase was animate, the relative clause was mainly a subject relative. However, object relative clauses usually had an inanimate modified noun phrase. Object relative clauses in their two corpora had the form of inanimate antecedent + that + pronoun.

Regarding the distribution of restrictive and non-restrictive relative clauses, Biber et al. (1999) report that in all written registers, restrictive relatives are more frequent than non-restrictive relatives which are marked by a comma. More precisely, in fiction and academic prose, non-restrictive relative clauses compose 15% of all relative clauses. In news, non-restrictive relatives make up 30% of all relative clauses.

Realı and Christiansen (2007) conducted a large-scale corpus analysis. They aimed to explore the relative frequencies of embedded pronominal and non-pronominal noun phrases in object and subject relative clauses in English. Their results showed a higher percentage of object relative clauses when the embedded noun phrase was personal and was referred to with a pronoun. Moreover, they suggested that when the pronoun in the embedded noun phrase was animate, pronominal object relative clauses were more frequent than their subject counterparts.

Regarding the application of '*that*' and '*which*' (relative pronouns) in restrictive and non-restrictive relative clauses, Yan (2011) studied the application of English relative clauses contrastively by students in Hong Kong English, Singapore English, and British English within the

framework of World Englishes. He found a tendency of using '*that*' in non-restrictive relative clauses in Hong Kong and Singapore students' writing. However, in the British corpus, there was not any non-restrictive relative with the relative pronoun '*that*'. He considers this change a linguistic variation in English.

In a corpus study, Wu et al. (2010) explored relative clause types in Mandarin and antecedent animacy and its distribution. The frequency of occurrence of the different relative clause types in Mandarin with head-final or pre-nominal relative clauses was SS > OS > SO > OO (with all verb types). In their corpus study, they found that antecedents in SS relative clauses were more frequently animate, but in SO and OO relatives, the antecedent was predominantly inanimate. However, in object-modifying, subject-extracted relative clauses, they could not find any clear preference for the animate or inanimate antecedent.

In Dutch and German with canonical word order of SOV in subordinate clauses and a post-nominal relative clause type, frequency of object and subject relative clauses with a combination of an animate or inanimate antecedent (NP1) and embedded noun phrase (NP2) match those of Wu et al. (2010) in Mandarin Chinese. In a Dutch corpus study with 286 transitive verbs, Mak et al. (2002) found 206 subject and 80 object relative clauses. Almost half of the subject relative clauses had an animate NP1 and an inanimate NP2. The majority of object relative clauses had an inanimate NP1 with an animate NP2. In contrast, there was no object relative clause with two animate NPs or with an animate NP1 and inanimate NP2 construction. The subject relative clauses with an inanimate NP1 and animate NP2 were the least ones as well. As illustrated in Table 3.1, the results obtained by Mak et al. (2002) showed that 64 out of 144 subject relative clauses occur in an animate NP1-inanimate NP2 condition. Subject relative clauses with an inanimate NP1-animate NP2 condition exist as well, but these are the least frequent subject relatives to occur. Likewise, in a German corpus study, Mak et al. (2002) found that German and Dutch have similar data regarding the effect of animacy of antecedent and

embedded noun phrase. On the object relative clauses occur in inanimate NP1-animate NP2 condition. Object relative clauses with an animate NP1-inanimate NP2 and animate NP1-animate NP2 conditions are very infrequent like Dutch. Interestingly, subject relative clauses with an inanimate NP1-inanimate NP2 condition are frequent in both Dutch and German.

Table 3. 1 *The Number of Subject and Object Relative Clauses in the Dutch and German Corpus as a Function of the Animacy of the Antecedent (NP1) and Embedded Noun Phrase (NP2). The Counts for German Ones are Given in Parentheses. (Mak, Vonk, and Schriefers, 2002 p. 55).*

	Animate Antecedent (NP1)		Inanimate Antecedent (NP1)	
	Animate NP2	Inanimate NP2	Animate NP2	Inanimate NP2
Subject RC	21 (18)	119 (64)	13 (15)	53 (47)
Object RC	0 (1)	2 (1)	70 (21)	8 (1)
<i>Total</i>	<i>21 (19)</i>	<i>121 (65)</i>	<i>83 (36)</i>	<i>61 (48)</i>

3.2.1 Previous Corpus Studies in Farsi Relative Clauses

In a corpus study, Rasekh-Mahand et al. (2016) investigated written and spoken texts from the Farsi Linguistic Database. They found that subject-extracted relative clauses are more frequent than object-extracted relative clauses. Following Keenan and Comrie’s (1977) NPAH, they revealed the following frequency order in the relative clause distribution: Subject (78%) > Direct object (12%) > Genitive (8%) > Oblique (4%). However, it is not clear if their relative clause hierarchy covers both restrictive and non-restrictive relatives or only one of them. Their findings provided evidence for the extraposition hypothesis. Within 757 relative clauses that they found, 167 relative clauses were extraposed from their canonical word

order in Farsi. So, they believe that extraposition is not a rare phenomenon in Farsi relative clauses. The following relative clause types were found in extraposed relative clauses:

Subject (76.19%) > Direct object (9.52%) > Oblique (7.14%) = Genitive (7.14%)

Rasekh-Mahand et al. (2016) concluded that the grammatical weight of the relative clause, verb class and definiteness are three factors affecting the extraposition in Farsi relative clauses.

According to Abdollahnejad and Marefat (2017), ordinary relative clauses which include restrictive and non-restrictive types, modify an antecedent in a matrix sentence. Free relative clauses do not modify an overt antecedent but they stand alone. In their small-scale Farsi corpus, Abdollahnejad and Marefat (2017) studied the frequency of ordinary (only restrictive) and free relative clauses. They coded the relative clauses based on the function that the modified element has in the relative clause (subject, object, direct or oblique, possessive, time, place) and the occurrence of some features such as the object marker /*rā*/, the status of a gap and a resumptive pronoun in the relative clause, and animacy of an antecedent in the relative clauses. Their results illustrated that ordinary subject relative clauses (69.53%) were the most frequent types. In ordinary relative clauses, the frequency distribution goes down from subject to possessive (genitive) and from subject to oblique in the free relatives, which is in line with Keenan and Comrie's (1977) NPAH. The object marker in the matrix sentence tends to occur before the object modifying relative clause (5).

5)

ما متقاضیانی را که تحصیلات عالی دارند انتخاب میکنیم.

mā motagāziyān-i rā ke tahsilāt-e āli
we applicant.PL-RES OM COMP education-EZ higher
dārand entexāb mikonim.
have-PRS.3PL selection do-PRS.1PL.
'We select applicants who have higher education.'

Abdollahnejad and Marefat (2017) mentioned that generally relative clauses in their corpus are used to modify inanimate antecedents. However, a high percentage of the subject and possessive relative clauses are modified with animate antecedents in ordinary relatives, but there were no free relative clauses with an animate antecedent. All ordinary relative clauses have the complementizer /ke/, but only 35% of free relatives contained the complementizer /ke/ as in example (6) (Abdollahnejad & Marefat, 2017, p.142).

(6)

هر کجا که باشد خدمتگذار ی صادق باقی خواهد ماند.

har koja ke bāšad xedmatgozar-i sādeq
 every where COMP be-PRS.3SG servant.INDF honest
 baqi xāhad mānd.
 remain want-FUT.3SG stay.

‘Wherever he/she goes he/she will remain an honest servant.’

Regarding the representation of the modified element inside the relative clause (gap, resumption and reiteration), they indicated that 82.80% of the relative clauses contained a gap, 16.44% resumption, and 0.77% reiteration of the antecedents. Moreover, they observed a very small amount of subject relative clauses with a resumptive pronoun (1.61%) and pronominal enclitic (0.26%). Resumption in subject relative clauses is sometimes used to emphasize the subject in the relative clause, as exemplified in Chapter 2 sentence (44).

In previous Farsi corpus studies, restrictive and non-restrictive relative clauses were not separated. Animacy of antecedents and embedded noun phrases in different types of relative clauses have not been studied either. The present corpus study aims to identify all kinds of relative clauses and their frequencies. We will investigate whether Farsi relative clauses follow Keenan and Comrie’s (1977) NPAH. Then, we will explore the distribution

of the relative clause types in restrictive and non-restrictive relatives. Animacy is shown to be an essential factor in corpus studies; therefore, we will study the effects of animacy of the antecedent and embedded noun phrases on this. Since resumption is an important difference between English and Farsi relative clauses, we will also look at the representation of the relativised element inside the relative clauses. Additionally, any possible relationship between resumptive pronouns, animacy of antecedent and embedded noun phrases in different relative clause types will be considered. At the end, the effect of animacy of the antecedent on the subject-verb agreement in number will be studied because, in Farsi, inanimate plural nouns occur with a singular verb ending in a sentence. Accordingly, we will focus on the following main issues in the present Farsi corpus analysis:

- Frequency distribution of relative clauses in the whole corpus
- Frequency distribution of restrictive relative clauses
- Distribution of resumptive pronouns in different types of relative clauses
- Resumptive pronouns in restrictive and non-restrictive relative clauses
- Animacy of antecedent and embedded noun phrase and their distribution
- Animacy of antecedent and embedded noun phrase as a pronoun
- Animacy of antecedent and resumptive pronoun
- Subject-verb disagreement in number in inanimate plural antecedents

We will endeavour to discover which relative clause types in Farsi are frequent and which factors are correlated with the frequency of those relative clauses.

3.3 Methods

3.3.1 Materials

The present corpus study was carried out to check the frequency distribution of all possible relative clause structures. To this end, we made a Farsi corpus consisting of 149,330 words and computed the relative frequency of all types of relative clauses. For the Farsi corpus study, we employed one edition of the on-line version of the Hamshahri newspaper (17 November 2017), an Iranian daily newspaper, which is entirely written in Farsi. The articles in this newspaper covered a range of topics such as Iran, defence, the world, economy, society, life, sport, cinema, knowledge, the culture of history/art, and children. From the cited corpus, a total of 738 relative clauses were extracted.

3.3.2 Procedure

The relative clauses were coded manually by the first author, after which the coding was checked by a linguist whose mother language is Farsi. As illustrated in Table 3.2, the relative clauses were coded according to the position of an antecedent in the matrix sentence and the function of its referent in the relative clause. Some antecedents were modified with two or three relative clauses. In those cases, they were counted as separate relative clauses. Based on the presence or absence of an enclitic morpheme attached to antecedents, the relative clauses were coded as restrictive and non-restrictive. The antecedents and embedded noun phrases were coded as a proper name, noun, compound noun, and pronoun. Embedded verbs in relative clauses were coded as active/passive, transitive, intransitive, and ditransitive. The relative clauses were coded based on a gap or resumption (resumptive pronoun or enclitic morpheme). The antecedents and embedded noun phrases were coded as animate or inanimate. In inanimate antecedents, the verb endings were coded as plural or singular. In inanimate antecedents with a resumptive pronoun in a relative clause, the number of the resumptive pronoun was coded as singular or plural as well.

Extraposition status was coded as relative clause extraposed or relative clause in canonical position.

Table 3. 2 *Coding Relative Clauses in the Farsi Corpus.*

Modifying RC	Subject, Object, Oblique, Indirect Object, Genitive
Extracted RC	Subject, Object, Oblique, Indirect Object, Genitive
Antecedent	Proper noun, Noun phrase, Compound noun, pronoun
Embedded noun phrase	Proper noun, Noun phrase, Compound noun, pronoun
Embedded VP	Active, Passive
Embedded VP	Transitive, Intransitive, Ditransitive
Animacy	Animate/Inanimate Antecedent
	Animate/Inanimate NP-internal
Resumption	Gap, Resumptive pronoun, Clitic
Agreement in Inanimate antecedents	Plural/Singular verb ending
	Plural/Singular resumptive pronoun
Extraposition	Relative clause in canonical position
	Extraposed relative clause

3.4 Results

3.4.1 Distribution of Relative Clauses in Whole Corpus

In the first analysis, we explored the relative clause hierarchy in the whole corpus. As illustrated in Figure 3.1, the most frequent types of relative clauses are subject relatives ($n=523$, 70.9%), which are followed by direct object relatives ($n=123$, 16.7%). Oblique ($n=57$, 7.7%), and genitive ($n=35$, 4.7%) relatives are the least common relative clause types in this corpus. This pattern is, to some extent, consistent with the pattern found in many other languages by Keenan and Comrie (1977). However, there is no indirect object relative in this corpus (7).

7)

Subject > Direct object > Oblique > Genitive

Figure 3.1 *The Frequency Distribution of Relative Clauses in the Whole Corpus.*

Secondly, we investigated whether the Accessibility Hierarchy of Keenan and Comrie (1977) also holds for Farsi restrictive and non-restrictive relative clauses separately. Restrictive relative clauses ($n=536$, 72,6 %) are more frequent than non-restrictive relatives ($n=202$, 27.4%) Within restrictive relatives, subject relatives ($n=357$, 66.6%) and object relatives ($n=110$, 20.52%) are the most frequent types. Oblique ($n=47$, 8.76%) and genitive ($n=22$, 4.1%) are the least common relatives (Figure 3.2). Interestingly, the hierarchy of non-restrictive relative clauses is the same as Keenan and Comrie’s NPAH, but there is not so much difference between the last three relative types (8).

8)

Subject ($n=166$, 82.2%) > Object ($n=13$, 6.4%) > Genitive ($n=13$, 6.4%) > Oblique ($n=10$, 5%).

Figure 3.2 *The Frequency Distribution of Relative Clauses in Restrictive Relative Clauses.*

Following the standard notation, we abbreviated relative clause types for example S-S, S-O, O-S, and O-O. The first letter indicates the function of an antecedent in the matrix clause, and the second one shows the function of its referent in the relative clause. Therefore, S-S stands for the subject-modifying and subject-extracted relative clause. We preferred not to use the term *relative clause-gapped* because there is no gap in some of the Farsi relative clauses.

When we split the relative clauses by the grammatical position of the antecedents in the matrix clause in the whole corpus, we find a different pattern; subject-modifying ($n=314$, 42.5%) are the most frequently occurring cases, followed by oblique-modifying ($n=309$, 41.9%), and object-modifying ($n=81$, 11 %). The genitive-modifying ($n=30$, 4.1%) and indirect object-modifying ($n= 4$, .5%) are the least frequent ones based on the function of the antecedent in the matrix sentences (Figure 3.3).

Figure 3.3 *The Frequency Distribution of Relative Clauses Based on the Role of the Antecedent in the Matrix Sentences in the Whole Corpus.*

By combining the frequency of modifying and extracted relative clauses in the whole corpus with all types of verb phrases inside the relative clauses within restrictive and non-restrictive relative clauses, we obtained the hierarchy presented in Figure 3.4.

Figure 3.4 *Frequency Distribution of the Modifying and Extracted Relative Clauses in the Whole Corpus.*

As illustrated in Figure 3.4, subject and oblique elements are the most frequent relativised nominal in the matrix clauses. The most frequent modifying and extracted Farsi relative clauses are S-S (9), OBL-S (10) types. Examples of OBL-O (11), S-O(12), O-S(13), and O-O (14) relative clauses in the corpus are as follows.

9)

S-S

کسی که مرتکب این رسوایی است باید عذرخواهی کند.

kas-i ke mortakeb-e in rosvāi
 person-RES COMP committed-EZ this scandal
 ast bāyad ozrxahi konad.
 be-PRS.3SG must apology do-SBJV-PRS.3SG.
 ‘The person who committed this scandal must apologise.’

10)

OBL-S

ما به هم وطنانی که قصد سفر به گرجستان را دارند توصیه می کنیم.

mā be hamvatanān-i ke qasd-e safar be
we to countryman.PL-RES COMP plan-EZ travel to
gorjestān rā dārand tosiye mikonim.
goeorgia OM have-PRS.3PL recommendation do-PRS.1PL.

‘We recommend to the fellow countrymen who are planning to travel to Georgia.’

11)

OBL-O

ما در ارتباط با سیاستی که ترکیه در منطقه دارد اظهار نظر نمی کنیم.

mā dar ertebāt bā siyāsāt-i ke torkiyye dar
we in relation to policy-RES COMP Turkey in
mantaqe dārad ezhārnazar nemikonim.
region have-PRS.1SG comment do-PRS-NEG.3SG.

‘We do not comment on the policy that Turkey has in the region.’

12)

S-O

مصر این وام را که از سال 2009 شروع می شود باز پس خواهد داد.

mesr in vām rā ke az sāl-e 2009 šoru mišavad
Egypt this loan OM COMP from year-EZ 2009 start become-PRS.3SG
bāz pas xāhad dād.
again back give-FUT.3SG.

‘Egypt will return this loan which starts in 2009.’

13)

O-S

اقدامات لازمی که بود انجام دادیم.

eqdāmāt-e lāzem-i ke bud

measure.PL-EZ necessary-RES COMP be-PST.3SG

anjām dādim.

performance give-PST.1PL.

‘We have taken the necessary measures.’

14)

O-O

ما تصمیماتی که از قبل اتخاذ کردیم را اجرا میکنیم.

mā tasmināt-i ke az qabl ettexāz kardim

we decision.PL-RES COMP from before adoption do-PST.1PL

rā ejrā mikonim.

OM execution do-PRS.1PL.

‘We execute appropriate decisions that we have already made.’

3.4.2 Distribution of Extraposed Relative Clauses

Out of 738 relative clauses, 692 are used in canonical position and 46 (6.2%) in extraposed position in this corpus. The majority of extraposed relatives (n=35) are restrictive. The extraposed relative clauses are predominantly included in sentences with a linking verb as a matrix verb. In four cases the relative clauses are very long, and in two cases the antecedents are very long. In example (15), the matrix verb is a linking verb, and the relative clause is very long.

15)

این مهمترین موضوعی است که این روزها دولت ترامپ و اروپایی ها و
کشورهای عربی متحدشان علیه ایران مطرح میکنند.

in mohemtarin ruzhā mozu-i ast ke

this most important issue-RES be-PSR.3SG COMP

in ruzha dolat-e terāmp va urupāihā va

this day.PL administration-EZ Trump and Eurpean.PL and

keşvarhāy-e arabi-e motahedāneşān alayh-e irān

county.PL-EZ arab-EZ ally-enclitic.PL against-EZ Iran

matrah mikonand.

propose do-PRS.3PL.

‘This is the issue that the Trump administration and the Europeans and their Arab allies are raising against Iran these days.’

We found some relative clauses ($n=23$, 3.1%) with a different construction; the relative clause comes after the matrix clause, but they have a difference with extraposed relative clauses. Following a semicolon, these relative clauses are located after the matrix clause and they modify a noun phrase (16) or a proper noun (17) in the matrix sentence. These joined or extraposed relative clauses are subject-extracted ($n=18$) and oblique-extracted ($n=5$) relative clauses.

16)

از سال 2014 نسبت به بروز چنین وضعیتی هشدار می‌دادیم؛ وضعیتی که در آن تنها اسمی از شورای همکاری مانده است.

az sāl-e 2014 nesbat be boruz-e çenin vaziyyati
from year-EZ 2014 relation to outbreak-EZ such situation
hoşdār midādīm ; vaziyyat-i ke dar ān tanhā
warning give-PST.1PL; situation-RES COMP in that only
esmi az şorāye hamkāri
noun-INDF from council-EZ cooperation
mānde ast.
remain-PTCP be-PRS.3SG.

‘From 2014, we warned about such a situation; a situation in which only the name of the Cooperation Council remained.’

17)

گروه داعش باز هم پایگاه حمایت‌کننده‌ای در عراق سنی پیدا می‌کند؛ کشوری که در آن نارضایتی از دولت بالاست.

goruhe dāiş bāzham paygāh-e hemāyatkonande-i dar
group-EZ ISIS again base-EZ supporter-INDF in
erāq-e sonni peydā mikonad ; keşvari ke dar ān

Iraq-EZ Sonni finding do-PRS.3SG; country-RES COMP in which
nārezāyati az dolat bālāst.

dissatisfaction from government high be-PRS.3SG.

‘The ISIS group also finds a supporter in the Sunni Iraq; a country in
which dissatisfaction with the government is high.’

3.4.3 Distribution of Restrictive Relative Clauses with a Transitive Verb

The verbs inside the relative clauses were coded as transitive, intransitive, and copula. All object relatives had a transitive verb. In subject relatives, there were 321 transitive, 164 intransitive, and 51 copula verbs.

Since Farsi is a null subject language, in some cases there is no apparent subject such as a noun phrase or a pronoun in the relative clause. In the following example, there is no apparent subject for the relative clause sentence. The antecedent is the subject of the matrix sentence with a passive verb and object of the relative clause. Inside the relative clause, there is no apparent subject, but it can in this case be inferred from the verb inflection /-im/ as the first plural subject ‘we (18).

18)

مشکلاتی که می توانستیم به راحتی حل کنیم، توسط آمریکا به بن بست رسید.

moşkelāti ke mitavānestim berāhati hal konim,

problem.PL-RES COMP can-PST.1PL easily solve do-SBJV.1PL,

tavassot-e āmrikā be bonbast resid

by-EZ America to deadlock **reach-PST.3SG.**

‘Problems that we could easily solve were deadlocked by the United
States.’

In this corpus, there are 15 object and 9 oblique relative clauses which have a null-subject structure inside the relative clause sentence. The verb ending inflections in these relatives refer to the subject of the matrix sentence.

3.4.4 Distribution of Resumptive Pronouns in Different Relative Clauses

Resumption has a distinctive role in Farsi relative clauses. As indicated in Chapter 2, some scholars illustrated that application of a resumptive pronoun is optional in object relatives, but it is obligatory in oblique and genitive relatives. Resumption comes in a pronoun (19) or pronominal enclitic forms. Out of 738 relatives, 643 (87.1%) include a gap and resumption is shown with 82 (11.1%) resumptive pronouns and 13 (1.8%) pronominal enclitics (20). As seen in Figure 3.5, there is no resumptive pronoun in subject relatives (21), but all genitive relatives and most of the oblique relatives take a resumptive pronoun. Although the object relatives have a resumptive pronoun and a pronominal enclitic, they mainly occur with a gap (Figure 3.5).

19)

سه کشور در مورد مسائلی که با آن روبرو هستند گفت‌وگو و رایزنی میکنند.

se keşvar dar mored-e masāeli ke bā ān
three county in about-EZ issue.PL-RES COMP with that
ruberu hastand goftegu kardand.
facing be-PRS.3PL discussion do-PST.3PL.
'The three countries will discuss and consult the issues that they face.'

20)

تفکری که پشتش باند‌های قدرت و ثروت است، همیشه دولت‌ها را
آزار داده است.

tafakkori ke poštaş bāndhāye godrat va servat
idea-RES COMP behind-clitic.3SG band.PL-EZ power and weath
ast hamişe dolathā rā
be-PRS.3SG always government.PL OM
āzār dāde ast.
bother give-PTCP be-PRS.3GS.

‘The idea which is behind the bands of power and wealth has always bothered governments.’

21)

کشور هایی که در این خصوص صحبت می کنند باید در دخل و
خرج خود ببینند.

keşvarhā-i ke dar in xosus sohbat
country.3PL-RES COMP in this about talk
mikonand bāyad dar daxl va xarej-e
do-PRS.3PL must in income and expense-EZ
xod bebinand.
oneself see-SBJV-PRS.3PL.
‘Countries that talk about this need to look at their income and spending.’

Figure 3.5 *Distribution of the Gaps and Resumptive Pronouns in the Subject, Direct Object, Oblique and Genitive Relative Clause Types.*

As shown in Figure 3.5, the lower the position is on the accessibility hierarchy of relative clauses in Farsi, the number of resumptive pronouns

increases. The more accessible a modified referent is, the more prevalent a gap is in that relative clause. As mentioned when discussing the frequency distribution of relative clauses, subject relatives are the most frequent and genitive relatives are the least frequent in the Farsi corpus. As illustrated in Figure 3.5, the frequency of gaps is correlated with the hierarchy of relatives in the corpus: the frequency of resumptive pronouns increases as we go down the hierarchy of relative clauses in the Farsi corpus. Therefore, we can also say that the usage of resumptive pronouns increases as the frequency of a relative clause type decreases in the Farsi corpus.

3.4.5 Resumptive Pronouns in Restrictive and Non-restrictive Relative Clauses

As illustrated in Chapter 2, Taghvaipour (2005) states that resumptive pronouns are distributed differently in restrictive and non-restrictive relative clauses. Comparing the frequency of resumptive pronouns and gaps in different types of restrictive and non-restrictive relative clauses, we ended up with some interesting results. As shown in Table 3.3, there is a gap in all subject relatives, but gaps do not occur at all in the genitive relative clauses. The resumptive pronoun and gap are equally distributed in the non-restrictive object relatives, whereas the vast majority of restrictive object relatives occur with a gap. Contrary to Taghvaipour's claim, in the non-restrictive object relative clauses (22) and non-restrictive oblique relative clauses (23) gap occurs as well.

22)

کارل اریاتس در این پیام که در صفحه توییتر خود منتشر کرده است، نوشت.

Karl eriats dar in payām ke dar safhey-e toiter-e
 Carl Eriats in this message COMP in page-EZ twitter-EZ
 xod montaşer karde ast nevešt.
 oneself publish do-PTCP be-PRS.3SG write-PST.3SG.
 'Carl Eriats in the message, which he posted on his Twitter page, wrote'

23)

در شرایط دنیای نوین که با پیچیدگی‌های تهدیداتی مواجهیم

dar šarāyet-e donyāy-e novin ke bā
in condition.PL-EZ world-EZ modern COMP with
piçidegihāy-e tahdidāti movājehim
complexity.PL-EZ threatening face-PRS.1PL.

‘In the modern world, where we are faced with the threatening
complexitie,...’

Table 3. 3 *Distribution of Resumptive Pronouns in Restrictive and Non-restrictive Relative Clauses.*

	Subject		Direct Object		Oblique		Genitive	
	Res	Non-Res	Res	Non-Res	Res	Non-Res	Res	Non-Res
Gap	357	166	105	8	6	1	0	0
RP	0	0	5	5	41	9	22	13

Note. Res = Restrictive, Non-Res = Non-Restrictive, RP = Resumptive Pronoun

It is worth mentioning that the majority of object relative clauses with a resumptive pronoun have a compound noun as an antecedent in this corpus (24). Moreover, in null-subject object relative clauses, a resumptive pronoun does not occur.

24)

حذف کامل گزینه‌ها از بازخوانی موضوع که بسیاری از متخصصان آن را
توصیه می‌کنند ...

hazf-e kām-eL gozinehā az
removal-EZ complete-EZ option-PL from
bāzxāniy-e mozu ke besiyāri az motaxasesān

re-reading-INF-EZ subject COMP many from expert-PI
 ān rā tosiye mikonand...
 that OM recommendation do-PRS.3PL...
 ‘Complete removal of options from re-reading the subject, which many
 experts recommend,’

In sum, the hierarchy of gap usage is in line with the hierarchy of relative clauses both in restrictive and non-restrictive relative clauses. There is an inverse probability of occurrence between the resumptive pronouns and the frequency of relative clauses:

Genitive > Oblique > Direct Object > Subject

3.4.6 Animacy of Antecedent and Embedded Noun Phrases

In this section, we will investigate whether animacy influences the frequency of relative clause distribution. The antecedent and embedded noun phrase were coded into two categories: animate and inanimate. Nouns like names of countries as well as the word ‘*country*’ are considered animate when they denote a human activity or when they are personified.

There are 426 transitive, 221 intransitive, and 91 copula verbs and 55 relatives with a pronominal NP in this corpus. We filtered the data as relative clauses with transitive verbs and full NPs (compound noun, noun phrase, and proper name) because we wanted our study of relative clauses in the Farsi corpus to resemble Mak et al.’s (2002) Dutch and German relatives and the other materials used in on-line English relative clause studies. This filtration resulted in 211 relative clauses. Subject-extracted relative clauses ($n=123$, 58.3%) and object-extracted relative clauses ($n=59$, 28%) are the most frequent, whereas the least frequent relative clauses are oblique-extracted relative clauses ($n=21$, 3.8%) and genitive-extracted relative clauses ($n=8$, 3.8%) as illustrated in Figure 3.7.

Figure 3. 6 *The Frequency of Relative Clauses with Transitive Verbs and Full NPs.*

Figure 3.7 illustrates the distribution of relative clauses with animate and inanimate antecedents. There is strong evidence of a relationship between animacy of antecedent and relative clause types with a transitive verb and full NP. Animate antecedents occur mostly with subject relatives, but object relatives predominantly have inanimate antecedents as in (24). The antecedent in genitive and oblique relatives was mostly inanimate. As shown in Figure 3.8, animacy of the embedded noun phrases in different relative clauses is almost opposite of that in the antecedents. Example (25) includes a subject relative clause with an animate antecedent, and an inanimate embedded noun phrase and example (26) is an object relative with an inanimate antecedent and an animate embedded noun phrase.

25)

دانشجوهايي که در فضاي آزاد بعد از انقلاب تمام تحليل ها را مي شنوند، متوجه اند.

dāneşjuhā-i ke dar fazāy-e āzād-e bad az
 student.3PL-RES COMP in situation-EZ free-EZ after from
 engelāb tamām-e tahlilāh rā mişenavand

revolution all analysis.PL OM hear-PRS.3PL
motavajehand.
notice-PTCP be-PRS.3PL.
*‘The students who hear all the analysis in the free situation after the
revolution have noticed.’*

26)
پیروزی هایی که ارتش عربی سوریه و نیروهای هم پیمان در عرصه نبرد
به دست آورده اند.
piruzihā-i ke arteš-e arabiy-e suriyye v niruhāye
victory.PL-RES COMP army-EZ Arabic-EZ Syria and force.PL-EZ
hampeyman dar arsey-e nabard be dast āvordeand.
ally.PL on field-EZ battle to hand bring-PTCP-PRS.3PL.
*‘The victories that the Syrian Arab Army and allied forces achieved on
the battlefield.’*

Figure 3. 7 Animacy of the Antecedents in Different Relative Clause Types.

Figure 3.8 Animacy of the Embedded Noun Phrases in Different Relative Clause Types.

Regarding the effect of animacy of the antecedent and the embedded noun phrase, our corpus results show almost similar correlations between animacy and relative clause types as in Dutch and German. The antecedent animacy shows a very distinct frequency distribution: 78 out of 123 subject-extracted have an animate head, whereas 45 have inanimate heads. In contrast, 58 out of 59 object-extracted have an inanimate head, but there is only one animate antecedent. However, 102 subject-extracted relative clauses have an inanimate embedded noun phrase, but only 21 NPs are animate. In contrast, 47 object-extracted relative clauses have an animate embedded noun phrase against only 12 inanimate ones, as illustrated in Table 3.4.

Table 3.4 Animacy of the Antecedent(NP1) and Embedded Noun Phrase(NP2) in the Farsi Corpus.

	Animate Antecedent (NP1)		Inanimate Antecedent (NP1)	
	Animate NP2	Inanimate NP2	Animate NP2	Inanimate NP2
Subject RC	11	67	10	35
Object RC	1	0	46	12
<i>Total</i>	<i>12</i>	<i>67</i>	<i>56</i>	<i>47</i>

The results in Table 3.4 illustrate that object relative clauses rarely occur in the animate NP1-animate NP2 condition, and they never occur in the animate-inanimate condition. They predominantly occur in the inanimate-animate condition. Subject-extracted relative clauses occur most often in the animate-inanimate condition, but they are also frequent in the inanimate-inanimate condition.

As seen in Table 3.1, the object relative clauses in Dutch occur almost exclusively in the inanimate NP1-animate NP2 condition. There is no object relative in animate-animate condition. The subject relatives occur predominantly in animate-inanimate condition. The German data were similar to Dutch; object relatives almost exclusively occur with an inanimate-animate condition. In sum, the animacy pattern in the antecedent and embedded noun phrase in the Farsi relative clause sentences is very similar to Dutch and German. This pattern is similar in restrictive and non-restrictive relative clause (see Table 3.5).

Table 3. 5 Animacy of the Antecedent (NP1) and Embedded Noun Phrase (NP2) in Restrictive and Non-restrictive Relative Clauses. Non-restrictive Relative Clauses are in Brackets.

	Animate Antecedent (NP1)		Inanimate Antecedent (NP1)	
	Animate NP2	Inanimate NP2	Animate NP2	Inanimate NP2
Subject RC	8 (3)	39 (28)	6 (4)	21(14)
Object RC	1(0)	0 (0)	37(9)	10 (2)
Total	9(3)	39(28)	43(13)	31(16)

It is noteworthy that in eight tokens, as in example (27) the antecedent is modified by two or three relative clauses. These relatives are sequenced in order. In all cases, the first relative clause is a subject relative clause which is the most frequent one in the corpus. The second and third relatives are subject, oblique and object types. Regarding the animacy of these antecedents, we observed that seven antecedents were animate, and only one was inanimate.

27)

یتیمان لبنانی که سرپرست نداشتند و هرکسی به آنها حمله می‌کرد.

yatimān-e lobnān-i ke sarparast nadāštand

orphan.PL-EZ Lebanon-RES COMP caretaker have-PST-NEG.3PL

va harkasi be ānhā hamle mikard.

and everybody to them attack do-PST.3PL.

‘Lebanese orphans who had no caretaker and everyone attacked them.’

Moreover, the antecedents in 12 tokens are composed of two, three, or four noun phrases as in (28).

28)

مناطق مسکونی و اماکن تجاری و جاهایی که مردم حضور دارند.

manāteqe maskuni va amāken- tejāri
 area.PL-EZ residential and place.PL-EZ commercial
 va jaha-i ke mardom hozur dārand
 and place.PL-RES COMP people presence have-PRS.3PL.
 ‘Residential and commercial areas and places where people are present.’

3.4.6.1 Animacy of Antecedent and Embedded Noun Phrase as a Pronoun

The pronominal antecedents of the subject relative clauses include 10 animate and 20 inanimate pronouns. There are only six object relatives with an inanimate pronominal antecedent. There is neither an oblique nor a genitive relative clause with a pronoun as an antecedent. There are 19 pronouns as embedded noun phrases. As illustrated in example (29), object relatives ($n=10$) had exclusively the form of inanimate NP1 + /ke/ + NP2 (pronoun) + verb (Table 3. 6). Roland et al. (2007) found the same in the English corpus as well.

29)

من در مورد نظراتی که ایشان مطرح کرده‌اند صحبتی ندارم.
 man darmored-e nazārāt-i ke išan
 I about-EZ comment.PL-RES COMP they
 matrah kardeand sohbatī nadāram.
 propose-PTCP do-PRS.3PL word-INDF have-PRS-NEG.1SG
 ‘I have nothing to say about the comments that they have made.’

Table 3. 6 *The Number of Pronouns as an Embedded Noun Phrase in the Relative Clauses with an Animate and an Inanimate Antecedent.*

	SU	DO	OBL	GEN
Animate Antecedent	4	0	0	0
Inanimate Antecedent	1	10	3	1

Note. SU= Subject, DO = Direct Object, OBL= Oblique, GEN = Genitive.

3.4.6.2 Animacy of Antecedent, Resumptive Pronoun, Restrictiveness

Concerning the animacy of the antecedents, the results illustrate a relation between the animacy of the antecedents and the frequency of resumptive pronouns in both restrictive and non-restrictive relative clauses. As summarised in Table 3.7 and illustrated in Figure 3.9, antecedent animacy shows a distinct distribution among restrictive and non-restrictive relatives regarding the occurrence of a resumptive pronoun and gap in the relative clauses.

Table 3.7 *The Number of Restrictive and Non-restrictive Relative Clauses in the Farsi Corpus as a Function of Animacy of Antecedent and Resumption in the Relative Clauses.*

	Animate Antecedent		Inanimate Antecedent	
	Gap	RP	Gap	RP
Res RC	48	3	76	19
Non-Res RC	31	0	24	10

Note. RP = resumptive pronoun, RC = relative clause, Res = restrictive and Non-res = non-restrictive.

Within the 65 non-restrictive relatives with a transitive verb and full NPs, gaps occur with 31 animate and 24 inanimate antecedents, whereas resumptive pronouns only occur with inanimate antecedents ($n=10$). The same pattern is found in the restrictive relative clauses: with an inanimate antecedent, predominantly there is a gap ($n=76$), whereas in non-restrictive relatives the frequency distribution of gap between animate antecedents ($n=31$) and inanimate antecedents ($n=24$) is almost similar. Overall, resumptive pronouns are predominantly used with inanimate antecedents.

Figure 3. 9 *Frequency of Animacy of the Antecedents in Restrictive and Non-restrictive Relative Clauses.*

3.4.7 Subject-Verb Disagreement in Inanimate Plural

Antecedents

In Farsi, the verb endings agree with the subject of the sentence in number and person. The verb ending inflection /-م / ‘am’ indicates the first person singular (30), and the inflection /-ند / ‘and’ at the end of the verb in example (31) shows the third-person plural.

30)

من این خانه را خریدم.

man in xāne rā xaridam.

I this house OM buy-PST.1SG.

‘I bought this house.’

31)

آنها این خانه را خریدند.

ānhā in xāne rā xaridand.

they this house OM buy-PST.3PL.

‘They bought this house.’

According to Lazard (1992), in a Farsi sentence, subject-verb agreement in number is necessary in case the subject is animate, but plural inanimate nouns always have a singular verb ending. It should be pointed out that when an inanimate noun functions as an animate subject, it is assumed as a personified animate subject. In example (32) ‘*Saudi Arabia and Riyadh*’ are personified because they perform the action of ‘*telling a lie*’; therefore, ‘*Saudi Arabia and Riyadh*’ are considered an animate subject of the matrix sentence. The antecedent NP (*the lies*) is a plural inanimate subject of the relative clause which takes a singular verb ending inside the relative clause.

32)

عربستان و ریاض دروغ‌هایی می‌گویند که در عالم واقع نمی‌تواند اتفاق بیفتد.

arabestān va riyāz dorghāi miguyand ke

Saudi Arabia and Riyadh **lie.PL-RES** say-PRS-RES.3PL COMP

dar ālame vāq nemitavānad

in world-EZ real **can-PRS-NEG.3SG**

ettefāq biyoftad.

happening **fall-SBJV-PRS.3SG.**

‘Saudi Arabia and Riyadh say lies that cannot happen in the real world.’

In the present corpus, we studied the relation of animacy of the plural antecedent with subject-verb agreement in subject relative clauses and the same effect with the number of the resumptive pronouns in the object, oblique and genitive relative clauses. Almost 20 plural inanimate antecedents were personified as they perform an act; therefore they agree with a plural verb ending (33) or a plural resumptive pronoun in an oblique relative clause (34).

33)

همه بیمارستان های کشور که تشخیص و درمان بیماران را با استفاده از انرژی هسته ای انجام می دهند ...

hameye bimārestānhāy-e kešvar ke tašxis va
all -EZ hospital.3PL-EZ country COMP diagnosis and
darmān-e bimārān rā bā estefāde az enerjī hastei
treatment-EZ patient.3PL OM by using of energy-EZ nuclear
anjām midahand ...
performance give-PRS.3PL

‘All the hospitals in the country that perform the diagnosis and treatment of patients by using nuclear energy...’

34)

کشور هایی مثل چک که اخیرا ایران با آنها قراردادهای همکاری هسته ای بسته است ...

kešvarhā-i mesle çek ke axarin irān bā ānhā
country.3PL-RES like Czech COMP recently Iran with them
qarārdādhāy-e hamkāri-e hastei baste ast.
agreement.3PL-EZ cooperation-EZ nuclear close-PTCP be-PRS.3SG...
‘Countries like Czech which recently Iran signed nuclear cooperation agreements with.’

Following the general subject-verb disagreement in number in Farsi, ($n=106$) inanimate plural antecedents go with a singular verb ending (35) and ($n=19$) inanimate plural antecedents occur with a singular resumptive pronoun (36). However, almost 39 inanimate plural antecedents violated that agreement as in (37), in which the compound noun ‘*the West and the US foreign ministry*’ is personified.

35)

راه هایی که می تواند منجر به تضعیف و ایجاد مشکلاتی برای آنها شود.

rāhhā-i ke mitavānad monjar be tazif va

way.3PL-RES COMP can-PRS.3SG leading to weakening and
 ijād-e moşkelāti barāye ānhā şavad.
 creation-EZ problem-INDF.PL for them become-SBJV-PRS.3SG.
 ‘Ways that can lead to weakening and creating problems for them.’

36)

حفاران تپه هایی را که زمانی خانه های خلفای نخست در آن شناسایی شده بود یکی
 پس از دیگری صاف می کنند.

haffārān tappehā-i rā ke zamāni xānehāy-e
 digger.PL **hill.PL**-RES OM COMP once **house.PL**-EZ
 xolafāye naxost dar ān şenāsāi şode bud
 caliph.PL-EZ first **in it** identification become-PTCP **be-PST.3SG**
 yeki pas az digar sāf mikonand.
 one after from one clear do-PRS.3PL.
 ‘Diggers are clearing one by one the hills where the houses of the first
 caliphs were once identified.’ (Lit. ‘Diggers are clearing one by one the
 hills where the houses of the first caliphs in it was once identified.’)

37)

خواسته های شما که غرب و وزارت خارجه آمریکا از آنها سخن می گویند، خواسته هایی
 غیر قابل اجرا هستند.

xāstehāy-e şomā ke garb va vezārat-e xāreje
 demand.PL-EZ you COMP west and ministry-EZ foreign-EZ
 āmrikā az ānhā soxan miguyand xāstehāi
 America from them talk say-PRS.3PL demand.PL-INDF
 geyregābel-e ejrā hastand.
 unworkable-EZ performance be-PRS.3PL.
 ‘Your demands that the West and the US foreign ministry are talking
 about, are unworkable demands.’

3.5 Discussion

This corpus study aimed to determine the frequency of distribution of different relative clause types in Farsi. To shed light on the factors that influence the frequency of relative clauses in Farsi, we first considered the distribution of different relative clause types in the whole corpus. Then, we investigated the frequency of the same relative clause types in restrictive and non-restrictive relatives. The effects of animacy of the antecedents and embedded noun phrases and resumptive pronouns on this distribution in the aforementioned relative clauses were studied as well. Moreover, we considered the possible relationship between resumptive pronouns, animacy of antecedent and embedded noun phrases in different relative clause types. At the end, we studied the effect of animacy of the antecedent on the subject-verb and resumptive pronoun agreement in number.

The present corpus study showed that the NPAH of Keenan and Comrie (1977) also holds for all types of Farsi relative clauses with all kinds of verb phrases inside the relative clauses within restrictive and non-restrictive relative clauses in the whole corpus. The subject-extracted relative clauses are the most frequent, whereas the genitive relatives are the least common. This pattern is, to some extent, consistent with the pattern found in many other languages by Keenan and Comrie. The only difference is that there are no indirect object relative clauses and object of comparison relative clauses in this corpus. We found the same pattern also in the subdivision of the restrictive relative clauses:

Subject > Direct object > Oblique > Genitive.

The majority of the relative clauses in the corpus are restrictive relative clauses which are marked by the clitic */-i/* attached to the antecedent. Subject-extracted relative clauses are more frequent than object-extracted relative clauses, which is consistent with the NPAH of Keenan and Comrie (1977).

We also explored the role of the modified antecedents in the matrix sentences. We learned that subject, and oblique elements are the most

frequently relativised nominals in the matrix sentences. This means that antecedents are modified from a subject and oblique position in the main sentence. In the relative clauses with a transitive verb and full NPs, the majority of antecedents are modified from the subject, object and oblique positions in the matrix sentences.

The frequency of the occurrence of gaps is consistent with the hierarchy of relative clauses both in restrictive and non-restrictive relatives. There is an inverse relationship between the resumptive pronouns and the hierarchy of relative clauses. Studying the distribution of resumptive pronouns shows that there is no resumptive pronoun in subject relative clauses, but all genitive relative clauses have a resumptive pronoun. Object relative clauses often have a gap and rarely they have a resumptive pronoun or a pronominal enclitic, and when they do, this is mostly in non-restrictive relative clauses. The usage of resumptive pronouns increases as the frequency of a relative clause decreases in the Farsi corpus.

In subject relative clauses with a transitive verb, there is an object marker /*rā*/ after the noun phrase inside the relative clause. This noun phrase is the object of the relative clause. Object relative clauses with a resumptive pronoun have an object marker after the resumptive pronoun as well.

In two previous corpus studies, Mak et al. (2002) showed that animacy of an antecedent and an embedded noun phrase play a significant role in the distribution of subject and object relative clauses. In two experiments, they concluded that animacy influences the processing difficulty of Dutch relative clauses. Therefore, we were motivated to study the effect of animacy of the antecedents (NP1) and the embedded noun phrases (NP2) on the distribution of the Farsi relative clauses. Our corpus results showed very similar relationships between animacy and relative clause distribution in Dutch and German. Object-extracted relative clauses rarely occur in the animate (NP1)-animate (NP2) condition, and they never occur in the animate (NP1)-inanimate (NP2) condition. They almost only

occur in the inanimate (NP1)-animate (NP2) condition. Subject-extracted relatives occur most often in the animate (NP1)-inanimate (NP2) condition, but they are also frequent in the inanimate (NP1)-inanimate (NP2) condition.

Notably, the antecedent animacy shows a different distribution among restrictive and non-restrictive relatives in combination with a resumptive pronoun or gap in the relative clauses. The pattern of distribution of gap and resumptions in restrictive and non-restrictive relative clauses is almost similar. A gap occurs in restrictive and non-restrictive relatives with either an animate or inanimate antecedent. However, resumptive pronouns almost exclusively occurred with inanimate antecedents, especially in non-restrictive relative clauses. Animacy is one of the factors that contributes to the topicworthiness of the referents. Because animate entities are topicworthy and they are active and accessible, there is no need for a resumptive pronoun. Inanimate referents are less accessible; therefore, resumptive pronouns are used to reactivate them. Hence, resumptive pronouns are predominantly used for inanimate referents.

Recall that with a plural animate subject in a Farsi sentence, subject-verb agreement in number is necessary; however, with inanimate plural nouns, the verb will be in a singular form. An inanimate subject can be assumed as an animate noun when it functions as a human being. The results of spoken and written materials analysis on subject-verb agreement by Hashabeiky (2007) illustrates that the application of singular verbs for inanimate plural subjects within the last 70 years has not changed. The only restriction in the usage of a singular verb for inanimate plural subjects is seen in the personified nouns. In the present corpus, almost 20 antecedents are personified as they performed an act like a human being; therefore, they took a plural verb ending and a plural resumptive pronoun where it is necessary. Interestingly, 106 inanimate plural antecedents go with a singular verb ending in the subject relatives and 19 plural inanimate antecedents occur with a singular resumptive pronoun in the object,

oblique, and genitive relative clauses. However, almost 39 inanimate plural antecedent had a plural verb ending or a plural resumptive pronoun. Accordingly, the violation of subject-verb and subject-resumptive pronoun disagreement in number in plural inanimate antecedents might have some reasons. First, the language has been changing over time, and it is not fixed as in the last 80 years. The second reason might be the influence of other languages on Farsi. The last point might be the mistakes that the journalists probably made due to some unknown reasons.

This corpus study lays the foundation for the research on Farsi L1 and English L2 relative clause processing in the next chapter. To have a better understanding of the relative clause processing in Farsi L1 and English L2, we will conduct online experiments in Farsi and English. Before conducting eye-tracking experiments regarding the processing relative clauses in L1 Farsi and English L2, we decided to study Farsi relative clauses in a formal written genre.

The results of this study indicate the importance of taking the frequency of relative clauses and animacy of antecedent and embedded noun phrase into account when making stimuli for relative clause studies. The majority of relative clause processing studies are built upon stimuli with only the animate (NP1)-animate (NP2) condition, which is a small proportion of relative clauses (subject relatives (1.6%). Building object relative clauses with the animate (NP1)-animate (NP2) condition certainly makes the processing very difficult.

In Chapter 2, we showed that English and Farsi relative clauses are structurally very different. In Chapter 3, we learned that the distribution of Farsi relative clauses is very similar to that in English. In Chapter 4, we will investigate the relative clause preference of Farsi-speaking participants in their L1 with an eye-tracking method. Based on the findings of the corpus study in this chapter, we hypothesise that processing object relative clauses would require more processing time in general, especially in non-restrictive Farsi relative clauses. In Chapter 5, we will explore the English relative clause preference of Farsi-speaking English learners. In

terms of content and type of relative clauses, the participants may not have difficulty with English. However, as they may not be able to rely on the frequency of the relative clauses, they will have to rely on structural cues, which are different in English and Farsi. Due to the lack of a resumptive pronoun and an object marker in English, processing English object relative clauses might be complicated for the Farsi-speaking learners of English.

Chapter 4

Chapter 4

Processing L1 Relative Clauses by Farsi Speakers

In the present eye-tracking study, we tested the object-subject relative clause symmetry and restrictiveness (restrictive versus non-restrictive relative clauses) in Farsi relative clause processing by L1 Farsi speakers. Based on the findings of the corpus study in Chapter 3, we hypothesised that processing object relative clauses would require more processing time in general, especially in non-restrictive Farsi relative clauses. Chapter 4 is organised as follows: a brief introduction, the aim, and the predictions are presented in Section 4.1. The methods, data analysis, and results are detailed in Sections 4.2, 4.3, and 4.4, respectively. They are followed by a discussion in section 4.5.

4.1 Introduction

The overarching aim of this dissertation is investigating any possible effect of language transfer from Farsi to English in the processing of relative clauses. In this chapter, we are going to discuss the processing of Farsi subject and object relative clauses as in examples (1) and (2).

1)

همسایه ای که پیرمرد را لوداد خانه اش را به سرعت ترک کرد.

hamsāye-i ke pir mard rā lodād

neighbour-RES COMP old man OM betray-PST.3SG

xāneaş rā besorat tark kard.

home-enclitic.3SG OM quickly leaving do-PST.3SG.

“The neighbour that betrayed the old man left his home quickly.”

2)

همسایه ای که پیرمرد لوداد خانه اش را به سرعت ترک کرد.

hamsāye-i ke pir mard lodād

neighbour-RES COMP old man betray-PST.3SG

xāneaş rā besorat tark kard.

home-enclitic.3SG OM quickly leaving do-PST.3SG.

“The neighbour that the old man betrayed left his home quickly.”

Note that, as shown in Chapter 3, these relative clauses are very infrequent and they constitute only 1.62% of the total. However, we are going to focus on this small subset of relative clauses in the corpus because they have been studied so much and we aim to make our results in this experiment comparable with the vast amount of literature on processing those relative clauses.

As explained in Chapter 1, there is a great number of studies indicating that object relative clauses of this type are more difficult to process than subject relative clauses in various pre-nominal and post-nominal languages, such as English (e.g., King & Just, 1991; King &

Kutas, 1995; Gibson, 1998; Traxler et al., 2002; Grodner & Gibson, 2005; Staub, 2010; Staub et al., 2017), Spanish (e.g., Betancort et al., 2009), Dutch (e.g., Frazier, 1987; Mak et al., 2002, 2006), German (e.g., Mecklinger et al., 1995), French (e.g., Holmes & O'Regan, 1981), Japanese (e.g., Ueno & Garnsey, 2008; Ishizuka et al., 2003), Chinese (e.g., Hsiao & Gibson, 2003; Chen et al., 2008; Gibson & Wu, 2013), Korean (e.g., Kwon et al., 2006; Kwon et al., 2013), and Turkish (e.g., Aydin, 2007; Kükiürt, 2004). Only in a few cases a preference for object relative clauses has been reported, namely in a study on Basque (e.g., Carreiras et al., 2010) and some studies on Chinese (e.g., Cui, 2013; Wu et al., 2010).

In the above-mentioned relative clause processing studies, several on-line and off-line testing methods such as eye-tracking, self-paced reading, corpus analysis, grammaticality judgement, and word selection tasks have been used. To the extent of our knowledge, there is no research investigating the on-line processing of Farsi subject and object relative clauses (1 and 2).

Hence, to establish any possible cross-linguistic influence in the processing of relative clauses by L1 Farsi-speaking learners of English, we first need to investigate relative clause processing in the Farsi language. Since restrictiveness is marked in Farsi relative clauses, we will investigate the processing difference between subject and object relatives in both restrictive and non-restrictive conditions (examples in Table 4.1). In order to make predictions about the Farsi speakers' relative clause preference, we repeat the most important findings from the corpus study in Chapter 3, the distinctive differences between Farsi and English relative clauses from Chapter 2 and some relative clause processing accounts in the following paragraphs.

To begin with, we learned that in Farsi, like in English, subject relative clauses are more frequent than object relative clauses. As explained in Chapter 1, there are many explanations for the processing asymmetry between subject and object relative clauses. The frequency-based approach (Real & Christiansen, 2007) argues that the more frequent

structures are in a given language, the easier processing will be. Also, according to the Accessibility Hierarchy of Keenan and Comrie (1977), the lower a position is on the accessibility hierarchy, the harder it is to understand the relative clause formed in that position. This difference is reflected in the frequency with which these constructions occur.

Thus, based on the findings in the corpus study in Chapter 3 the frequency-based approach and Accessibility Hierarchy predict a subject relative clause preference in processing Farsi relative clauses. However, there may be a difference between restrictive and non-restrictive relative clauses in this respect. The analysis of relative clauses with transitive verbs in the corpus revealed that restrictive object relative clauses are relatively more frequent than non-restrictive relative clauses. Thus, in non-restrictive relatives, there is a strong preference for the subject relatives. This may be the reason why in these object relatives, a resumptive pronoun is often used: the majority of restrictive object relative clauses (98%) occur with a gap; however, non-restrictive object relatives come almost equally often with a resumptive pronoun (45%) and with a gap (55%) as. According to the frequency-based approach, we may predict that processing non-restrictive object relative clauses will be the most difficult one firstly because of their lowest frequency in the corpus.

Besides frequency, a second relevant factor is that disambiguation of relative clauses depends on morphological cues at the very beginning of a relative clause, rather than structural cues as is the case in English. There is an object marker following an object noun phrase in a subject relative clause, which is not present in an object relative clause. This is the first cue for the readers as to the structure of the relative clause. The presence or absence of an object marker helps the reader to differentiate subject relatives from object relatives at the embedded noun phrase. Therefore, there is no ambiguity at all. The object marker is an early and reliable cue, so Farsi speakers can be expected to rely on this in processing. The second morphological cue that disambiguates the relative clause is the number marker on the verb ending inflection; the verb inflection correlates with the

number of the subject. Note that this cue is helpful only in the cases where subject and object differ in number.

Since readers do not encounter a relative pronoun in the Farsi relative clauses, they face a noun phrase after the complementizer /*ke*/ which unambiguously shows them the type of the relative clause, because an object is accompanied with an object marker, indicating that the relative clause is a subject relative. If there is no object marker, the relative clause must be an object relative clause. When the readers encounter the embedded noun phrase plus the object marker in the subject relative clause, they have to project a subject and a verb. In the object relative clause, they are faced with an embedded noun phrase, then they have to project an object and a verb. They have two projections in both subject and object relative clauses, but the object marker cue in the subject relative clause may make the projection of the subject and verb fast.

The Structural Distance Hypothesis (O'Grady et al., 2003) is another structural account that might be relevant to the processing of relative clauses by Farsi speakers. Based on this hypothesis, the number of elements between the antecedent (the filler in their terminology) and the gap in the relative clause and the depth of a gap in the syntactic tree corresponding to the antecedent determine the difficulty of the relative clause processing. Since the distance between the antecedent and the gap in Farsi subject relatives is shorter than that in the object relatives, this theory predicts that processing object relatives is more complicated than processing subject relatives.

Another relevant factor is the word order in the Farsi relative clauses. Canonical word order theory (MacDonald & Christiansen, 2002) argues that the word order in English subject relative clauses resembles the word order in canonical declarative sentences which are used very frequently. Experience with frequent simple sentences with the same word order aids in interpreting subject relatives more than object relatives. We note that Farsi is a Subject-Object-Verb (SOV) ordered language in which canonical order of sentence constituents is Subject, followed by Object,

followed by Verb. In English subject and object relative clauses, the word order is NP V NP and NP NP V, respectively. However, in Farsi, in both cases the word order after the complementizer /*ke*/ is NP V, where the NP is unmarked in the object relative clauses and marked (as the object) in the subject relative clauses. Therefore, there is no canonical or non-canonical word order in the Farsi subject and object relative clauses. Finally, based on the Perspective Shift Hypothesis (MacWinney & Pleh, 1988), we might also predict a subject relative clause preference in Farsi. In the subject relative, the perspective of the relative clause and the matrix clause is the same because the noun phrase which has the position of a subject in the matrix clause has the function of a subject inside the relative clause as well. However, in the object relative clauses, the perspective of the subject of matrix clause shifts to the relative clause subject. Then, after the relative clause, the perspective of the relative clause shifts back to the matrix subject.

On the basis of the discussion above, we hypothesise that processing object relative clauses will require more processing time in general, especially in non-restrictive Farsi relative clauses. For the L1 Farsi participants, we started with the English experiment reported in Chapter 5, since that was the most crucial experiment for this group, and we did not want to have the results influenced by their experience with the sentences in Farsi. The Farsi experiment was conducted (at least) two weeks later. The participants got a different version of the experiment. For expository reasons, we present the results of the Farsi experiment first.

4.2 Methods

4.2.1 Participants

Forty-two Iranian students at the University of Groningen participated in the experiment voluntarily. There were 35 native speakers of Farsi, four Azerbaijani Turk, two Kurd, and one Arab participants. Since Farsi is the only instruction language at schools and universities in Iran, non-Farsi Iranians are almost illiterate in their mother languages, and they read and

write in Farsi. Therefore, the non-Farsi Iranian speakers mentioned here also were included in the experiment. There were 16 men and 26 women. Their mean age was 30.76 (ranging between 22 and 40). The participants had normal or corrected-to-normal vision, and they reported no reading or other language-related disorders.

4.2.2 Materials and Design

This study focused on only two types of relative clauses; subject and direct object relative clauses. An example of an item is given in Table 4.1. All the antecedents and the embedded noun phrases were animate full NPs, and all the relative clause verbs were transitive. All four versions of relative clauses were subject modified (the antecedents were the subject of the matrix sentence). They were either subject or object extracted relative clauses (the referents of the antecedents were subject or object of the relative clauses). The test sentences either contained a subject relative clause (1a and 2a), or an object relative clause (1b and 2b). There is no change in the order of the embedded noun phrase and the verb phrase. The only difference between (1) and (2) is the restrictive enclitic */-i/* attached to the antecedent in the group (1).

The materials for this experiment consisted of 36 items, each consisting of four sentence versions (see Appendix B). Initially, the items were adapted from Staub (2010) and Staub et al. (2017) and were used in the experiments in English reported in the next two chapters. Then, for the present experiment, the items were translated into Farsi carefully. The examples in Table 4.1 show restrictive and non-restrictive object and subject relative clauses in Farsi.

Table 4. 1 *An Example of an Item in Farsi Including Subject and Object Relative Clauses in Restrictive and Non-restrictive Conditions.*

3) (SR Res)
همسایه ای که پیرمرد را لوداد خانه اش را به سرعت ترک کرد.
hamsāye-i ke pīr mard rā lodād
neighbour-RES COMP old man OM betray-PST.3SG
xāneaş rā besorat tark kard.
home-enclitic.3SG OM quickly leaving do-PST.3SG.
‘The neighbour that betrayed the old man left his home quickly.’
4) (OR Res)
همسایه ای که پیرمرد لوداد خانه اش را به سرعت ترک کرد.
hamsāye-i ke pīr mard lodād
neighbour-RES COMP old man betray-PST.3SG
xāneaş rā besorat tark kard.
home-enclitic.3SG OM quickly leaving do-PST.3SG.
‘The neighbour that the old man betrayed left his home quickly.’
5) (SR Non-res)
همسایه که پیرمرد را لوداد خانه اش را به سرعت ترک کرد.
hamsāye ke pīr mard rā lodād
neighbour COMP old man OM betray-PST.3SG
xāneaş rā besorat tark kard.
home-enclitic.3SG OM quickly leaving do-PST.3SG.
‘The neighbour, who betrayed the old man, left his home quickly.’
6) (OR Non-res)
همسایه که پیرمرد لوداد خانه اش را به سرعت ترک کرد.
hamsāye ke pīr mard lodād
neighbour COMP old man betray-PST.3SG
home-enclitic.3SG rā besorat tark kard.
home-enclitic OM quickly leaving do-PST.3SG.
‘The neighbour, whom the old man betrayed, left his home quickly.’

Note. SR res = restrictive subject relative clause, OR Res = restrictive object relative clause, SR Non-res = non-restrictive subject relative clause, OR Non-res = non-restrictive object relative clause.

The object marker in the subject relative clauses and the enclitic/-i/ in restrictive relative clauses provide the reader with morphological cues

as to which relative clause they are reading in the experiment. The subject-verb agreement did not provide information in the items since the NPs in the relative clauses do not differ in number. The four versions of every item were distributed across four different lists so that precisely one version of each set appeared in a list and an equal number of items of the same version appeared across the lists.

Each participant read nine *restrictive* subject relative clauses, nine *restrictive* object relative clauses, nine *non-restrictive* subject RCs, and nine *non-restrictive* object relative clauses. The test items in every version were presented together with 60 filler items of various syntactic types. These items were based on the Cambridge Preparation for the TOEFL (Gear & Gear, 2002). Twenty-five per cent of the test sentences were paired with a simple comprehension verification statement (True/False) about the content of either the relative clause or the matrix sentence. Half of the statements were about the relative clause and the other half about the matrix sentence. Half of the statements were true to the content of the target sentence, and the other half were false.

4.2.3 Procedure

Participants were tested individually in the eye lab at the University of Groningen. Eye movements were recorded using a Tobii 1750 Eye tracker, interfaced with a laptop. The sampling rate was 50 HZ. Stimuli were displayed on a 17-inch monitor. Participants were seated approximately 68 cm from the computer screen. The movements of both eyes were recorded. Sentences were presented in 40 pt—Arabic Typesetting font. We opted for Olive Green lighter 80% for the background of stimuli to avoid a strain on the participants' eyes. All parts of the matrix sentences including the clause and matrix verb appeared on one line.

Every list was divided into three sections: First, the participants read ten practice sentences, after which there was a short break. Then, they read the first 48 sentences of the experiment, which were again followed by a pause. After this break, the final set of 48 sentences were read. A nine-

point calibration was carried out three times: before the practice part, before the first experimental part, and before the second experimental part. Before each sentence, an asterisk appeared on the right side of the screen at the position where the first word would be presented. Half of the participants were exposed to the two experimental parts in one order, the other half in the reverse order. The experiment was built and run with the Clearview software.

Before starting the experiment, the participants were instructed to read silently at their own pace for comprehension and were informed that they would be checked for comprehension of some of the sentences randomly. A space bar press either led to the next item or a comprehension verification statement. The participants answered True by clicking on the key ‘C’ and False on ‘M’. These keys were marked with a green and a red sticker, respectively.

4.3 Data analysis

We divided the sentences into six regions: the antecedent, complementizer /*ke*/, embedded noun phrase in the relative clause, embedded verb phrase in the relative clause, pre-matrix verb, and matrix verb (Table 4.2).

Table 4. 2 *Areas of Interest for Data Analysis.*

7)	همسایه ای که پیرمرد را لوداد خانه اش را به سرعت ترک کرد.						
	Matrix VP	Pre-matrixVP	VP	OM	NP	COMP	HD
8)	همسایه ای که پیرمرد لوداد خانه اش را به سرعت ترک کرد.						
	Matrix VP	Pre-matrixVP	VP	NP	COMP	HD	
9)	همسایه که پیرمرد را لوداد خانه اش را به سرعت ترک کرد.						
	Matrix VP	Pre-MatrixVP	VP	OM	NP	COMP	HD
10)	همسایه که پیرمرد لوداد خانه اش را به سرعت ترک کرد.						
	Matrix VP	Pre-MatrixVP	VP	NP	COMP	HD	

Note. HD=head noun (antecedent), COMP=complementizer, NP = noun phrase, OM= object marker, VP= verb phrase, Pre-MatrixVP = pre-matrix verb, Matrix VP = Matrix verb. ‘|’ marks the division between the areas of interests.

For each region, four reading time measures were compared. The First-pass reading time or gaze duration is defined as the sum of all the fixations made in a region until the eyes of the reader leave the region either to the left or to the right. First-pass total reading time (also known as right-bounded time or total gaze duration) (FP_{tot}) sums all fixations within a region before moving on progressively (which means to the left in Farsi). This measure consists of First-pass reading times (FP), including additional fixations that follow regressive eye-movements. Regression path duration (RPD) is defined as the total time from initially encountering a word to moving to the following word. Total reading time (TRT) sums all fixations made within a region of text, including those fixations made when re-reading the region. Figure 4.1 illustrates the reading direction from right to left in a Farsi filler sentence in the present experiment. The blue balls show the fixations and the blue lines are saccades between the fixations.

Figure 4. 1 Reading Direction and Patterns in a Farsi Sentence.

We corrected the vertical drifts manually by pulling the fixations up or down the areas of interests with the program Fixation (Cozijn, 1994). Within 17.1 % of FP, 16.5% of FPtot, 7% TRT, and 16.5% of RP on the areas of interests, no reading time measurement was recorded; they were skipped by the readers. Of the remaining cases 17.3 % of FP, 19.7% of FPtot, 29.5 % TRT, and 23 % of RP have been discarded because of the poor quality of the measurements like blinking. We deleted observations above and below 2 SD from both the participant and item means. Accordingly, 26 outliers in FP, 33 outliers in FPtot, 30 outliers in TRT, and 46 outliers in RP were deleted. Since reading time data are inherently skewed, we transformed the data by taking logarithmic to approximate the normal distribution of the reading times.

Statistical analysis was conducted using linear mixed-effects models of the reading times. We used R (R Core Team, 2019) and the *lme4* package (Bates et al., 2015) to predict the times of the eye movement measurements (First-pass, First-pass total, total reading time, regression path duration) based on Clause Type (subject versus object) and Restrictiveness (Restrictive versus Non-restrictive). We produced the figures by using the package *ggplot2* (Wickham, 2016).

As random effects, we included intercepts for subjects and items as well as by-subject and by-item random slopes for the effect of Clause Type and Restrictiveness and their interaction. First, we created the model with the main effects and then compared it with the model with the interaction. In cases where the model did not converge, we first removed

the interaction from the random part, and if necessary, in some cases, also the random slopes for the main effect. This was the case in 18 of the 48 models.

In the models, the subject relative was the baseline for Clause Type and the restrictive condition was the baseline for Restrictiveness. In the case of an interaction, an extra analysis was run to test the effect of Clause Type in the non-restrictive condition by changing the baseline for Restrictiveness into the non-restrictive condition.

4.4 Results

4.4.1 Antecedent

The antecedent in restrictive relative clauses is marked by the particle /-i/ which is shown in example (11). The example (12) is a non-restrictive relative clause without a restrictive marker.

11)

(Restrictive)

The babysitter-i | ke | the child rā | liked | a qualified nurse | was.

12)

(Non-restrictive)

The babysitter | ke | the child rā | liked | a qualified nurse | was.

The results for the antecedent are presented in Table 4.3. For the *First-pass Reading Time* (which is in this region the same as the *First-pass total Reading Time* and the *Regression Path Duration*), adding the interaction did not improve the model ($\chi^2(1) = 0.80$, $p = 0.369$). In the model without the interaction (marginal R^2 squared = 0.017), the main effect of Restrictiveness was significant ($\beta = -0.166$, $SE = 0.61$, $t = -2.71$, $p = 0.01$): Reading times were slower in restrictive conditions than in non-restrictive conditions.

Table 4. 3 Means (in ms) for Reading Time Measures and Standard Deviations in Parentheses by Condition for the Antecedent Region in Experiment 1. Significant Effects are Identified with a Bold Type.

	Restrictive		Non-restrictive	
	SR	OR	SR	OR
First-pass	395(225)	463(315)	387(343)	346(220)
Total reading time	712(542)	766(718)	578(529)	631(529)

For the *Total Reading Time*, adding the interaction did not improve the model ($\chi^2(1) = 1.52$, $p = .21$; marginal $R^2 = 0.028$). In the model without the interaction, there was a main effect of Clause Type ($\beta = 0.114$, $SE = 0.042$, $t = 2.70$, $p = .006$): object relative clauses were read slower than subject relatives. There was also a main effect of Restrictiveness ($\beta = -0.223$, $SE = 0.049$, $t = -4.70$, $p < .001$): reading times on the antecedent of non-restrictive relative clauses was shorter than the reading times of restrictive relative clauses.

Figure 4. 2 *Experiment 1 Mean and Standard Error for First-pass Reading Time for the Antecedent Region Split by Clause Type and Restrictiveness.*

Note. Res = restrictive, NRes = non-restrictive, SR = subject relative clause, OR = object relative clause.

In sum, the main finding at the antecedent is a significant effect of Restrictiveness for all the measurements, indicating that the reading times on the head of restrictive relative clauses (which contains the particle /-i/) were longer than on the head of non-restrictive relative clauses (see Figure 4.2; here and in the following we will present the measure that is most representative in a graph). Only in the Total Reading Time, which includes re-reading from later parts of the sentence, an effect of Clause Type is found: in object relative clauses there was more re-reading of the head than in subject relative clauses.

4.4.2 Complementizer *Ke*

At the complementizer /*ke*/, adding the interaction did not improve the model for any of the measures (FP: $\chi^2(1) = 0.005$, $p = 0.93$; RPD: $\chi^2(1) =$

0.003, $p = .95$; TRT: $\chi^2(1) = 3.24$, $p = .071$; FPtot: $\chi^2(1) = 0.002$, $p = .95$). The marginal R^2 for the optimal models was 0.027 for FP, 0.019 for RPD, 0.027 for TRT, and 0.0048 for FPtot. The results at the complementizer /ke/ are presented in Table 4.4. The complementizer is the same in all conditions. There were no significant effects in the *First-pass Reading Time* and in the *First-pass Total Reading Time*.

Table 4. 4 Means (in ms) for Reading Time Measures Standard Deviations in Parentheses by Condition for the Complementizer ke Region in Experiment 1. Significant Effects are Identified with a Bold Type.

	Restrictive		Non-restrictive	
	SR	OR	SR	OR
First-pass	227(100)	228(87)	206(86)	248(105)
First-pass total	227(109)	228(94)	211(85)	248(166)
Regression path duration	307(245)	341(269)	264(205)	295(189)
Total reading time	337(258)	324(203)	352(254)	563(658)

For the *Regression Path Duration*, there was a significant effect of Restrictiveness ($\beta = -0.155$, $SE = 0.066$, $t = -2.34$, $p = .02$), with longer reading time on restrictive relatives than on the non-restrictive relative clauses.

For the *Total Reading Time*, the effect of Restrictiveness was significant ($\beta = 0.181$, $SE = 0.058$, $t = 3.09$, $p = 0.002$): in re-reading, restrictive relative clauses were read *faster* than non-restrictive relative clauses.

Figure 4. 3 Experiment 1 Mean and Standard Error for Regression Path Duration for Complementizer Ke Region Split by Clause Type and Restrictiveness.

Note. Res = restrictive, NRes = non-restrictive, SR = subject relative clause, OR = object relative clause.

In sum, the regression path duration shows longer reading times on the restrictive relative clause than on the non-restrictive relative clauses (see Figure 4.3). In contrast, the total reading times show that re-reading times in the non-restrictive relative clauses were longer than in the restrictive relative clauses.

4.4.3 Embedded Noun Phrase

In Farsi, the position of the embedded noun phrase is fixed in both subject and object relative clauses, see example (13 and 14). However, the embedded noun phrase in subject relative clauses (where it is the object) is marked by the object marker /*rā*/.

13)

The babysitter | ke | **the child** *rā* | liked | a qualified nurse | was. (SR)

14)

The babysitter | ke | **the child** | liked | a qualified nurse | was. (OR)

The results at the noun phrase are presented in Table 4.5. There were no significant effects in the *First-pass Reading Time*. For the *First-pass Total Reading Time*, the *Regression Path Duration* and the *Total Reading Time* the pattern of results was the same. Adding the interaction did not improve the model (FPtot: $\chi^2(1) = 0.86$, $p = 0.351$; RPD: $\chi^2(1) = 0.563$, $p = .453$; TRT: $\chi^2(1) = 1.25$, $p = .26$). The marginal R^2 for the optimal models was 0.034 for FPtot, 0.04 for RPD, 0.016 for TRT. In the model without the interactions, the effect of Clause Type was significant (FPtot: $\beta = -0.149$, $SE = 0.029$, $t = -5.035$, $p < .001$; RPD: $\beta = -0.166$, $SE = 0.036$, $t = -4.56$, $p < .001$; TRT: $\beta = -0.093$, $SE = 0.042$, $t = -2.20$, $p = .03$): Object relative clauses were read faster than subject relative clauses. The effect of Restrictiveness was also significant (FPtot: $\beta = 0.134$, $SE = 0.034$, $t = 3.88$, $p < .001$; RPD: $\beta = 0.179$, $SE = 0.041$, $t = 4.27$, $p < .001$; TRT: $\beta = 0.153$, $SE = 0.048$, $t = 3.19$, $p = .001$): non-restrictive relative clauses were read slower than restrictive relative clauses.

Table 4. 5 Means (in ms) for Reading Time Measures Standard Deviations in Parentheses by Condition for the Embedded Noun Phrase Region in Experiment 1. Significant Effects are Identified with a Bold Type.

	Restrictive		Non-restrictive	
	SR	OR	SR	OR
First-pass	384(236)	358(221)	437(268)	412(244)
First-pass total	472(248)	426(251)	614(338)	518(266)
Regression path duration	537(326)	502(365)	722(435)	602(386)
Total reading time	998(791)	823(565)	1127(802)	1050(685)

Figure 4. 4 Experiment 1 Mean and Standard Error for Regression Path Duration for the Embedded Noun Phrase Region Split by Clause Type and Restrictiveness.

Note. Res = restrictive, NRes = non-restrictive, SR = subject relative clause, OR = object relative clause.

In sum, at the embedded noun phrases, reading times on the subject relative clauses were longer than the object relative clauses (see Figure 4.4). This effect can be explained by the extra length of the region in subject relative clauses, because of the object marker following the NP.

4.4.4 Embedded Verb Phrase

The position of the embedded verb phrase in subject and object relatives is the same. It follows the embedded noun phrase and is positioned at the end of the relative clause. The verb phrases are in bold type in (15) and (16).

15)

The babysitter | ke | the child rā | **liked** | a qualified nurse | was. (SR)

16)

The babysitter | ke | the child | **liked** | a qualified nurse | was. (OR)

The results at the verb phrase are presented in Table 4.6. There were no effects in the *First-pass Reading Time*, the *First-pass Total Reading Time*, and in the *regression path* duration.

Table 4. 6 Means (in ms) for Reading Time Measures Standard Deviations in Parentheses by Condition for the Embedded Verb Phrase Region in Experiment 1. Significant Effects are Identified with a Bold Type.

	Restrictive		Non-restrictive	
	SR	OR	SR	OR
First-pass	530(279)	569(380)	572(298)	584(328)
First-pass total	638(277)	698(407)	664(291)	740(399)
Regression path duration	700(371)	781(510)	712(358)	855(604)
Total reading time	1106(773)	1179(861)	1037(577)	1358(836)

For the *Total Reading Time*, adding the interaction did not improve the model ($\chi^2(1) = 1.18$, $p = .27$; marginal R^2 squared = 0.017). In the model without the interactions, there was a significant effect of Clause Type ($\beta = 0.176$, $SE = 0.041$, $t = 4.28$, $p < .001$): Object relative clauses were read slower than subject relative clauses.

Figure 4. 5 *Experiment 1 Mean and Standard Error for Total Reading Time for Embedded Verb Phrase Region Split by Clause Type and Restrictiveness.*

Note. Res = restrictive, NRes = non-restrictive, SR = subject relative clause, OR = object relative clause.

In sum, at the embedded verb phrases, reading times on the object relative clauses were longer than the subject relatives, but only when the participants re-read the verb after first reading the rest of the sentence (see Figure 4.5).

4.4.5 Pre-matrix Verb

Since Farsi has an SOV word order, object, object marker, adjective and adverbs precede the main verb. Therefore, in our materials, the matrix verb in the relative clause sentence does not follow the embedded verb phrase of the relative clause directly (17).

17)

The babysitter | ke | the child | liked | **a qualified nurse** | was.

The results at the pre-matrix verb region are presented in Table 4.7. At this region, adding the interaction did not improve the model for the measurements (FP: $\chi^2(1) = 1.94$, $p = 0.16$; FPtot: $\chi^2(1) = 0.25$, $p = .61$; RPD: $\chi^2(1) = 1.03$, $p = 0.30$; TRT: $\chi^2(1) = 0.467$, $p = .49$). The marginal R^2 for the optimal models was 0.0031 for FP, 0.022 for RPD, 0.011 for TRT, and 0.011 for FPtot).

There were no significant effects in the *First-pass Reading Time*. For the *First-pass Total Reading Time*, there was a significant effect of Clause Type ($\beta = 0.088$, $SE = 0.031$, $t = 2.87$, $p = .009$), with longer reading time in the object relative conditions than in the subject relative conditions.

Table 4. 7 Means (in ms) For Reading Time Measures and Standard Deviations in Parentheses by Condition for the Pre-matrix Verb Region in Experiment 1. Significant Effects are Identified with a Bold Type.

	Restrictive		Non-restrictive	
	SR	OR	SR	OR
First-pass	785(412)	798(432)	854(433)	808(485)
First-pass total	925(415)	987(422)	957(391)	1049(495)
Regression path duration	940(424)	1059(530)	1040(505)	1240(857)
Total reading time	1287(819)	1376(696)	1277(786)	1453(807)

For the *Regression Path duration*, there was a significant effect of Clause Type ($\beta = 0.118$, $SE = 0.029$, $t = 3.999$, $p < .001$), with longer reading times on the object relative clauses. Moreover, there was a significant effect of Restrictiveness ($\beta = 0.01$, $SE = 0.034$, $t = 2.888$, $p = .004$): Reading times in non-restrictive relative clauses were longer than in restrictive relative clauses.

For the *Total Reading Time*, there was a significant effect of Clause Type ($\beta = 0.1$, $SE = 0.05$, $t = 1.98$, $p = .05$), with longer total reading times in object relative clauses than in subject relative clauses.

Figure 4. 6 *Experiment 1 Mean and Standard Error for Regression Path Duration for Pre-matrix Verb Region Split by Clause Type and Restrictiveness.*

Note. Res = restrictive, NRes = non-restrictive, SR = subject relative clause, OR = object relative clause.

In sum, the main finding was a significant effect of Clause Type, illustrating that the reading times in the object relative conditions were more prolonged than in the subject relative conditions. Only in the Regression Path Duration, there was also an effect of Restrictiveness: Reading times in non-restrictive relatives were longer than restrictive relatives (see Figure 4.6).

4.4.6 Matrix Verb

The matrix verb is positioned at the end of the sentence, which could be a transitive, intransitive, or copula verb. The Matrix verb is illustrated in bold in (18).

18)

The babysitter | ke | the child | liked | a qualified nurse | **was**.

The results at the matrix verb are presented in Table 4.8. For all four measures, adding the interaction improved the model (FP: $\chi^2(1) = 8.14$, $p = 0.004$; FPtot & TRT: $\chi^2(1) = 7.47$, $p = .006$; RPD: $\chi^2(1) = 10.01$, $p = .001$). The marginal R^2 for the optimal models was 0.0097 for FP, 0.018 for RPD, 0.012 for TRT, and 0.011 for FPtot). There was a significant effect of clause type in the restrictive conditions (FP: $\beta = -0.117$, $SE = 0.06$, $t = -1.96$, $p = .05$; FPtot & TRT: $\beta = -0.12$, $SE = 0.061$, $t = -2.09$, $p < 0.001$; RPD: $\beta = -0.229$, $SE = 0.102$, $t = -2.252$, $p = .02$): object relative clauses were read faster than subject relative clauses.

Table 4. 8 Means (in ms) for Reading Time Measures and Standard Deviations in Parentheses by Condition for the Matrix Verb Region in Experiment 1. Significant Effects are Identified with a Bold Type.

	Restrictive		Non-restrictive	
	SR	OR	SR	OR
First-pass	578(359)	525(347)	523(354)	560(320)
Regression path duration	2036(2167)	1687(1658)	1506(1793)	1774(1666)
Total reading time	763(451)	681(490)	657(492)	744(528)

In subject relative clauses, there was an effect of Restrictiveness (FP: $\beta = -0.144$, $SE = 0.064$, $t = -2.22$, $p = .03$; FPtot & TRT: $\beta = -0.20$, $SE = 0.067$, $t = -3.10$, $p = .001$; RPD: $\beta = -0.391$, $SE = 0.10$, $t = -3.73$, $p < .001$): Non-restrictive relative clauses were read faster than restrictive relative clauses. There was a significant interaction of Clause Type and Restrictiveness (FP: $\beta = 0.25$, $SE = 0.09$, $t = 2.85$, $p = .004$; FPtot & TRT: $\beta = 0.257$, $SE = 0.094$, $t = 2.73$, $p = .006$; RPD: $\beta = 0.478$, $SE = 0.151$, $t = 3.169$, $p = .001$). In non-restrictive conditions, the reading times for the object relative clauses were longer than the reading times for the subject relative clauses (FP: $\beta = 0.13$, $SE = 0.06$, $t = 2.31$, $p = .02$; FPtot & TRT: $\beta = 0.127$, $SE = 0.062$, $t = 2.00$, $p = .041$; RPD: $\beta = 0.24$, $SE = 0.102$, $t = 2.42$, $p = .01$).

Figure 4. 7 *Experiment 1 Mean and Standard Error for Regression Path Duration for Matrix Verb Region Split by Clause Type and Restrictiveness.*

Note. Res = restrictive, NRes = non-restrictive, SR = subject relative clause, OR = object relative clause.

In sum, the interactions of Clause Type and Restrictiveness conditions for three reading time measurements were significant. They indicate that reading times in non-restrictive relative clauses were longer in object relative clauses than in subject relatives. In contrast, in restrictive relative clauses, there were longer reading times in subject relative clauses than in object relative clauses (see Figure 4.7).

4.5 Discussion

The main aim of the present experiment was to investigate whether there is any processing symmetry between Farsi object and subject relative clauses and whether the frequency distribution of Farsi restrictive and non-restrictive object and subject relative clauses is reflected in processing by L1 Farsi speakers. To this end, with an eye-tracking method, we tested the effect of Clause Type and Restrictiveness in Farsi relative clauses. The expectation was that there would be a delay in reading Farsi object relative clauses of the type studied in the experiment, especially in non-restrictive relative clauses.

The results show that there is indeed a processing delay in object relative clauses compared to subject relative clauses, which is consistent with all of the theories discussed in the introduction. The effect of processing difficulty in the object relatives is revealed at the continuation of the main clause (pre-matrix verb) in First-pass total reading time, regression path duration, and total reading time. The effect is also found in re-reading times at the embedded verb phrase and the antecedent. Thus, the effect of Clause Type is comparable to the effect seen in many languages such as English, but it seems to appear later in this experiment.

The fact that the effect appears quite late may have to do with the fact that the relative clauses are unambiguously marked as subject or object relative clauses at the Noun Phrase. The embedded noun phrase in the subject relative clauses elicited long First-pass total reading time, regression path duration, and total reading times. This effect might be because of the presence of the object marker /*rā*/. We might say that the object marker is an important cue in recognizing the subject relative clauses so that no difficulty or doubt is left to be solved at the next regions, which may facilitate processing of the syntactic structure of the relative clauses.

The pre-matrix verb region includes the object of the matrix sentence, an object marker and an adverb, adjective, preposition, or object of a preposition. As already mentioned, Farsi sentences have the Subject-

Object-Verb word order. Therefore, the pre-matrix verb region is located before the matrix verb. There was a significant reading time penalty in object relatives in the pre-matrix verb region. A possible explanation for the effect at this region is related to a perspective shift (MacWhinney & Pleh, 1988) between matrix clause and relative clause: In object relative clauses, there has been a shift between the main clause to another subject noun phrase in the relative clause. Therefore, there is a shift back in the main clause, which may explain the delay in reading times at the continuation of the matrix clause and in re-reading the previous regions.

Farsi speakers may process restrictive relative clauses differently from non-restrictive relatives because it is a kind of syntactic category in the language, so there is a clear division between two, signalled through an enclitic morpheme */-i/* attached to the antecedent. It is observed that non-restrictive relative clauses are read slower than restrictive relative clauses at the embedded verb phrase, the pre-matrix region, and the matrix verb. One idea might be the frequency-based approach (MacDonald & Christiansen, 2002); the preference of the relative clauses in Farsi is in line with their frequency distribution in the Farsi corpus. Non-restrictive relatives are much less frequent in the corpus than restrictive relative clauses.

At the end of the sentence, the matrix verb, there is an interaction of Clause Type and Restrictiveness. Here, an unexpected pattern of results appeared: In the non-restrictive condition there is a subject relative clause preference, but in the restrictive condition, there is an object relative clause preference. This effect may be related to the fact that restrictive relative clauses are often object relative clauses, since they are used to connect a new referent (the head), to a given referent, the embedded noun phrase (Fox & Thompson, 1990). In the restrictive condition, object relatives are more common, whilst in the non-restrictive condition, subject relatives are frequent. This may be reflected in a wrap-up effect at the matrix verb.

In sum, the asymmetry in the processing of the Farsi object and subject relative clauses specially on the restrictive and non-restrictive types

mirrored the patterns of distributions which the Farsi corpus analysis revealed. This experiment revealed that there is a clause type effect in Farsi relative clause sentences which is similar to the effect found in many languages. The question now is, how the same participants process relative clauses in English, which is a language they acquired later. There are some striking differences between relative clauses in Farsi and English. The most important one is that in Farsi, the readers can rely on morphological cues to disambiguate the sentence reliably. In English, disambiguation is also reliable but based on the difference in word order.

To find out whether there is a cross-linguistic influence of L1 Farsi on L2 English in the processing of relative clauses, we will conduct a follow-up experiment. We will investigate how the same participants who took part in the present experiment process English relative clauses with the relative pronoun '*that*', which are only disambiguated by word order. We will contrast this with relative clauses with the relative pronouns '*who/whom*', which do provide a morphological cue that disambiguates the relative clauses. We expect that Farsi speakers will appeal to morphological cues for processing the relative clauses since object and subject relative clauses in their L1 are not differentiated by word order. Hence, they are expected to experience more difficulty in relative clauses with the relative pronoun *that* than in relative clauses with the pronoun '*who(m)*'.

Chapter 5

Chapter 5

Cross-linguistic Influence in Processing English Relative Clauses by Farsi Speakers

This chapter investigates whether there is cross-linguistic influence of L1 Farsi on L2 English in the processing of relative clauses. Chapter 2 described the language systems under investigation, revealing essential differences in relative clauses between the two languages. However, Chapter 3 showed that the languages are functionally similar in how they use relative clauses. Important for this chapter is the fact that the distribution of subject and object relative clauses in English and Farsi is very similar: subject relative clauses are more frequent than object relatives. Since the distributions are similar, there is a reason to expect similarities in processing as well. However, the two languages are different in other crucial aspects which makes it difficult for learners of Farsi to acquire English. The present study is motivated by unique syntactic properties of Farsi relative clauses and the difficulties that L1 Farsi speakers may encounter while processing L2 English relative clauses.

5.1 Introduction

Based on language structure, we might expect different processing patterns between Farsi and English for several reasons. One reason is that the word order in Farsi is SOV, as in the relative clause in (1), as opposed to basic SVO word order in English. The other reason is that Farsi sometimes has a resumptive pronoun in object relative clauses, for example in (2).

1)

I *the woman ke a blue dress was wearing* met.

‘I met the woman who was wearing a blue dress.’

2)

I the woman ke you *her* met know.

‘I know the woman you met.’

Another reason is that in Farsi objects are marked, as illustrated in (3).

3)

The student ke the exam *ra* passed hardworking is.

‘The student who passed the exam is hardworking.’

Before we discuss how these differences might lead to cross-linguistic influences, we will briefly repeat the most important points from the discussion of relative clause processing in Chapter 1. A growing body of literature has investigated the processing of relative clause sentences. Most relative clause processing studies have been done on a minimal subset of all the relative clauses that we encountered in the Farsi corpus studied in Chapter 3. The corpus study shows that relative clauses come in an enormous number of different types and that all kinds of factors, such as animacy and topic status, influence their distribution. These factors have also been shown to play a role in relative clause processing (e.g., Mak et

al., 2002, 2006; Traxler et al., 2002, 2005; Weckerly & Kutas, 1999 for animacy and Mak et al., 2008 for topic status).

Note that the corpus study in Chapter 3 shows that the type of relative clauses that have been predominantly used in previous research (i.e., subject and object relative clauses with animate antecedent and embedded noun phrase) form only 1.61% of the relative clauses in the corpus study. Nevertheless, in this study, we will also study these types of relative clauses, because we want to compare the processing of the L1 Farsi L2 English speakers with what is known about the processing of these constructions by native speakers of English.

The main aim of this chapter is to establish to what extent there is cross-linguistic influence from Farsi to English in relative clause processing by native L1 Farsi learners of L2 -English. In Chapter 1, we discussed second language acquisition and identified two important mechanisms of positive and negative transfer. When people learn a new language, their knowledge of their L1 can either facilitate learning the L2 (positive transfer) or hinder it (negative transfer).

Studies on the transfer of structures in languages with different structures show negative transfer, where L1 knowledge interferes with L2 acquisition. An example is a study by Erdocia and Laka (2018). They investigated whether L1 Spanish speakers of L2 Basque process Basque sentences with a word order that differs from the one in their L1 in the same way as native speakers of Basque do. They observed that the cues in both languages compete, and negative transfer from L1 occurs. They concluded that as long as L2 learners transfer their L1 grammatical cues to L2, they can never process the L2 grammatical structures like a native L2 speaker.

Another example of transfer is Farsi and Zarei's (2013) investigation of how Iranian students deal with English relative clauses. Based on their data analysis, they revealed that the most frequent errors resulted from the incorrect use of object pronouns and the incorrect use of relative pronouns. The reason for the first error might be that there is a

resumptive pronoun in Farsi (L1) object relative clauses, which is not present in English. The reason for the second error might be the lack of a relative pronoun in Farsi; the invariant complementizer /*ke*/, which is also used in complement clauses, comes after all antecedents regardless of the type of relative clause.

In the experiment reported in this chapter, we study English relative clause processing by adult learners of English whose L1 is Farsi. The main aim is to examine whether the subject-object asymmetry in relative clause processing evidenced in adult native speakers of English (e.g., King & Just, 1991; King & Kutas, 1995; Gibson, 1998; Traxler et al., 2002; Grodner & Gibson, 2005; Staub, 2010; Staub et al., 2017) is mirrored in the processing of English relative clauses by Farsi speakers.

According to MacWhinney (2005), at the beginning stages of learning a second language, L2 learners use the language cues that are essential in their first language. The similarity of cues in L1 and L2 makes positive transfer, which facilitates processing of L2, whereas, if L1 and L2 are very different like English and Farsi, the cues that L1 Farsi speakers transfer from Farsi to English may hinder processing. MacWhinney (2005) states that the cues that a bilingual person uses to process sentences depend on a range of factors, such as the age of acquisition, proficiency in L1 and L2 and language dominance. It is important to mention that more experience with the L2 decreases the level of language transfer.

As discussed in Chapter 1, McDonald (1987) studied the effect of cue strength on sentence processing and stated that English and Dutch native speakers apply syntactic and semantic cues like word order, prepositions, inflections and animacy to interpret the sentences in their first language to various degrees. McDonald compared the cue usage of English/Dutch and Dutch/English L2 learners who were exposed to the targeted second language to the native speaker groups. She tested dative constructions, simple (NP+VP+NP) sentences and relative clauses and found that the cue usage in the first language transfers from the native language to the second language. However, by increasing second language

exposure, the L1 transfer decreases, and the language learners start using the L2 cues in sentence processing and interpretations. She found that beginners have a tendency to use their L1 cues in processing L2 relative clause, but as they become more proficient by being more exposed to L2, they are capable of applying L2 cues like the structural word order cue in English: in subject relative clauses the relative pronoun is followed by a verb, in object relative clauses, it is followed by a noun phrase. Building upon the findings in the Farsi corpus study in Chapter 3 and given that (1) word order in both subject and object relative clauses in Farsi is the same (i.e., NP NP V); (2) structural word order in Farsi is different from English relative clause word order; and that (3) English lacks a morphological cue such as an object marker (as in Farsi), we speculate that Farsi speakers will have difficulty in processing relative clauses with the relative pronoun '*that*', as in (4) and (5).

4)

The worker *that* hired the rancher planted the seeds in long rows.

5)

The worker *that* the rancher hired planted the seeds in long rows.

We expect that the L1 Farsi speakers will perform better when a morphological cue is present, which is the case in relative clauses with the relative pronoun '*who(m)*', as in (6) and (7). Here, strategies from the L1 may help them process the relative clauses, leading to less processing difficulty than in relative clauses with the relative pronoun '*that*'.

6)

The worker *who* hired the rancher planted the seeds in long rows.

7)

The worker *whom* the rancher hired planted the seeds in long rows.

5.2 Methods

5.2.1 Participants

The same 42 participants as in Experiment 1 (as outlined in Chapter 4) took part voluntarily in Experiment 2. The participants completed their Bachelor or Master in Iran before coming to the Netherlands. They started learning English as a second language in 7th grade at school when they were 11 years old, then they continued learning it as a compulsory course through the secondary school years. Some of them had English courses out of school as well. The duration of their stay in the Netherlands ranged from 6 months to 4 years. As a Master or a PhD student, their English language proficiency while starting a program at the University of Groningen was around 6.5-7 as measured using an IELTS (International English Language Testing System, <https://www.ielts.org>). LexTALE (Lexical Test for Advanced Learners of English) was used to assess the participants' proficiency experimentally. The LexTALE is an un-speeded visual lexical decision that gives a fair indication of general English proficiency (Lemhöfer and Boersma (2012)). The average LexTALE score of the participants was 60.15 ($SD = 8.52$, range 41.25 to 83.75). The participants had normal or corrected-to-normal vision, and they reported no reading or other language-related disorders. The present study was approved by The Research Ethics Review Committee (Commissie Ethische Toetsing Onderzoek, CETO) at the University of Groningen.

5.2.2 Materials and Design

The materials for this experiment were taken from the items used in Staub (2010) and Staub et al. (2017). We wanted to be able to compare the results of the present experiment with L2 English learners to their results with native English speakers. The present study used 36 sentences to create four types of relative clauses per item (in total 144 relative clause sentences); subject and direct object relative clauses with either the relative pronoun *'that'* or the relative pronouns *'who/whom'* (see Appendix A). All the

antecedents and the embedded noun phrases were animate full NPs, and all the embedded verbs were transitive. All four versions of relative clauses were subject modified (the antecedents were in the position of the subject of the matrix sentences). The sentences contained either subject or object extracted relative clauses (the antecedents had the function of subject or object of the relative clauses). Therefore, the test sentences either contained a subject relative clause (8a and 9a in Table 5.1), or an object relative clause (see 8b and 9b in Table 5.1). For each type of relative clause, half of the items contained the relative pronoun ‘that’ and the other half the relative pronoun *who(m)*.

As illustrated in Table 5.1, the only difference on the surface between (8a) and (8b) is the order of the embedded noun phrase and verb phrase. In (9a) and (9b) the relative pronoun provides an additional (morphological) cue as to the type of relative clause. In the relative clauses with the relative pronoun *who(m)*, a comma was inserted after the antecedent to make the materials parallel with those in Farsi. As a rule, in English non-restrictive relative clauses commas split the relative clauses from the matrix sentence and the relative pronouns ‘*who*’ and ‘*whom*’ are used in subject and object relative clauses, whereas in restrictive relative clauses the relative pronoun ‘*that*’ is used as well.

Table 5. 1 *An Example of an Item in English Including Subject and Object Relative Clauses Split by Clause Type and Type of Pronoun.*

(8)
a. The babysitter that liked the child was a qualified nurse.
b. The babysitter that the child liked was a qualified nurse.
(9)
a. The babysitter, who liked the child, was a qualified nurse.
b. The babysitter, whom the child liked, was a qualified nurse.

As already mentioned, the online LexTALE test was applied to assess the general English language proficiency of the participants. Moreover, a sociolinguistic and personal questionnaire was applied, in which the participants were asked to indicate their age, gender, the latest university major that they have completed, their native language, length of studying English as a foreign language, knowledge of other languages and whether they have an eyesight problem or trouble in reading. A copy of the questionnaire is in Appendix D.

The four versions of every item were distributed across four different lists so that precisely one version of each set appeared in a list and an equal number of items of the same condition appeared across the lists. Each participant read nine *that*-clause subject relative clauses, nine *that*-clause object relative clauses, nine *who(m)*-clause subject relative clauses, and nine *who(m)*-clause object relative clauses. The test items in every version were presented together with 60 filler items of various syntactic types adapted from the Cambridge Preparation for the TOEFL (Gear & Gear, 2002).

To ensure that the participants read the sentences attentively, 25% of the test sentences were paired with a simple verification statement (True/False) about the content of the relative clause and the matrix sentence ($n=7$) or filler sentences ($n=18$). For example, a true statement about the matrix sentence '*The babysitter that the child liked was a qualified nurse*' would be '*The babysitter was a qualified nurse*'. The verification statements for both the *that*-clause and *who(m)*-clause relative clause type were identical. Each participant initially read ten practice sentences to become familiar with the procedure. Then, he/she read the 36 experimental sentences intermixed with 60 filler sentences.

5.2.3 Procedure

The procedure was the same as in Experiment 1, except for a few things. Sentences were presented in 20 pt. Courier New font. After the reading task, the participants completed the online LexTALE test, the English

language proficiency test, on another computer. The experiment ended with a background questionnaire on paper.

5.3 Data analysis

We divided the sentences into six regions: the antecedent, the relative pronoun, embedded noun phrase in the relative clause, verb phrase embedded in the relative clause, matrix verb, and the rest of the sentence (10). We compared the reading time for the whole relative clause region as well (Table 5.2).

Table 5. 2 *Areas of Interest for Data Analysis.*

(10)					
a. The babysitter that liked the child was a qualified nurse.					
HD	Relpron	VP	NP	MatrixVP	Post-matrix VP
b. The babysitter that the child liked was a qualified nurse.					
HD	Relpron	NP	VP	MatrixVP	Post-matrix VP
c. The babysitter , who liked the child, was a qualified nurse.					
HD	Relpron	VP	NP	Matrix VP	Post-matrix VP
d. The babysitter , whom the child liked, was a qualified nurse.					
HD	Relpron	NP	VP	MatrixVP	Post-matrix VP
<i>Note.</i> HD = head noun (antecedent), Relpron = relative pronoun, NP = noun phrase, VP = verb phrase, Matrix VP = Matrix verb, Post-matrix VP = post-matrix verb phrase.					

For each region, the same four reading time measures were computed as in Experiment 1. The First-pass reading time (FP) or gaze duration is defined as the sum of all the fixations made in a region until the eyes of the reader leave the region either to the left or to the right. First-pass total reading time (Fptot), which is also known as right-bounded time or total gaze duration, sums all fixations within a region before moving on

progressively. This measure consists of First-pass reading times, including additional fixations that follow regressive eye-movements. Regression path duration (RPD) is defined as the total time from initially encountering a word to moving to the following word. Total reading time (TRT) sums all fixations made within a region of text, including those fixations made when re-reading the region. Figure 5.1 illustrates the reading direction from left to right in an English relative clause sentence in the present experiment. The blue balls show the fixations and the blue lines are saccades between the fixations. The numbers inside the balls indicate the sequence of fixations and regressions.

Figure 5. 1 *Reading Direction and Patterns in an English Sentence.*

For trimming the data first, we corrected the drifts manually by pulling the fixations up or down the areas of interests. Within 9.5 % of FP, 9.2 % of FP_{tot}, 0.7 % of TRT, and 9.1% of RPD on the areas of interests, there was no reading time measurement, as the regions were skipped by the readers. Of the remaining cases 20.7 % of FP, 25.5% of FP_{tot}, 37.8 % of TRT, and 28.7 % of RPD have been discarded because of the bad quality of the measurements where the regions were fixated. Finally, we deleted observations beyond ± 2 *SD* from both the participant and item mean. Accordingly, 36 cases in FP, 34 cases in FP_{tot}, 15 cases in TRT, and 30 cases in RPD as outliers were deleted. Since reading time data are inherently skewed, we transformed the data by using the logarithm function to approximate the normal distribution of the reading times.

The statistical analyses were the same as in Experiment 1. In cases where the model did not converge, we first removed the interaction from

the random part, and if necessary, in some cases also the random slopes for the main effect. This was the case in 18 of the 56 models. In the models, the subject relative was the baseline for Clause Type and *that*-clause condition was the baseline for Type of Pronoun. In the case of interaction, an extra analysis was run to test the effect of Clause Type in the *who(m)*-clause conditions.

5.4 Results

5.4.1 Antecedent

The results at the antecedent are presented in Table 5.3. For the *First-pass Reading Time* (which is in this region the same as the *First-pass total Reading Time* and the *Regression Path Duration*), adding the interaction did not improve the model ($\chi^2(1) = 0.39$, $p = .84$; marginal R^2 squared = 0.0048). In the model without the interaction, there was a significant effect of Type of Pronoun ($\beta = 0.077$, $SE = 0.033$, $t = 2.32$, $p = .024$): In the *who(m)*-conditions the antecedent took longer to read than in the *that*-conditions.

Table 5.3 Means (in ms) for Reading Time Measures and Standard Deviations in Parentheses by Condition for the Antecedent Region in Experiment 2. Significant Effects are Identified with a Bold Type.

	That		Who(m)	
	SR	OR	SR	OR
First-pass	856(431)	915(545)	932(515)	996(609)
Total reading time	1713(1072)	1788(1188)	1623(960)	1831(1179)

For the *Total Reading Time*, adding the interaction did not improve the model ($\chi^2(1) = 0.9$, $p = .34$) (marginal $R^2 = 0.0003$). Also, none of the main effects was significant in that model.

Figure 5.2
Experiment 2 Mean and Standard Error for First-pass Reading Time for the Antecedent Region Split by Clause Type and Type of Pronoun.

In sum, at the antecedent, the only significant effect concerned overall longer reading times in the *who(m)*-conditions. Since this region is similar across conditions, this must be a preview effect of the relative pronouns: *who(m)* is associated with longer reading times than *that* (see Figure 5.2; here and in the following we will present the measure that is most representative in a graph)

5.4.2 Relative Pronoun

The results at the relative pronoun are presented in Table 5.4. At the relative pronoun, for the *First-pass Reading Time*, *First-pass Total Reading Time*, and *Total Reading Time*, adding the interaction improved the model (FP: $\chi^2(1) = 10.72, p = .001$; FPtot: $\chi^2(1) = 17.57, p < .001$; TRT: $\chi^2(1) = 28.67, p < .001$). The marginal R^2 for the optimal models was 0.028 for FP, 0.054 for TRT, and 0.038 for FPtot. There was no effect of

Clause Type in the conditions with a *that*-clause (FP: $\beta = 0.031$, $SE = 0.031$, $t = 1$, $p = .31$; FPtot: $\beta = 0.018$, $SE = 0.033$, $t = 0.55$, $p = .58$; TRT: $\beta = 0.017$, $SE = 0.05$, $t = 0.34$, $p = .73$). In the subject relative clauses, there was an effect of Type of Pronoun (FP: $\beta = -0.091$, $SE = 0.031$, $t = -2.88$, $p = .004$; FPtot: $\beta = -0.15$, $SE = 0.033$, $t = -4.53$, $p < .001$; TRT: $\beta = -0.27$, $SE = 0.049$, $t = -5.56$, $p < .001$): in subject relative clauses with the relative pronoun ‘*who*’, the reading times were shorter than in the conditions with the relative pronoun ‘*that*’. There was an interaction of Clause Type and Type of Pronoun (FP: $\beta = 0.145$, $SE = 0.044$, $t = 3.28$, $p = .001$; FPtot: $\beta = 0.195$, $SE = 0.046$, $t = 4.21$, $p < .001$; TRT: $\beta = 0.38$, $SE = 0.07$, $t = 5.41$, $p < .001$). An extra analysis was run with the *who(m)*-clause condition as the baseline for Type of Pronoun in order to test the effect of Clause Type in the *who(m)*-clause conditions directly. In the conditions with *who(m)*, the reading times for the object relative clauses were longer than the reading times for the subject relative clauses (FP: $\beta = -0.177$, $SE = 0.031$, $t = -5.69$, $p < .001$; FPtot: $\beta = -0.214$, $SE = 0.032$, $t = -6.52$, $p < .001$; TRT: $\beta = -0.4$, $SE = 0.054$, $t = -7.36$, $p < .001$). In the conditions with ‘*who(m)*’, the reading times for the object relative clauses were longer than the reading times for the subject relative clauses and this difference was not found in the conditions with ‘*that*’.

Table 5. 4 Means (in ms) for Reading Time Measures and Standard Deviations in Parentheses by Condition for the Relative Pronoun Region in Experiment 2. Significant Effects are Identified with a Bold Type.

	That		Who(m)	
	SR	OR	SR	OR
First-pass	325(135)	342(158)	293(112)	353(144)
First-pass total	378(189)	386(185)	318(126)	398(178)
Regression path duration	415(260)	468(387)	384(292)	440(313)
Total reading time	797(492)	793(470)	587(336)	925(636)

For the *Regression Path Duration*, adding the interaction did not improve the model ($\chi^2(1) = 2.45$, $p = .11$). In the model without the interaction (marginal $R^2 = 0.013$), there was a significant effect of Clause Type ($\beta = 0.10$, $SE = 0.031$, $t = 3.33$, $p = .000$), reading times on the object relative clauses were longer than the reading times on the subject relatives.

Figure 5. 3 Experiment 2 Mean and Standard Error for First-pass Total Reading Time for the Relative Pronoun Region by Conditions of Clause Type and Type of Pronoun.

In sum, the main finding at the relative pronoun is an interaction: in subject relative clauses with the relative pronoun ‘*who*’, the reading times were shorter than in subject relative clauses with the relative pronoun ‘*that*’. (see Figure 5.3). In the conditions with ‘*who(m)*’, the reading times for the object relative clauses were longer than the reading times for the subject relative clauses.

5.4.3 Embedded Noun Phrase

The embedded noun phrase occurs in two different positions in relative clause sentences. In a subject relative clause, it follows the embedded verb phrase, but in an object relative clause, the embedded noun phrase precedes the verb phrase inside the relative clause (11 and 12).

11)

The babysitter | that | liked | **the child** | was | a qualified nurse. (SR)

12)

The babysitter | that | **the child** | liked | was | a qualified nurse. (OR)

The results at the noun phrase are presented in Table 5.5. For all measures, the pattern of results was the same. Adding the interaction did not improve the model for any of the measures (FP: $\chi^2(1) = 3.15$, $p = .075$; FPtot: $\chi^2(1) = 2.5$, $p = .11$; RPD: $\chi^2(1) = \chi^2(1) = 3.54$, $p = .059$; TRT: $\chi^2(1) = 0.25$, $p = .61$). The marginal R^2 for the optimal models was 0.013 for FP, 0.0076 for RPD, 0.0093 for TRT, and 0.0041 for FPtot.

Table 5. 5 Means (in ms) for Reading Time Measures and Standard Deviations in Parentheses by Condition for the Embedded Noun Phrase Region in Experiment 2. Significant Effects are Identified with a Bold Type.

	That		Who(m)	
	SR	OR	SR	OR
First-pass	922(522)	818(518)	973(570)	781(515)
First-pass total	1095(636)	1006(569)	1160(679)	985(558)
Regression path duration	1157(703)	1067(641)	1280(881)	1045(617)
Total reading time	2052(1597)	1925(1232)	1698(1094)	2000(1492)

In the model without the interaction, there was a main effect of Clause Type (FP: $\beta = -0.153$, $SE = 0.056$, $t = -2.71$, $p = .009$; FPtot: $\beta = -$

0.071, SE = 0.025, $t = -2.74$, $p = .006$; RPD: $\beta = -0.084$, SE = 0.029, $t = -2.86$, $p = .004$): the reading times on the subject relatives were longer than the reading times on the object relatives. For the Total Reading Time, there was also a significant main effect of Type of Pronoun ($\beta = -0.082$, SE = 0.036, $t = -2.23$, $p = .025$): reading times at the noun phrase of the *that*-clause condition were longer than the reading times on the *who(m)*-clause conditions.

Figure 5. 4 *Experiment 2 Mean and Standard Error for Regression Path Duration for the Embedded Noun Phrase Region Split by Clause Type and Type of Pronoun.*

In sum, at the embedded noun phrase, subject relative clauses were read slower than object relative clauses (see Figure 5.4).

5.4.4 Embedded Verb Phrase

The embedded relative clause verb occurs in different positions. In the subject relative clauses, the embedded verb phrase follows the relative

pronoun, and it precedes the noun phrase. But in the object relative clauses, the embedded verb phrase follows the noun phrase (13 and 14).

13)

The babysitter | that | **liked** | the child | was | a qualified nurse. (SR)

14)

The babysitter | that | the child | **liked** | was | a qualified nurse. (OR)

The results at the verb phrase are presented in Table 5.6. For the *First-pass Reading Time*, adding the interaction improved the model ($\chi^2(1) = 5.81, p = .015$; marginal $R^2 = 0.014$). There was no effect of *Clause Type* in the *that*-clause conditions ($\beta = 0.043, SE = 0.047, t = 0.91, p = .35$). However, there was a significant interaction of *Clause Type* and *Type of Pronoun* ($\beta = 0.161, SE = 0.066, t = 2.41, p = .016$). An extra analysis was run to test the effect of *who(m)*-clause condition after making the object relative clause as the baseline for *Clause Type*, in order to test the effect of *Clause Type* in the *who(m)*-clause conditions directly. In the conditions with *who(m)*, the reading times for the object relative clauses were longer than the reading times for the subject relative clauses ($\beta = -0.20, SE = 0.047, t = -4.31, p < .001$).

Table 5. 6 Means (in ms) for Reading Time Measures and Standard Deviations in Parentheses by Condition for the Embedded Verb Phrase Region in Experiment 2. Significant Effects are Identified with a Bold Type.

	That		Who(m)	
	SR	OR	SR	OR
First-pass	666(438)	632(404)	665(455)	811(523)
First-pass total	811(535)	710(422)	758(476)	991(628)
Regression path duration	891(605)	754(492)	806(529)	1212(1041)
Total reading time	1557(1219)	1368(1007)	1290(932)	1491(963)

For the *First-pass Total Reading Time*, including the interaction improved the model ($\chi^2(1) = 30$, $p < .0001$; marginal $R^2 = 0.022$). There was an effect of Clause Type in the conditions with *that* ($\beta = -0.077$, $SE = 0.037$, $t = -2.05$, $p = .04$): in the *that*-conditions reading times for the object relative clauses were shorter than for the subject relatives. In the subject relative clauses, there was an effect of Type of Pronoun ($\beta = -0.075$, $SE = 0.038$, $t = -1.99$, $p = .046$): in the condition with '*who(m)*', the reading times were faster than in the condition with '*that*'. Moreover, there was an interaction of Clause Type and Type of Pronoun ($\beta = 0.297$, $SE = 0.053$, $t = 5.51$, $p < .001$). An extra analysis was run with the *who(m)*-clause condition as the baseline for Type of Pronoun in order to test the effect of Clause Type in the *who(m)*-clause conditions directly. In the conditions with *who(m)*, the reading times for the object relative clauses were longer than the reading times for the subject relative clauses ($\beta = -0.219$, $SE = 0.038$, $t = -5.71$, $p < .001$).

For the *Regression Path Duration*, adding the interaction improved the model ($\chi^2(1) = 36.16$, $p < 0.001$; marginal $R^2 = 0.032$). There was no effect of Type of Pronoun in the conditions with the subject relatives ($\beta = -0.072$, $SE = 0.046$, $t = -1.56$, $p = .11$). In conditions with *that*, there was an effect of Clause Type ($\beta = -0.10$, $SE = 0.046$, $t = -2.24$, $p = .025$): reading times were faster in the object relative clauses.

Additionally, there was a significant interaction of *Clause Type* and *Type of Pronoun* ($\beta = 0.37$, $SE = 0.06$, $t = 5.71$, $p < .001$). An extra analysis was run with the *who(m)*-clause condition as the baseline for *Type of Pronoun* in order to test the effect of *Clause Type* in the *who(m)*-clause conditions directly. In the conditions with *who(m)*, the reading times for the object relative clauses were longer than the reading times for the subject relative clauses ($\beta = -0.273$, $SE = 0.0472$, $t = -5.789$, $p < .001$).

For the *Total Reading Time*, adding the interaction did not improve the model ($\chi^2(1) = 3.41$, $p = .06$; marginal $R^2 = 0.0013$). Neither main effects nor the interaction approached significance.

Figure 5. 5 Experiment 2 Mean and Standard Error for First-pass Total Reading Time for the Embedded Verb Phrase Region Split by Clause Type and Type of Pronoun.

In sum, significant interactions between *Clause Type* and *Type of Pronoun* were found for three reading time measurements. These interactions indicate that reading times on the object relative clauses in the *who(m)*-clause condition were slower than the reading times in the subject relatives (see Figure 5.5). On the other hand, in the *that*-clause condition, we found significantly longer reading times in the subject relative clauses than in the object relative clauses.

5.4.5 Matrix Verb

The results at the matrix verb are presented in Table 5.7. For the *First-pass Reading Time* and *Regression Path Duration*, adding the interaction did not improve the model (FP: $\chi^2(1) = 0.35$, $p = .55$; RPD: $\chi^2(1) = 0.10$, $p = .74$). The marginal R^2 for the optimal models was 0.0016 for FP, and 0.0034 for RP. There was no significant effect of any condition.

For the *First-pass Total Reading Time* and *Total Reading Time*, adding the interaction did not improve the model (FPtot: $\chi^2(1) = 0.005$, $t = 0.94$; TRT: $\chi^2(1) = 0.14$, $p = .60$). In the model without the interactions, the marginal R^2 for the optimal models was 0.0018 for FPtot, and 0.013 for TRT. There was a significant main effect of Type of Pronoun (FPtot: $\beta = -0.049$, $SE = 0.024$, $t = -1.98$, $p = .047$; TRT: $\beta = -0.16$, $SE = 0.033$, $t = -5$, $p < .001$): reading times in the *that*-clause conditions were longer than in the *who(m)*-clause conditions.

Table 5. 7 Means (in ms) for Reading Time Measures and Standard Deviations in Parentheses by Condition for the Matrix Verb Region in Experiment 2. Significant Effects are Identified with a Bold Type.

	That		Who(m)	
	SR	OR	SR	OR
First-pass	666(408)	633(478)	641(444)	616(409)
First-pass total	766(415)	765(563)	728(509)	684(476)
Regression path duration	822(478)	793(620)	765(573)	685(483)
Total reading time	1398(957)	1370(1159)	1090(832)	1062(765)

Figure 5. 6 Experiment 2 Mean and Standard Error for Regression Path Duration for the Matrix Verb Region Split by Clause Type and Type of Pronoun.

In sum, at the matrix verb, there was no interaction between any of the independent variables. However, there was a significant effect of Type of

Pronoun with overall longer reading times on the *that*-clause relatives than the *who(m)*-clause relatives (see Figure 5.6).

5.4.6 Post-Matrix Verb

A matrix verb or main verb of a relative clause sentence may require an object, an adjective, or an adverb. Therefore, we named the final words of the relative clause sentence after the matrix verb the post-matrix verb region. The post-matrix verb region is shown in bold in (15).

15) The babysitter | that | liked | the child | was | **a qualified nurse**. (SR)

The results at the post-matrix verb region are presented in Table 5.8. For the *First-pass Reading Time*, in the post-matrix verb region, adding the interaction did not improve the model ($\chi^2(1) = 0.084, p = .77$; marginal $R^2 = 0.0015$). There were no significant main effects.

Table 5. 8 Means (in ms) for Reading Time Measures and Standard Deviations in Parentheses by Condition for the Post-Matrix Verb region in Experiment 2. Significant Effects are Identified with a Bold Type.

	That		Who(m)	
	SR	OR	SR	OR
First-pass	1507(1028)	1512(1008)	1446(1096)	1461(1002)
Regression path duration	5420(4315)	5107(3647)	4133(3567)	4643(3803)
Total reading time	3225(1918)	2978(1770)	2706(1892)	2640(1595)

For the *Total Reading Time* (which is the same as the *First-pass Total Reading Time* in this region) and the *Regression Path Duration*, the pattern of results was the same. Adding the interaction did not improve the model (FPtot & TRT: $\chi^2(1) = 0.75, p = 0.38$; RPD: $\chi^2(1) = 0.0003, p = .98$). The marginal R^2 for the optimal models was 0.013 for Fptot, and

0.013 for TRT. In the model without the interactions, there was a significant effect of Type of Pronoun (FP_{tot} & TRT: $\beta = -0.129$, SE = 0.034, $t = -3.71$, $p = .0003$; RPD: $\beta = -0.20$, SE = 0.052, $t = -3.99$, $p < .001$): The reading times in *that*-clauses were longer than the reading times in *who(m)*-clauses.

Figure 5. 7 Experiment 2 Mean and Standard Error for Total Reading Time for the Post-Matrix Verb Region Split by Clause Type and Type of Pronoun.

In sum, at the post-matrix verb region, there was no interaction of the conditions, but there was a significant main effect of Type of Pronoun with longer reading times on the *that*-clause relatives than on the *who(m)*-clause relatives (see Figure 5.7).

5.4.7 Relative Clause (NP + VP)

Given that we found different effects at the noun phrase than at the verb phrase, and the comparison is confounded with their positions in the relative clause sentences, it is important to see the overall differences. Therefore, by combining the noun phrase and verb phrase regions, we looked at the processing of the relative clauses without that confound. The relative pronoun is not included because that would introduce another confound, namely that of the differences in length and frequency of the relative pronouns. Thus, we analysed the region consisting of the embedded noun phrase and the embedded verb phrase (16 and 17).

16)

The babysitter | that | **liked the child** | was | a qualified nurse. (SR)

17)

The babysitter | that | **the child liked** | was | a qualified nurse. (OR)

The results at the relative clause region are presented in Table 5.9. For the *First-pass Reading Time*, adding the interaction did not improve the model ($\chi^2(1) = 0.018$, $p = .89$; marginal $R^2 = 0.00075$). There was no significant effect on either factor.

Table 5. 9 Means (in ms) for Reading Time Measures and Standard Deviations in Parentheses by Condition for the Relative Clause Region in Experiment 2. Significant Effects are Identified with a Bold Type.

	That		Who(m)	
	SR	OR	SR	OR
First-pass	793(498)	723(472)	814(536)	796(519)
First-pass total	953(604)	853(519)	953(616)	988(592)
Regression path duration	1024(669)	905(590)	1036(758)	1126(851)
Total reading time	1800(1437)	1634(1153)	1492(1034)	1736(1270)

For the *First-pass Total Reading Time* and *Regression Path Duration*, adding the interaction improved the model (FPtot: $\chi^2(1) = 6.17$, $p = .012$; RPD: $\chi^2(1) = 7.13$, $p = .007$). The marginal R^2 for the optimal models was 0.0035 for FPtot, and 0.0028 for RPD. There was a significant interaction of Clause Type and Type of Pronoun (FPtot: $\beta = 0.109$, $SE = 0.043$, $t = 2.48$, $p = .013$; RPD: $\beta = 0.13$, $SE = 0.049$, $t = 2.67$, $p = .007$).

There was no difference between subject and object relative clauses in the *that*-clause condition for the *First-pass Total Reading Time* ($\beta = -0.052$, $SE = 0.031$, $t = -1.676$, $p = .093$) and no effect of Type of Pronoun ($\beta = -0.010$, $SE = 0.0312$, $t = -0.338$, $p = .735$). An extra analysis was run with the *who(m)*-clause condition as the baseline for Type of Pronoun, to test the effect of Clause Type in the *who(m)*-clause conditions directly. In the conditions with *who(m)*, the reading times for the object relative clauses were longer than the reading times for the subject relative clauses (FPtot: $\beta = -0.066$, $SE = 0.030$, $t = -2.148$, $p = .032$). For the *Regression Path Duration*, there was no difference between subject and object relative clauses in the *that*-clause conditions ($\beta = -0.043$, $SE = 0.039$, $t = -1.125$, $p = .266$) and there was no effect of Type of Pronoun ($\beta = -0.011$, $SE = 0.039$, $t = -0.283$, $p = .778$) at the relative clause region. An extra analysis was run with the *who(m)*-clause condition as the baseline for Type of Pronoun, to test the effect of Clause Type in the *who(m)*-clause conditions directly. In the conditions with *who(m)*, the reading times for the object relative clauses were longer than the reading times for the subject relative clauses (RPD: $\beta = -0.081$, $SE = 0.034$, $t = -2.339$, $p = .02$).

Figure 5. 8 Experiment 2 Mean and Standard Error for Regression Path Duration for the Relative Clause Region Split by Clause Type and Type of Pronoun.

For the Total *Reading Time*, adding the interaction did not improve the model ($\chi^2(1) = 2.36$, $p = .12$). In the model without the interactions (marginal $R^2 = 0.0031$), there was a significant effect of Type of Pronoun ($\beta = -0.065$, $SE = 0.028$, $t = -2.32$, $p = .02$), with longer reading times on the *that*-clause relatives.

In sum, the main finding at the Relative Clause region was the interaction of Clause Type and Pronoun Type for First-pass Total Reading Time and Regression Path Duration measurements. The reading times on the object relative clauses in the *who(m)*-clause condition were longer than the reading times in the subject relatives (see Figure 5.8). There was no difference between subject and object relatives in *that*-clause conditions. Besides, reading times were longer in the *that*-clause relative clauses than in the *who(m)*-clause relative clauses in the Total Reading Time.

5.5 Discussion

The main goal of Experiment 2 was to find out how Farsi-speakers process English subject and object relative clauses in *that*-clause and *who(m)*-clause conditions. Moreover, we explored whether there is a cross-linguistic effect of L1 Farsi on the L2 English relative clause processing and whether the morphological cue helps them in processing the English relative clauses. Since word order in subject and object relative clauses in Farsi is the same, we expected that Farsi speakers have difficulty interpreting the word order cue in the English relative clauses while processing. Therefore, we speculated that they would benefit from the morphological cue in *who(m)*-clause conditions and would encounter less processing difficulty. However, we found the opposite as will be explained in the following paragraphs.

The processing difficulty in the *who(m)*-clauses was revealed first at the relative pronoun region. The relative pronoun within object relative clauses in the *who(m)*-clause condition elicited longer reading times in all measures. The delay in object relative clauses also appeared at the verb and in the analysis on the relative clause region, but only for the *who(m)*-conditions. In the conditions with the relative pronoun '*that*', similar reading times were found in the object and subject relative clauses. It thus seems that there is no difference in the processing of relative clauses in *that*-clause conditions, which is in line with the interpretation that the participants have trouble with finding out the type of relative clauses. Generally, when readers encounter an object relative clause, the reading pace slows down. So, the absence of such a slow down effect may indicate that they did not interpret the relative clause as an object relative clause. This point is reinforced by the fact that at the remainder of the main clause in *that*-clause conditions, the participants spent a lot of time wrapping up the sentence.

We analysed the reading times effects and potential interactions between conditions in the relative clause region (NP+VP/VP+NP). Across the two measures of First-pass total reading time and regression path

duration, there was an effect of Clause Type. Reading times in the object relative clauses were more prolonged than those in the subject relative clauses in the *who(m)*-clause condition. However, in total reading times, more time was spent on *that*-clause relatives than *who(m)*-clause relatives.

Thus, this experiment only partially replicated the results obtained by Staub et al. (2017), the study from which the materials in this experiment were taken. Based on an eye-tracking study with native English speakers, Staub et al. (2017) reported that the difficulty in object relative clause processing was detected on the embedded noun phrases and the embedded verb phrases, but the noun phrase induced more difficulty in processing. The Farsi readers tested in the present study, however, showed difficulties with object relative clauses on the verb phrase and only in *who(m)*-clause conditions.

The most striking result is the absence of an effect of Clause Type in the *that*-clause conditions. Our explanation for this result is that the word order of object relative clauses in English is similar to that in Farsi subject relatives. Therefore, the object relative clauses in the *that*-clause conditions may be processed as subject relative clauses by Farsi speakers, whereas object relatives with the relative pronoun ‘*whom*’ are actually processed as an object relative clause because there is a morphological marker indicating that this is not a subject relative clause. It is notable to mention that the very first word in the relative clauses in the Farsi experiment is the noun phrase (NP2), which marks the object in the subject relatives, which is similar to the situation in the object relatives with ‘*whom*’. If the participants were sensitive to that marker, they would not have trouble with the word order cue because they already knew what kind of relative clause they encounter.

There was a striking effect of Type of Pronoun which first appeared in the continuation of the main clause (matrix verb): there were longer reading times following the relative clause in the *that*-clause conditions. The processing difficulty on the matrix verb can be attributed to the difficulty of the *that*-clause relatives, in which only word order

provides a cue about the type of relative clause the participant is reading. The second effect of Type of Pronoun appeared on the post-matrix verb region. The wrap-up effects might be evidence of difficulty in the processing of *that*-clause relatives by long rereading times on the post-matrix verb region (sentence-final words). As in the matrix verb, the Farsi speakers read the post-matrix verb regions slowly in both types of relative clauses in the *that*-clause condition. The effects on the regions after both relative clauses in the *that*-clause conditions illustrate that the Farsi speakers processed them with difficulty probably due to lack of a morphological cue such as a relative pronoun '*who(m)*' and not being able to apply the word order cue in English relatives. It seems that they are at the phase of learning English where they apply L1 to L2 which is fine in the *who(m)*-clause conditions but it does not work in *that*-clause relatives (cf McDonald, 1987).

There was an unpredicted effect on the embedded noun phrase: The noun phrase in the subject relative clause was read more slowly than in the object relative clause. The reason for this is probably the word order in the relative clause. The canonical word order in an English subject relative clause with a transitive verb is NP1+ VP + NP2, which is different from its Farsi equivalent, NP1+ NP2 + Object Marker + VP. Accordingly, the Farsi readers fixated on the NP2 in English subject relatives for a long time to find out the role of the NP2 due to the unexpected word order in the subject relative clauses. For the embedded noun phrase, Farsi readers spent a long time reading this region in both *that*-clause and *whom*-clause conditions in the subject relative clauses.

Concerning the reading times at the antecedent, there was a difference between *that*-clause and *who(m)*-clause conditions, which must be a preview effect of the relative pronouns: *who(m)*-clauses are associated with longer reading times than *that*-clauses.

We might conclude that Farsi readers disambiguated the English subject relatives in the last part of the relatives which is a noun phrase and the object relatives in a verb phrase since the canonical word order in

English relative clauses is different from Farsi relatives. Farsi readers may not be able to rely on the word order in processing relative clauses without a morphological cue like a relative pronoun ‘*who(m)*’. There are three possible explanations for these results: First, Farsi speakers have not acquired the ability to process the structural cues in English effectively. Second, Farsi speakers tend to interpret the relative pronoun ‘*that*’ as restrictive, which leads to a smaller effect in the *that*-clause conditions just like in the restrictive conditions in the Farsi Experiment, which were processed easier than that in the non-restrictive conditions. Third, possibly, they do not understand the relative clauses in the *that*-clause condition at all.

The question is thus whether Farsi speakers could interpret *that*-clauses relatives correctly at all. This question will be answered in Chapter 7. Possibly, Farsi speakers still rely too much on the morphological cues like an object marker that they are used to, and they have not yet switched to the application of word order cues in English. As explained in the Introduction, Erdocia and Laka (2018) explored that when the canonical word order of L1 and L2 is different, the cues in both languages compete and negative transfer from L1 occurs. In the present experiment, the long wrap up times at the sentence-final words in the *that*-clause conditions, in which there is no morphological cue can be interpreted as a negative transfer from L1 Farsi on L2 English. Even though they differentiate the relative clauses with the relative pronoun ‘*who*’ and ‘*whom*’, still they process the object relatives with difficulty on the embedded verb. Farsi and Zarei’s (2013) explored the extent to which Farsi speakers make errors in encountering English relative clauses. Adding a pronoun in English object relatives was one of their problems. Therefore, we might state that our participants probably expected a pronoun after the embedded verb, which is a trace of a negative transfer from their L1 to L2. This effect was observed as long reading times on the embedded verb phrases.

Thus, given the structural similarities between Farsi and Dutch, and their English language proficiency, we will investigate Dutch

participants' relative clause processing behaviour in L2 English in the next chapter. The question is whether they also rely on the morphological cues in *who(m)*-clause conditions or they use the structural cues in L2 English relative clause processing as well. On the basis of McDonald (1987), who found that L1 Dutch learners of L2 gradually learn to use L2 cues, we expect different results, since Dutch participants are expected to be more proficient and experienced in English. The Dutch participants may have less trouble in using the word order cues in English and perform better than Farsi speakers because they are more proficient in English, and they have had more input and experience with English.

Chapter 6

Chapter 6

Cross-linguistic Influence in Processing English Relative Clauses by Dutch Speakers

In the present experiment, we studied how Dutch L1 speakers process subject and object relative clauses in English as a second language. The reason to include Dutch participants is that relative clauses in Dutch are also head initial and they have a verb-final word order similar to Farsi. Also, as in Farsi, there is no structural cue in Dutch relative clauses. Therefore, in terms of the differences between L1 and L2, the situation is similar for Dutch and Farsi speakers. However, there is a difference between Dutch and Farsi L2 learners based on English proficiency; Dutch speakers, in general, have had much more experience in the English language and are more proficient than Farsi speakers. It is interesting to find out whether this difference influences the readers' application of the word order cue in processing English relative clauses.

6.1 Introduction

Regarding canonical word order, Farsi and Dutch relative clauses are similar; both have an SOV word order. This implies that in both languages, the word order in relative clauses does not disambiguate the relative clause. In Farsi relative clauses, the presence or absence of an object marker disambiguates the relative clause. In both Farsi and Dutch, the number marking on the verb may also disambiguate the relative clause, if the subject and the object of the relative clause differ in number. Note that in Dutch, if the subject and the object do not differ in number, the relative clauses are globally ambiguous. The relative clause in (1) can either be a subject or an object relative clause.

1)

De leraar, die de leerling uitschold, was heel boos.

'The teacher, who yelled at the student/whom the student yelled at, was very angry.'

By using a self-paced reading paradigm, Frazier (1987) showed that the object relative clauses in Dutch induce more processing difficulty than the subject relative clauses. She made 24 relative clause sentences with an animate NP1 and an animate NP2. Twelve relative clause sentences were ambiguous (as in 2, from Frazier, 1987, pp. 549-550) and the other twelve were unambiguous subject and object relative clauses (as in 3 and 4, from Frazier, 1987, pp. 549-550). Each sentence was followed by the question “*Wie verb Wie?*” (Who verb who). The embedded verbs agreed in number with the antecedents or the embedded noun phrases. Half of the sentences had a singular antecedent and the other half had a plural antecedent.

2)

Jan houdt niet van de Amerikaanse die de Nederlander wil uitnodigen.

John liked not the American who the Dutchperson wants to invite.

‘Jan does not like the American that wants to invite the Dutchperson.’ or
‘Jan does not like the American that the Dutchperson wants to invite.’

3)

Karl hielp de mijnwerkers die de boswachter vonden.

Karl helped the mineworkers who the forester found-PL

‘Karl helped the mineworkers who found the forester.’

4)

Karl hielp de mijnwerkers die de boswachter vond.

Karl helped the mineworkers who the forester found-SG

‘Karl helped the mineworkers who the forester found.’

In the ambiguous relative clauses, Frazier (1987) found a clear subject relative clause interpretation. Moreover, the reading times on the unambiguous subject relative clauses were shorter than on the object relative counterparts; however, this difference was not significant. Other studies on relative clause processing in Dutch confirm that object relative clauses generate more difficulty than the subject relative clauses (e.g., Mak et al, 2002, 2006, 2008). Note, however, as discussed in Chapter 1, these studies showed that the effect of clause type is different depending on semantic and pragmatic factors, such as animacy and topichood.

Frazier (1987) found that in unambiguous object relatives, the antecedents were incorrectly identified as the subject of the relative clauses 31% of the time. Frazier indicated that the results were clearly compatible with the Active Filler Hypothesis, which claims that when a reader encounters a filler, such as a relative pronoun, she/he assigns it to the earliest possible gap in the sentence. The earliest possible gap place in a relative clause sentence is the subject position, which is correct for the subject relative clauses, but in the object relatives, this analysis has to be revised when the verb inflection is not in line with this analysis.

In the present eye-tracking experiment, we will study how Dutch L1 speakers process subject and object relative clauses in English as a second language. In principle, in terms of differences between L1 and L2, the situation for the Dutch speakers is the same as for the Farsi speakers discussed in Chapter 5. As long as they use their L1 as the basis for production or comprehension of L2 English, processing will be problematic. However, Dutch L2 English learners have had much more exposure to English at home, for example via movies and cartoons. Dutch universities are another source of exposure to English, since much of the literature, and sometimes also the teaching is in English. Moreover, L1 Dutch L2 English learners have the opportunity of having social interaction and communication with English speakers. McDonald (1987) compared the cue usage of English/Dutch and Dutch/English L2 learners who were exposed to the second language to native speaker groups. She tested relative clauses and found that the cue usage in the first language transferred from the native language to the second language, just as we have observed for the L1 Farsi speakers. However, with increasing second language exposure, the L1 transfer decreased, and the language learners started using the second language cues in sentence processing and interpretation.

The Dutch participants in the present experiment may thus perform better than the Farsi speakers because they probably are more proficient in English, and they have had more input and experience with English. It is expected that they will have less trouble in processing relative clause sentences and they will perform more like native English speakers. In other words, the Dutch participants may have less trouble in using the word order cues in English and will show fewer signs of cross-linguistic transfer.

6.2 Methods

6.2.1 Participants

Thirty Dutch students at the University of Groningen participated in the experiment in return for course credit as part of their enrolment in a Linguistics course. There were three males and 27 females. All were Dutch natives and had learned English at school. In addition, they had been exposed to English via TV, the internet and social contacts. They were doing a Bachelor in European languages and cultures. Their mean age was 22.21 ($SD = 2.04$), ranging between 20 and 28. The average LexTALE score of the Dutch participants was 88.15 ($SD = 6.4$), ranging between 71.25 and 97.5, whereas for the Farsi speakers it was 60.15 ($SD = 8.52$) ranging between 41.25 and 83.75.

6.2.2 Materials, Design and Procedure

The materials, design, and procedure were the same as in the experiment reported in Chapter 5. The study was approved by The Research Ethics Review Committee (Commissie Ethische Toetsing Onderzoek, CETO) at the University of Groningen.

6.3 Data analysis

The analyses were the same as in the experiment reported in Chapter 5 (see Appendix A). We corrected the drifts manually by pulling the fixations up or down the areas of interests using the program Fixation. Within 17.5 % of FP, 17 % of FP_{tot}, 5.2 % TRT, and 16.9% of RPD on the areas of interests, there were no reading time measurements. Of the remaining cases 32 % of FP, 35.6% of FP_{tot}, 47.5 % TRT, and 38.4 % of RPD have been discarded because of the bad quality of the measurements. Since reading time data are inherently skewed, we transformed the data by using the logarithm function to approximate the normal distribution. Finally, we deleted observations above and below 2 SD from both the participant and

item mean. Accordingly, 4 cases in FP, 2 cases in FPtot, 2 cases in TRT, and 6 cases in RPD as outliers were deleted.

The statistical analyses were the same as in the experiment reported in Chapter 5. In cases where the model did not converge, we first removed the interaction from the random part, and if necessary, in some cases also the random slopes for the main effect. This was the case in 18 of the 56 models.

6.4 Results

6.4.1 Antecedent

The results for the antecedent are presented in Table 6.1. For the *First-pass Reading Time* (and hence for the *First-pass Total Reading Time* and the *Regression Path Duration*), adding the interaction did not improve the model (FP: $\chi^2(1) = 0.75, p = .38$). The marginal R^2 for the optimal models was 0.015 for FP, 0.016 for RPD, and 0.014 for FPtot. There was a significant main effect of *Type of Pronoun* (FP: $\beta = 0.112, SE = 0.039, t = 2.86, p = .004$) caused by longer reading times in *who(m)*-clauses than in *that*-clauses. There was no effect of Clause Type ($\beta = -0.074, SE = 0.04, t = -1.84, p = .06$).

Table 6. 1 Means (in ms) for Reading Time Measures and Standard Deviations in Parentheses by Condition for the Antecedent Region in Experiment 3. Significant Effects are Identified with a Bold Type.

	That		Who(m)	
	SR	OR	SR	OR
First-pass	562(752)	447(233)	606(1019)	514(233)
Total reading time	1097(684)	1113(615)	1157(1323)	1068(589)

There were no significant effects on the *Total Reading Time*.

Figure 6. 1 Experiment 3 Mean and Standard Error for First-pass Reading Time for the Antecedent Region Split by Clause Type and Type of Pronoun.

In sum, the main finding at the antecedent is the significant effect of the *Type of Pronoun* condition, indicating that the reading times on the antecedent before *who(m)*-clauses were longer than before *that*-clauses (see Figure 6.1; here and in the following we will present the measure that is most representative in a graph).

6.4.2 Relative Pronoun

The results for the relative pronoun are presented in Table 6.2. For the First-pass Reading Time, adding the interaction did not improve the model (FP: $\chi^2(1) = 3.79$, $p = .051$; marginal $R^2 = 0.024$). There was neither any effect of Clause Type ($\beta = 0.088$, $SE = 0.047$, $t = 1.86$, $p = .07$) nor any effect of Type of Pronoun ($\beta = -0.068$, $SE = 0.036$, $t = -1.87$, $p = .07$). For the *First-pass Total Reading Time*, adding the interaction improved the model ($\chi^2(1) = 8.39$, $p = .003$; marginal $R^2 = 0.098$). There was no effect of Clause Type in the conditions with *that*-clauses ($\beta = 0.003$, $SE = 0.05$, t

= 0.06, $p = .95$). In the subject relative clause conditions, there was an effect of Type of Pronoun ($\beta = -0.173$, $SE = 0.054$, $t = -3.32$, $p = .001$): in the conditions with *who(m)*-clauses, the reading times were faster than in the condition with *that*-clauses. Moreover, there was a significant interaction of Clause Type and Type of Pronoun ($\beta = 0.176$, $SE = 0.072$, $t = 2.43$, $p = .01$): in the conditions with *who(m)*-clauses, the reading times for the object relative clauses were longer than the subject relative clauses ($\beta = -0.179$, $SE = 0.053$, $t = -3.33$, $p < .001$).

Table 6. 2 Means (in ms) for Reading Time Measures and Standard Deviations in Parentheses by Condition for the Relative Pronoun Region in Experiment 3. Significant Effects are Identified with a Bold Type.

	That		Who(m)	
	SR	OR	SR	OR
First-pass	244(106)	239(80)	209(69)	241(91)
First-pass total	260(119)	252(113)	213(88)	257(103)
Regression path duration	304(179)	297(198)	252(146)	282(146)
Total reading time	423(247)	525(317)	286(166)	495(360)

For the *Regression Path Duration*, adding the interaction did not improve the model ($\chi^2(1) = 3.56$, $p = .058$; marginal $R^2 = 0.023$). In the model without the interaction, there was a significant effect of Type of Pronoun ($\beta = -0.11$, $SE = 0.043$, $t = -2.57$, $p = .01$): the relative pronoun in the *that*-clauses had longer reading times than that in the *who(m)*-clauses.

For the *Total Reading Time*, adding the interaction improved the model ($\chi^2(1) = 8.39$, $p = .003$; marginal $R^2 = 0.098$). There was an effect of Clause Type in the conditions with *that*-clauses ($\beta = 0.19$, $SE = 0.069$, $t = 2.74$, $p = .006$): reading times for object relative clauses were longer than for subject relative clauses. In the subject relative clauses, there was an effect of Type of Pronoun ($\beta = -0.35$, $SE = 0.069$, $t = -5.16$, $p < .001$): in

the conditions with *who(m)*-clauses, the reading times were faster than in the conditions with *that*-clauses. There was a significant interaction between Clause Type and Type of Pronoun ($\beta = 0.28$, $SE = 0.098$, $t = 2.9$, $p = .003$). The effect of Clause Type was larger in the conditions with *who(m)*-clauses than in the conditions with *that*-clauses.

Figure 6. 2 Experiment 3 Mean and Standard Error for Total Reading Time for the Relative Pronoun Region Split by Clause Type and Type of Pronoun.

In sum, there were longer reading times on the relative pronoun *whom* than on the relative pronoun *who*. Only in the Total Reading Time (which involves rereading) reading times on the object relative clauses were also longer in the *that*-clauses (see Figure 6.2).

6.4.3 Embedded Noun Phrase

The embedded Noun phrase occurs in two different positions in relative clause sentences. In a subject relative clause, it follows the embedded verb

phrase, but in an object relative clause, the embedded noun phrase precedes the verb phrase inside the relative clause (5 and 6).

5)

(SR)

The babysitter | that | liked | **the child** | was | a qualified nurse.

6)

(OR)

The babysitter | that | **the child** | liked | was | a qualified nurse.

The results for the embedded noun phrase are presented in Table 6.3. For the *First-pass Reading Time*, *First-pass Total Reading Time*, and *Regression Path Duration* adding the interaction improved the model (FP: $\chi^2(1) = 5$, $p = .024$; FPtot: $\chi^2(1) = 13.44$, $p < .001$; RP: $\chi^2(1) = 9.42$, $p = .002$). The marginal R^2 for the optimal models was 0.024 for FP, 0.041 for FPtot, and 0.035 for RP. There was no effect of Clause Type in the conditions with *that*-clauses (FP: $\beta = -0.083$, $SE = 0.052$, $t = -1.57$, $p = .11$; FPtot: $\beta = -0.029$, $SE = 0.048$, $t = -0.61$, $p = .53$; RPD: $\beta = -0.016$, $SE = 0.069$, $t = -0.24$, $p = .81$). In the subject relative clauses, there was an effect of Type of Pronoun (FP: $\beta = 0.11$, $SE = 0.051$, $t = 2.21$, $p = .02$; FPtot: $\beta = 0.126$, $SE = 0.046$, $t = 2.72$, $p = .006$; RPD: $\beta = 0.123$, $SE = 0.057$, $t = 2.16$, $p = .04$): in the *who(m)*-clauses, the reading times were slower than in the *that*-clauses. There was a significant interaction of Clause Type and Type of Pronoun (FP: $\beta = -.87$, $SE = 34.69$, $t = -2.5$, $p = .01$; FPtot: $\beta = -0.243$, $SE = 0.066$, $t = -3.69$, $p < .001$; RPD: $\beta = -0.259$, $SE = 0.075$, $t = -3.44$, $p < .001$): in the condition with *who(m)*-clauses, subject relative clauses were read slower than object relative clauses.

Table 6. 3 Means (in ms) for Reading Time Measures and Standard Deviations in Parentheses by Condition for the Embedded Noun Phrase Region in Experiment 3. Significant Effects are Identified with a Bold Type.

	That		Who(m)	
	SR	OR	SR	OR
First-pass	460(233)	418(203)	520(296)	399(180)
First-pass total	495(227)	478(216)	580(309)	436(209)
Regression path duration	527(261)	526(270)	627(353)	473(304)
Total reading time	896(539)	954(572)	830(479)	970(696)

For the *Total Reading Time*, adding the interaction did not improve the model ($\chi^2(1) = 0.19, p = .66$; marginal $R^2 = 0.01$). In the model without the interactions, there was a significant effect of Clause Type ($\beta = 0.12, SE = 0.049, t = 2.41, p = .01$); the noun phrases in the object relative clauses were read slower than in the subject relative clauses.

Figure 6. 3 Experiment 3 Mean and Standard Error for First-pass Total Reading Time for the Embedded Noun Phrase Region Split by Clause Type and Type of Pronoun.

In sum, the interactions of Clause Type and Type of Pronoun conditions for the three measurements of initial reading time were significant. Reading times on the subject relative clauses in *who(m)*-clauses were slower than the reading times in the object relative clauses (Figure 6.3), but no such clause type effect was found in *that*-clauses.. In the Total Reading Time, which includes rereading of the noun phrase, there was a significant main effect of Clause Type with longer reading times on the object relative clauses in both *that*-clauses and *who(m)*-clauses.

6.4.4 Embedded Verb Phrase

An embedded relative clause verb occurs in different positions. In a subject relative clause, the embedded verb phrase follows a relative pronoun, and it precedes a noun phrase. But in an object relative clause, the embedded verb phrase follows the noun phrase (7 and 8).

7)

(SR)

The babysitter | that | **liked** | the child | was | a qualified nurse.

8)

(OR)

The babysitter | that | the child | **liked** | was | a qualified nurse.

The results for the relative clause verb are presented in Table 6.4. For the *First-pass Reading Time*, adding the interaction did not improve the model ($\chi^2(1) = 0.03, p = .86$; marginal $R^2 = 0.058$). In the model without the interactions, there was a significant effect of Clause Type ($\beta = 0.223, SE = 0.035, t = 6.29, p < .001$): The verb phrase was read slower in object relative clauses than in subject relative clauses.

For the *First-pass Total Reading Time*, adding the interaction improved the model ($\chi^2(1) = 6.8, p = .009$; marginal $R^2 = 0.11$). There was an effect of Clause Type in the conditions with *that*-clauses ($\beta = 0.259, SE = 0.049, t = 5.28, p < .001$): the object relative clauses were read slower than the subject relatives. There was a significant interaction of Clause Type and Type of Pronoun ($\beta = 0.175, SE = 0.067, t = 2.61, p = .009$): in the conditions with *who(m)*-clauses, the effect of Clause Type was stronger than in the conditions with *that*-clauses.

Table 6. 4 Means (in ms) for Reading Time Measures and Standard Deviations in Parentheses by Condition for the Embedded Verb Phrase Region in Experiment 3. Significant Effects are Identified with a Bold Type.

	That		Who(m)	
	SR	OR	SR	OR
First-pass	321(171)	357(155)	323(188)	397(202)
First-pass total	343(172)	390(172)	343(206)	508(269)
Regression path duration	385(218)	444(283)	367(240)	665(563)
Total reading time	677(396)	736(478)	677(462)	764(565)

For the *Regression Path Duration*, adding the interaction improved the model ($\chi^2(1) = 24.29, p < .001$; marginal $R^2 = 0.11$). There was no effect of Clause Type in the *that*-clauses ($\beta = 0.14, SE = 0.082, t = 1.73, p = .09$). There was an interaction of Clause Type and Type of Pronoun ($\beta = 0.38, SE = 0.077, t = 5.00, p < .001$): in the conditions with *who(m)*-clause, the reading times for the object relative clauses were longer than the reading times for the subject relative clauses.

For the *Total Reading Time*, adding the interaction did not improve the model ($\chi^2(1) = 0.35, p = .85$; marginal $R^2 = 0.0084$). In the model without the interactions, there was a significant effect of Clause Type ($\beta = 0.125, SE = 0.015, t = 2.43, p = .01$), with longer reading times in object relative clauses than in subject relative clauses.

Figure 6. 4 Experiment 3 Mean and Standard Error for First-Pass Total Reading Time for the Embedded Verb Phrase Region Split by Clause Type and Type of Pronoun.

In sum, the reading times in object relative clauses were longer than in subject relative clauses. This effect was stronger in the *who(m)*-clauses than in the *that*-clauses (Figure 6.4).

6.4.5 Matrix Verb

The results for the matrix verb are presented in Table 6.5. For the *First-pass Reading Time*, *First-pass Total Reading Time*, *Regression Path Duration*, and *Total Reading Time*, adding the interaction did not improve the model (FP: $\chi^2(1) = 0.65$, $p = .41$; FPtot: $\chi^2(1) = 0.98$, $p = .32$; RPD: $\chi^2(1) = 0.98$, $p = .32$; TRT: $\chi^2(1) = 0.34$, $p = .55$). The marginal R^2 for the optimal models was 0.01 for FP, 0.29 for RPD, 0.024 for TRT, and 0.022 for FPtot.

In the model without the interactions, there was a significant effect of Type of Pronoun (FP: $\beta = -0.085$, $SE = 0.032$, $t = -2.64$, $p = .008$; FPtot: $\beta = -0.136$, $SE = 0.044$, $t = -3$, $p = .004$; RPD: $\beta = -0.17$, $SE = 0.039$, $t = -4.32$,

$p < .001$; TRT: $\beta = -0.193$, $SE = 0.045$, $t = -4.29$, $p < .001$): Reading times in the conditions with *that*-clauses were longer than reading times in the conditions with *who(m)*-clauses.

Table 6. 5 *Means (in ms) for Reading Time Measures and Standard Deviations in Parentheses by Condition for the Matrix Verb Region in Experiment 3. Significant Effects are Identified with a Bold Type.*

	That		Who(m)	
	SR	OR	SR	OR
First-pass	370(171)	366(174)	332(142)	343(148)
First-pass total	416(207)	409(211)	340(145)	356(151)
Regression path duration	472(295)	475(452)	355(163)	390(279)
Total reading time	615(358)	674(507)	476(286)	528(286)

Figure 6. 5 Experiment 3 Mean and Standard Error for First-pass Total Reading Time for the Matrix Verb Region Split by Clause Type and Type of Pronoun.

In sum, at the matrix verb, reading times in the conditions with *that*-clauses were longer than reading times in the conditions with *who(m)*-clauses (see Figure 6.5).

6.3.6 Post-matrix Verb

A matrix verb or main verb of a relative clause sentence may require an object, an adjective, or an adverb. Therefore, we named the region after the matrix verb as a post-matrix verb. The post-matrix verb region is shown in bold in example (9).

9)
The babysitter | that | liked | the child | was | **a qualified nurse**. (SR)

The results for rest region are presented in Table 6.6. There were no significant effects in the *First-pass Reading Time*. For the *First-pass Total Reading Time*, *Regression Path Duration*, and *Total Reading Time*, adding the interaction did not improve the model (FPtot: $\chi^2(1) = 0.008$, $p = .92$; RPD: $\chi^2(1) = 0.46$, $p = .49$; TRT: $\chi^2(1) = 0.026$, $p = .87$). The marginal R^2 for the optimal models was 0.01 for RPD, 0.0085 for TRT, and 0.0085 for FPtot.

Table 6. 6 Means (in ms) for Reading Time Measures and Standard Deviations in Parentheses by Condition for the Post-Matrix Verb Region in Experiment 3. Significant Effects are Identified with a Bold Type.

	That		Who(m)	
	SR	OR	SR	OR
First-pass	1010(700)	864(667)	975(689)	838(569)
First-pass total	1622(896)	1485(799)	1466(808)	1378(762)
Regression path duration	2897(1753)	3128(2156)	2642(1717)	2564(1822)
Total reading time	1661(976)	1485(799)	1512(942)	1378(762)

In the model without the interactions, there was a significant effect of Type of Pronoun (FPtot: $\beta = -0.103$, $SE = 0.041$, $t = -2.48$, $p = .01$; RPD: $\beta = -0.137$, $SE = 0.060$, $t = -2.26$, $p = .03$; TRT: $\beta = -0.10$, $SE = 0.047$, $t = -2.02$, $p = .04$), reading times in the *that*-clause conditions were longer than in the *who(m)*-clause conditions.

Figure 6. 6 Experiment 3 Mean and Standard Error for Regression Path Duration for the Post-Matrix Verb Region Split by Clause Type and Type of Pronoun.

In sum, at the post-matrix verb region, there was a significant effect of Type of Pronoun with longer reading times in the *that*-clause conditions than in the *who(m)*-clause conditions (see Figure 6.6).

6.4.7 Relative Clause (NP + VP)

Because the reading times on the embedded noun phrases and the verb phrases in the relative clause involve a comparison between different positions in the relative clause sentence, we combined these two regions to look at the processing of the relative clauses without that position confound. Relative clause regions are in bold in examples (10 and 11)

10)

The babysitter | that | **liked the child** | was | a qualified nurse. (SR)

11)

The babysitter | that | **the child liked** | was | a qualified nurse. (OR)

The results for the relative clause region are presented in Table 6.7. There were no significant effects in the *First-pass Reading Time*. For the *First-pass Total Reading Time*, *Regression Path Duration*, and *Total Reading Time*, adding the interaction did not improve the model (FPtot: $\chi^2(1) = 0.23, p = .62$; RPD: $\chi^2(1) = 0.65, p = .41$; TRT: $\chi^2(1) = 0.18, p = .67$). The marginal R^2 for the optimal models was 0.0092 for RPD, 0.008 for TRT, and 0.0096 for FPtot.

Table 6. 7 Means (in ms) for Reading Time Measures and Standard Deviations in Parentheses by Condition for the Relative Clause Region in Experiment 3. Significant Effects are Identified with a Bold Type.

	That		Who(m)	
	SR	OR	SR	OR
First-pass	392(700)	387(667)	421(689)	398(569)
First-pass total	420(215)	434(200)	461(287)	471(242)
Regression path duration	458(251)	485(279)	495(327)	563(455)
Total reading time	783(482)	838(534)	752(476)	861(638)

In the model without the interactions, there was a significant effect of Clause Type (FPtot: $\beta = 0.096, SE = 0.027, t = 3.45, p < .001$; RPD: $\beta = 0.10, SE = 0.038, t = 2.72, p = .01$; TRT: $\beta = 0.125, SE = 0.037, t = 3.36, p < .001$): Object relative clauses were read slower than subject relative clauses.

Figure 6. 7 Experiment 3 Mean and Standard Error for Total Reading Time for the Relative Clause Region Split by Clause Type and Type of Pronoun.

In sum, at the relative clause region, across the three measures, there was an effect of Clause Type: Reading times in the object relative clauses were longer than in the subject relative clauses (see Figure 6.7).

6.5 Discussion

In the present eye-tracking experiment, we aimed to find out how Dutch learners of English process subject and object relative clauses and whether they rely on the morphological cues or can also process the structural cues in English relative clauses. Based on structural differences between L1 and L2 we expected that processing English relative clauses by speakers of Dutch would be similar to that of Farsi speakers because they face the same problem: also in Dutch, there is no structural cue as to the type of relative clause; syntactic disambiguation is entirely based on morphological cues. However, given that we know Dutch participants are more proficient in

English because they have had much more exposure to English than Farsi speakers, they may have proceeded further in the direction of using L2 cues for processing relative clauses. In that case, they would have no trouble with processing relative clause structures even when there is no morphological cue.

On the embedded verb phrase, an effect of Clause Type was found, irrespective of the type of relative pronoun. The verb in object relatives incurred a reading time penalty due to the longer First-pass reading time, which was continued by First-pass total reading time, regression path duration, and total reading time. Thus, Dutch participants showed a clear subject relative clause preference in both *that*-clause and *who(m)*-clause conditions. This effect on the embedded verb in the object relative clause is the same as what Staub et al. (2017) found in their experiment with native English speakers.

The reading time effects in the relative clause region (NP+VP/VP+NP) was the second finding that showed the subject relative clause preference and ability of the Dutch participants in using the structural cue (word order) in *that*-clause relatives. Across the three measures of First-pass total reading time, regression path duration, and total reading time, there was an effect of Clause Type. Reading times in the object relative clauses were more prolonged than in the subject relative clauses in both *that*-clause and *who(m)*-clause conditions. The Farsi speakers showed the subject relative clause preference as well but only in *who(m)*-clause conditions. In *that*-clause conditions, there was no difference between the subject and object relative clauses for the Farsi speakers. They had longer rereading times on the *that*-clause conditions in general, but they did not differentiate the subject and object relative clauses.

In the data of the Dutch participants, the object relative clauses in both conditions took longer to read than the subject relative clauses. This is in contrast with the data of the Farsi speakers, who did not show any delay in the object relative clauses compared to the subject relatives in the *that*-clause conditions, where they had to rely solely on the word order cue.

They even had a reverse effect on the verb: In *that*-clause conditions, the reading times on the subject relatives were longer than on the object relatives. This difference between the groups is consistent with the idea that Farsi speakers have not acquired the ability of switching to the structural cues in L2 English. Given the finding that this ability increases with increasing proficiency (McDonald, 1987), we expected that Dutch participants do have acquired the ability to use the structural cue. The combined data of Chapter 5 and 6 indeed show this difference between the two groups suggesting that Dutch speakers, as opposed to Farsi speakers, can use the structural cue in *that*-clauses in L2 English. Note, however, that also for the Dutch participants there was an interaction of Clause Type and Type of Pronoun at the verb phrase, with a larger effect of Clause Type in the First-pass total reading time in the *who(m)*-clauses than in the *that*-clauses.

We learned that the Dutch participants have a clear subject relative clause preference, but this effect was smaller in the *that*-clause conditions than in the *who(m)*-clause conditions. The question then arises whether the smaller effect in the *that*-clauses implies that these were easier or more difficult to process. To answer that question, it is important to investigate the regions after the embedded verb phrase, the matrix verb and the post-matrix verb region.

In the continuation of the matrix sentence, the matrix verb and post-matrix verb regions, similar to the Farsi speakers, reading times in *that*-clause conditions were longer than in the *who(m)*-clause conditions, in the absence of an effect of Clause Type. Thus, unlike in the experiment of Staub et al. (2017), there was no spillover effect after the verb phrase. The wrap-up effect on the post-matrix region in the *that*-clause relatives probably shows the last try on resolving the difficulty in the processing of the relative clauses with *that*-clause conditions. So, we may conclude that also for the Dutch participants processing *that*-clause relatives is more difficult than the *who(m)*-clause relatives.

As illustrated in Chapter 5, Farsi-speakers had long reading times on the embedded noun phrase in the subject relative clauses both in *that*-clause and *who(m)*-clause conditions. Also, for the Dutch participants, reading times on the embedded noun phrases were longer in the subject relative clauses than in the object relative clauses on first reading. Note, however, that unlike the results of the Farsi speakers, this effect occurred only in the *who(m)*-clauses. Thus, similar to the Farsi-speakers, the Dutch participants experienced processing difficulty on the noun phrase when it occurred in a position that would not occur in Dutch. This can be interpreted as an effect of transfer from Dutch to English. However, the effect was more local than in the case of the Farsi participants: it was shown only in the *who(m)*-clause conditions. Seemingly, the effect on the *that*-clause conditions for the noun phrase is different from the *who(m)*-clause conditions. Given that it is in the same direction, it is also possible that the effect is general, but smaller in the *that*-clause conditions just as the effect on the verb phrase is smaller in those conditions.

The reason that the effects in the *that*-clause conditions are small overall maybe that processing of these sentences occurs after participants have already read the end of the sentence. As discussed before, reading times in the continuation of the main clause are longer in the *that*-clause conditions than in the *who(m)*-clause conditions. In addition, in the total reading time, which includes rereading, there is a different result at the Noun Phrase: In this measure, the reading times in the object relative clauses are longer than in the subject relative clauses. Apparently, at this stage, the Dutch readers have interpreted the subject relative clause as a subject relative, and hence there is less need to read back than in the object relative clauses. This effect occurs in a different phase in processing; they read back when they still need to do some more work to get the right interpretation of the sentence. Thus, the effect on the noun phrase in the object relative clause is the same as what Staub et al. (2017) found in their experiment with the native English speakers, but in a later stage of processing.

Therefore, if we look at the crucial effects on the embedded verb phrase and the relative clause region, the Dutch participants are dissimilar to the Farsi speakers and similar to the native English speakers. However, they converge in two ways, (1) the effect on the embedded noun phrase on the subject relatives and (2) the extra difficulty on the continuation of the matrix clause in *that*-clause conditions.

Type of Pronoun significantly affected reading time on the relative pronoun in the direction of longer reading times in the object relative clauses in the *who(m)*-clause conditions. There were longer reading times on the relative pronoun '*whom*' than on the relative pronoun '*who*'. Only in the total reading time (which involves rereading) in the object relative clauses, the reading times were also longer in the *that*-clauses. Just like for the Farsi speakers, Dutch participants read the relative pronoun '*who*' faster than '*that*' in the subject relative clauses.

In sum, the Dutch participants showed a clear subject relative clause preference in both *that*-clause and *who(m)*-clause conditions. Therefore, unlike the Farsi speakers, the Dutch participants could obviously use structural cue (word order) in *that*-clause relatives. This can be explained by their higher proficiency in English. There are similarities in the processing of L2 English relative clauses by Dutch and Farsi speakers, for example, the embedded noun phrase effect in subject relative clauses and the effect on matrix verb and post-matrix verb regions in *that*-clause conditions. The most important difference with Farsi speakers is that the Dutch participants showed they can interpret the relative clauses in *that*-clause conditions as well, which indicates that the Dutch participants can use the word order cue in the English relative clause processing, whereas the Farsi speakers have a problem in the processing of English relative clauses without a morphological cue. This difference can be explained based on the results of McDonald (1987) as she found that initially processing L2 relative clauses is in line with the application of the related cues in L1. When L2 learners get more proficient in the L2, they can switch from the cues in their first language into cues in the second

language when they process relative clauses. As already mentioned, the Dutch L2 speakers in our experiment are more proficient in English than Farsi speakers, so they can use the word order cue in English relative clauses without the help of a morphological cue.

In our experiments, we did not combine the reading comprehension and processing experiments together because having so many questions might influence the reading process. The question is then whether Farsi speakers do comprehend *that*-clause relatives or not. In Chapter 7, we will try to answer this question. We will investigate the relative clause comprehension of Farsi speakers in both *that*-clause and *who(m)*-clause conditions.

Chapter 7

Chapter 7

Comprehension of Relative Clauses

In Chapter 5, relative clause sentence processing by Farsi-speaking learners of English was investigated with an eye-tracking method. These Farsi learners of English showed a delay in processing only in English object relatives when there was a morphological cue. Therefore, it seems that they cannot apply the word order cue while processing English relative clause sentences. In the present chapter, the comprehension and reading times of the same relative clause sentences will be tested with a survey method. The study aims to find out to what extent, given enough time, Farsi-speaking learners of English can comprehend L2 English relative clauses with or without a morphological cue. The comprehension experiment was divided into two parts. In the first part, the relative clause sentence and verification statements (True/False) were presented on separate screens. In the second part, the relative clause sentence and verification statements appeared together on one screen. Chapter 7 is organised as follows: a brief introduction, a review of the literature and the aims are presented in Section 7.1. The method is presented in Section 7.2. The Results and discussion of Part 1 are presented in section 7.3, followed by the results and discussion of Part 2 in Section 7.4. The general discussion is presented in Section 7.5.

7.1 Introduction

In Chapter 5, we studied English relative clause processing by L1 Farsi learners of English using eye-tracking during reading. First, we investigated whether there was a subject-object asymmetry in relative clause processing in L2 English in relative clauses with either the relative pronoun '*that*' or the relative pronoun '*who(m)*'. The results revealed that Farsi speakers had longer processing times with object relative clauses on the verb phrase only in *who(m)*-relative clauses. A reverse effect was found in *that*-relative clauses. Based on these results, we speculate that Farsi readers probably cannot rely on the L2 English word order in processing relative clauses. It is possible that the Farsi speakers have not acquired the ability to process the structural cues in L2 effectively. They may rely too much on morphological cues in sentence processing because they have not yet switched to applying the word order cues in English and hence process the relative clause in the *that*-clause conditions incorrectly.

7.1.1 Relative Clause Processing and Comprehension

L1 and L2 relative clause studies are often accompanied by relative clause comprehension questions, such as verification statements with true/false or yes/no answers. The results of relative clause processing tasks and comprehension tasks are sometimes in line with each other, but, in other instances, the results of the two tasks do not match. Duffeler (2017) states that the processing asymmetry of subject/object relative clauses does not necessarily imply a difference in their comprehension.

For instance, Hsiao and Gibson (2003) administered a self-paced reading task accompanied by a yes/no comprehension question to study relative clause processing in L1 Chinese. Their data suggested an object relative clause processing preference. In their study, the response accuracy of the comprehension questions provided additional support for this object relative clause preference. In contrast, Xu et al. (2019) applied a self-paced reading task with a true/false question after every subject and object relative clause sentence in Chinese, but found a mismatch between the

tasks: an object relative clause preference in processing, but no accuracy difference between subject and object relatives.

Researchers apply different methods for relative clause comprehension studies, such as picture selection, multiple-choice items, a grammaticality judgement task, and verification statements. For instance, Costa et al. (2011) assessed the comprehension of subject and object relative clauses by applying a sentence-picture matching task and suggested that adult Portuguese speakers comprehend subject and object relatives equally well. Duffeler (2017) administered a picture selection and an elicited imitation task. She investigated the comprehension of L2 English subject, object, and oblique relative clauses with animate referents and full noun phrases by French and Italian learners of English. The participants understood subject relative clauses better than oblique relative clauses, but she did not find a difference in comprehension between subject and object relative clauses. She concludes that subject and object relative clauses were comprehended equally well by L2 English learners and there was no evidence of cross-linguistic L1 transfer on the comprehension of L2 English relative clauses, probably because of the participants' high level of English proficiency.

To give another example of a study examining relative clause processing and comprehension in English as an L2, we refer to Lim and Christiansen (2013) who posited the view that comprehension questions in online experimental methods may not necessarily provide a precise indication of how language learners display their comprehension of relatives. With this concern in mind, they employed translation as an off-line task besides a self-paced reading experiment to provide explicit evidence of what kind of information Korean learners of L2 English use for comprehending the plausible and implausible subject and object relative clauses as in the examples in (1).

1)

a. The cat that chased the mouse was fast. (SR-plausible)

-
- b. The mouse that chased the cat was fast. (SR-implausible)
 - c. The mouse that the cat chased was fast. (OR-plausible)
 - d. The cat that the mouse chased was fast. (OR-implausible)
- (Lim & Christiansen, 2013, p.525)

The results of reading times, comprehension accuracy and translation analysis showed that during comprehension, Korean L2 learners were able to apply syntactic information equally well as native English speakers; moreover, the reading goals (comprehension vs translation) and L2 proficiency moderated online L2 processing and off-line L2 comprehension. During the online comprehension task, the participants could apply both syntactic and semantic knowledge; they had difficulty in comprehending the object relative clauses and implausible sentences. However, in the translation task, the low-proficiency participants paid more attention to the structural sources as they had longer reading times on the object relative clauses than the subject relatives. Comprehension accuracy rate in both tasks was similar; L2 learners similarly comprehended relative clause sentences while reading either for comprehension or translation. The participants' L2 proficiency levels were positively correlated with comprehension accuracy in both reading comprehension and translation tasks. Regarding the comprehension accuracy, Lim and Christiansen state that regardless of plausibility, subject relative clauses yielded more accurate answers than object relative clauses; moreover, implausible relatives produced fewer accurate answers than the plausible ones in both structures.

In their eye-tracking experiment with English native speakers, Staub et al. (2017) did not investigate comprehension of the relative clauses. Similarly, in the experiments on the relative clause processing reported in Chapters 4-6 in this dissertation, we did not include comprehension questions simultaneously with all the relative clause sentences. The reason was that adding a comprehension question for every relative clause sentence and asking for the interpretation would influence

the reading process. Therefore, we will investigate the reading comprehension of English relative clauses by Farsi-speaking L2 learners in this separate experiment.

Several studies tested the comprehension of English relative clauses by Farsi speakers. Abdolmanafi and Rahmani (2012) applied a sentence combining test, in which participants had to combine two simple declarative sentences into one sentence, using a relative pronoun. For example, the sentences *I know a student* and *she got an A* had to be combined into the complex OS-sentence illustrated in (2).

Abdolmanafi and Rahmani (2012) investigated the learnability of the English relative clauses by L1 Farsi learners of English. They applied a Sentence Combining Test to find out the rank order of mastery of the four types of relative clauses, SS, SO, OS, and OO. The following sentences in (2) are examples of the four types of relative clauses.

2)

(OS) I know the student who got an A.

(OO) I know the woman who(m) you are looking for.

(SS) The student who got an A is a friend of mine.

(SO) The student whom you have talked to got an A.

(Abdolmanafi & Rahmani, 2012, p. 30)

The mastery order was OS (80%) > OO (52.5%) > SS (20%) > SO (2.5%). They concluded that OS and OO RC types are more accessible to acquire than SS and SO ones. Moreover, they reported pronoun retention and incorrect relative pronoun application by the participants as well. However, we know from the literature (Traxler et al., 2002, Mak et al., 2002) and our corpus study (Chapter 3) that the animacy of the noun phrases influences the distribution and the processing of relative clauses. Moreover, having a pronoun in an embedded noun phrase (subject) of an object relative clause makes its processing much easier or even reverses the processing difficulty of the subject and object relative clauses (Real &

Christiansen, 2007, Mak et al., 2008). These factors are confounded in the materials of Abdolmanafi and Rahmani (2012). For example, they found that object relative clauses (OO) are easier than the subject relatives (SS), which at a first glance looks very strange. However, looking at the example '*I know the woman who(m) you are looking for*', we observe that this object relative clause has a pronoun in the position of the embedded noun (subject), which has been shown to make object relative clauses easier to process than subject relative clauses. Thus, these relative clause sentences have a confound of clause type, animacy, and category, which are different from what we used in the present comprehension experiment, so the results will be inconclusive concerning the relative difficulty of these clauses.

Marefat and Rahmany (2009) used a Sentence Comprehension task to determine the difficulty order of comprehension of the four types of relative clauses as in (4) by Farsi-speaking learners of English. All the verbs were transitive, and all noun phrases were animate. The participants had to identify the subject and object of the verb in (a) the relative clause sentence and (b) the matrix sentence as in example (3):

3)

'The dog that watches the cat pushes the horse.'

(a) [-----watches-----] (b) [-----pushes-----]

The blanks represent the position of subject and object in the sentence. The analysis of their data suggests that the hierarchy of comprehension difficulty of the four relative clauses is OS > SS > OO > SO. Thus subject-extracted relative clauses are easier than object-extracted relative clauses, and object-modifying (right-branching) relative clauses are easier than subject-modifying (embedded) relative clauses. They indicated that interruptions within both the matrix clause and the relative clause, word order canonicity, and structural distance between the antecedent and the gap could account for the difficulty order of relative clauses processing. This is illustrated in the four relative clause types in

(4). In OS both propositions (*the boy sees the girl, the girl likes the artist*) have the canonical word order, and the distance within the propositions is small. In SS both propositions (*the boy sees the girl, the boy likes the artist*) have the canonical word order, but the distance within one of the propositions (*the boy ...likes the artist*) is longer because the main clause proposition is interrupted by the proposition in the relative clause. In OO one of the propositions (*The girl the artist likes*) is non-canonical. In SO, one of the propositions (*The boy the girl sees*) is non-canonical, and the distance within one of the propositions is longer because the main clause proposition is interrupted by the other proposition.

4)

The boy sees the girl that GAP likes the artist. (OS)

The boy that GAP sees the girl likes the artist. (SS)

The boy sees the girl that the artist likes GAP. (OO)

The boy that the girl sees GAP likes the artist. (SO)

Following Marefat and Rahmany (2009), Rahmany and Haghpour (2015) applied a Sentence Comprehension task, again consisting of the four types of relative clauses illustrated in (5) to explore the ranking of processing difficulty of relative clauses by Farsi EFL learners. The following item is an example of SO relative clause type in their experiment:

5)

'The rabbit that the cat watches kicks the bird.'

(a) watches

(b)kicks.....

Their data analysis illustrated the following relative clause processing order: OS and OO > SO > SS. Their ranking order was thus not in line with NPAH of Keenan and Comrie (1977), and with the results of Marefat and Rahmany (2009). They indicated that the determining factor in relative

clause processing is the position of the relative clause within the matrix clause (embeddedness) rather than the role of the antecedent in the relative clause. They explained that interruption of the matrix sentence with a relative clause sentence is the most crucial reason for misunderstanding the relative clauses. However, a closer look at their data reveals that the low position of SS in the results is due to the questions about the main clause. For questions about the relative clauses, the same order of difficulty is found as that found by Marefat and Rahmany (2009).

In both studies with Farsi-speaking English learners, the researchers claimed that the L2 English proficiency level of the participants did not affect the order of difficulty of the relative clause comprehension. However, in the study by Marefat and Rahmany (2009), we see that the high proficient speakers score higher than low proficient speakers, and this difference becomes larger with increasing difficulty of the relative clause type.

The above-mentioned studies by Marefat and Rahmany (2009), and Rahmany and Haghpour (2015) in the comprehension of English relative clauses by Farsi speakers used only experimental sentences with the relative pronoun '*that*'. Also, the fill in the blank tasks they used are not very natural because they are not very representative of normal processing. In addition, there are ceiling effects in these experiments; the tasks are in general very easy. For these reasons, in our experiment, we use the task of reading an experimental sentence and then choosing an appropriate verification statement, as this requires the readers to access the memory representation of the sentences that is the result of processing.

Also, to have a good indication of how the participants in our experiment comprehend relative clause sentences, we need to have participants with the same demographics as the participants in the eye-tracking study. In this dissertation, we have mainly postgraduate students in an environment where they have to speak in English, so they are probably more proficient than the participants in Iran, who participated in previous studies. The study aimed to investigate, first of all, whether the

subject-object asymmetry in relative clause processing in *that*-clause and *who(m)*-clause relative clauses evidenced in the eye-tracking study is mirrored in reading comprehension. To answer this question, we studied both the comprehension scores and the time needed to answer the comprehension questions. Second, we investigated whether the English language proficiency of the speakers is correlated with the comprehension of the relative clauses and their reaction times.

We hypothesised that comprehension of subject relative clauses would be easier than of object relative clauses. Also, we hypothesised that the effect of Type of Pronoun would be similar to the eye-tracking experiment: We expected that Farsi speakers would answer the questions about the relative clauses in the *who(m)*-clause condition more accurately than in the *that*-clause condition. Based on the reading processing experiment in Chapter 5, we speculated that it is possible that in *that*-clause conditions, the participants read the object relative clauses as subject relatives and vice versa.

As illustrated in the study of Marefat and Rahmany (2009), language proficiency may change the size of the effect in different subject and object relative clause comprehension. Therefore, a proficiency effect was expected to occur in the comprehension experiment; the higher the learners' L2 proficiency was, the more aware of the structure cue in L2 English they would be.

7.2 Methods

7.2.1 Participants

Eighty-four Iranian learners of English participated in this reading comprehension experiment voluntarily. The majority of these participants (N = 38) also participated in the eye-tracking experiments in Chapter 4 and 5. There was a time interval of nine months between the eye-tracking and reading comprehension experiments. Forty-eight participants answered the questions thoroughly, and thirty-six participants answered the questions partially. We only analysed the data from the complete responses. There

were 43 native speakers of Farsi, 2 L1 Azerbaijani Turk, 2 L1 Kurd, and 1 L1 Arab participant. Since Farsi is the only instruction language at schools and universities in Iran, Iranians whose L1 is not Farsi are literate in Farsi. There were 17 males and 32 females. Their mean age was 33.65 (range 26-45). Nine had completed their PhD, there were four bachelors' students, and 35 were PhD students. Most of them started learning English at school when they were 11 years old, and some of them had had some English courses out of school; eight participants studied English literature, linguistics and English translation. Five participants had never been to an English-speaking university or working place. The L2 English proficiency of the participants was assessed through the LexTALE test. Their scores ($M = 73.28$, $SD = 12.27$) ranged between 43.75 and 90.

7.2.2 Materials and Design

There were 40 sets of items, for an example see Table 7.1. These consisted of the 36 items from the relative clause processing experiment (Chapter 5), plus 4 extra items (see Appendix C). The items contained either a subject relative clause (6a,7a) or an object relative clause (6b, 7b). The relative clauses either contained the pronoun *that* (6a and 6b) or the pronoun *who(m)* (7a and 7b). All the antecedents and the embedded noun phrases were animate full NPs, and all the relative clause verbs were transitive. The relative clauses were subject modified (the antecedents were the subject of the matrix sentences).

Table 7. 1 *An example of an Item in English Including Subject and Object Relative Clauses Split by Clause Type and Pronoun Type.*

-
- (6)
- a. The babysitter that liked the child was a qualified nurse.
 - b. The babysitter that the child liked was a qualified nurse.
- (7)
- a. The babysitter, who liked the child, was a qualified nurse.
 - b. The babysitter, whom the child liked, was a qualified nurse.
-

The only difference between the sentences in the first pair (with the relative pronoun *that*) was the word order inside the relative clause. The items in the second pair were formed by replacing the relative pronoun '*that*' with '*who*' or '*whom*'. Moreover, the relative clauses in the second pair were enclosed with commas. The four versions of every item were distributed across four different lists so that precisely one version of each set appeared in a list and an equal number of items of the same version appeared across the lists. Each participant read ten *that*-clause subject relatives, ten *that*-clause object relatives, ten *who(m)*-clause subject relatives, and ten *who(m)*-clause object relatives. The test items in every version were presented together with 39 filler items (28 in Part 1 and 11 in Part 2) of various syntactic types adapted from the Cambridge Preparation for the TOEFL (Gear & Gear, 2002).

The test was divided into two parts. In Part 1, with 24 items, the participants first read the test sentence, after which a new screen appeared with a simple comprehension verification statement (True/False) about the content of either the relative clause or the matrix sentence. Half of the statements were about the relative clause and the other half about the matrix sentence. Half of the statements were true to the content of the target sentence, and the other half were false. For example, a true statement about the object relative clause '*The babysitter that the child liked was a qualified nurse*' would be '*The child liked the babysitter*'. In contrast, the statement

'The babysitter liked the child' would be false. The verification statement for both the *that*-clause and *who(m)*-clause relative clause type was identical.

In Part 2, 16 items were paired with two simple comprehension verification statements about the content of either the relative clause or the matrix sentence. One of the statements was true to the content of the target sentence, and the other one was false. In this case, the verification statements were presented on the same screen as the sentences they were about.

To assess the general English language proficiency of the participants, we applied the LexTALE test (Lemhöfer & Broersma, 2012). This comprises 63 trials, in each of which the participant sees a string of letters. The participants' task was to decide whether this was an existing English word or not. If they thought that the current word was an existing word in English, they clicked on 'yes'; otherwise, they clicked on 'no'. The first three items were dummy items, so we did not include them in the analysis. The highest possible score was 100. The last part of the experiment included six questions verifying the age, gender, the duration of being in an English speaking university or working place, the highest level of education that was completed, first language, and field of study. The findings from these questions are reported in Section 7.2.1 Participants.

7.2.3 Procedure

The reading comprehension experiment was conducted in LimeSurvey 2.5 (<https://www.limesurvey.org>), which was provided by Utrecht University. We forwarded an email with the link of the survey inviting the prospective participants and asked them to complete this survey in a quiet place. It was completed online individually on a PC or a laptop. On the first page, a welcoming message with a summary of three sections of the experiment was displayed. By clicking on the NEXT button, participants were forwarded to the next page. The central part of the comprehension

experiment was divided into two sections. In Part 1, which included 24 items, one item was displayed, then on the next page, a verification statement with True/False choices was shown. In Part 1, the participants were instructed to read every sentence for comprehension, and then to decide if the following statement was True or False (see Figure 7.1 and Figure 7.2).

Figure 7. 1 *A Relative Clause Item in Part 1.*

A screenshot of a computer screen showing a relative clause item. At the top left, there is a small icon with the number 13. Below it, the text reads: "The bus driver, whom the passerby guided, wondered about the location of the hotel. *". There is a horizontal line below the text, indicating a space for a response.

Figure 7. 2 *A Verification Statement with True/False Options in Part 1.*

A screenshot of a computer screen showing a verification statement. At the top left, there is a small icon with the number 14. Below it, the text reads: "The bus driver guided the passerby *". There is a horizontal line below the text. Below the line, there are two radio button options: "True" and "False".

After completing Part 1, Part 2 started. This section included 16 items with 11 filler sentences. In this section, one item (relative clause sentence) with two verification statements were displayed on the same page. The participants were instructed to determine which statement was correct based on the content of the sentence. (see Figure 7.3).

Figure 7. 3 *A Relative Clause Item with Two Verification Statements in Part 2.*

8%

The man, whom the woman betrayed, left home very quickly. *

☐ The man left home very quickly.

☐ The woman left home very quickly.

A red asterisk on the upper left of every statement indicated that choosing an option was mandatory. Timings or reaction time on every page was saved. Participants were allowed to take as much time as they wanted for reading the sentences and for making their choices.

In Section B, the participants were informed that they would see a string of letters. Their task was to decide whether that was an existing English word or not. They would answer with yes/no options, see Figure 7.4.

Figure 7. 4 *An Item With a String of Letters and Yes/No Options in Section B.*

8%

Platery *

☐ Yes

☐ No

In the last section, the participants answered the individual linguistic and characteristic questions by typing in the provided box. Finally, a thank you message was displayed on the screen, and the answers were forwarded to the experimenter's email.

7.2.4 Data Analysis

Data trimming was conducted first by deleting incomplete responses; 36 out of the 84 participants' responses were removed. Second, in reaction and reading time data, cases that were more than two standard deviations above or below both participant and item mean were removed; in Part 1, 33 cases and Part 2, 20 cases were excluded. Reading times for the items with both correct and wrong answers were analysed. Based on Lemhöfer and Broersma (2012), LexTALE scores were calculated according to the formula in (8) and the LexTALE scores were centred around zero by subtracting the mean score from the individual scores.

8)

$$((\text{number of words correct}/40*100) + (\text{number of nonwords correct}/20*100)) / 2$$

We performed binomial logistic regressions analyses on the comprehension data because they concerned *yes/no* and *true/false* options. We used R (R Core Team, 2019) and the lme4 package (Bates et al., 2015) to perform logistic regressions analyses to ascertain the effects of Clause Type (SR versus OR) and Type of Pronoun (*that* versus *who(m)*) and their interactions on the likelihood that the participants comprehend the relative clause sentences. As random effects, we had intercepts for subjects and items as well as by-subject and by-item random slopes for the impact of Clause Type and Type of Pronoun conditions and their interactions.

For reaction and reading times, we performed data analysis using linear mixed-effects models of the reaction and reading times. We used R (R Core Team, 2019) and the lme4 package (Bates et al., 2015) to predict the reaction and reading times based on Clause Type (SR versus OR) and

Type of Pronoun (*that* versus *who(m)*). As random effects, we included intercepts for subjects and items as well as by-subject and by-item random slopes for the effect of Clause Type and Pronoun Type conditions and their interaction. In cases where the model did not converge, we first removed the interaction from the random part, and if necessary, in some cases also the random slopes for the main effect. We performed a logarithmic transformation on the data to approximate the normal distribution. We produced the figures by using the package ggplot2 (Wickham, 2016).

To obtain the ultimate model, we first made a model with the main effects of Clause Type and Type of Pronoun, and then we added the interaction. If the model improved, we went forward and added LexTALE scores to the model as a covariate. Finally, the interaction of the LexTALE scores with the other factors was added. At any stage, if the addition of a predictor did not improve the model thus far, we removed that factor from the model.

7.3 Reading Comprehension Experiment Part 1

In Part 1, the participants had no access to the relative clause sentence when they judged the verification statement. They could not go back to the previous page because we wanted to compare the results of the comprehension experiment to those of the eye-tracking experiment.

7.3.1 Results

7.3.1.1 Accuracy Data for Statements about the Content of the

Relative Clauses

First, we analysed the accuracy data for statements about the content of the relative clauses. The mean percentage of correct responses to comprehension questions was 77.53%. Table 7.2 shows the percentage of accurate answers for the statements about the content of the relative clauses.

Table 7.2 *Mean Percentage of Accurate Answers and Standard Deviations in Parentheses for Statements about the Content of the Relative Clauses in Part 1.*

	That	Who(m)
Subject Relative Clause	72.53(44.79)	88.88(31.52)
Object Relative Clause	71.97(45.00)	75.71(43.00)

Adding the interaction of Clause Type and Type of Pronoun conditions to the base model with only the main effects improved the model ($\chi^2(1) = 4.610$, $p = .03$). Adding LexTALE score as a covariate to the interaction model improved the model even further ($\chi^2(1) = 7.015$, $p = .008$). Finally, we added the interaction with LexTALE score to the model, but this did not improve the model fit ($\chi^2(3) = 5.800$, $p = .12$). In the optimal model (marginal R^2 squared = 0.089), there was a significant effect of Type of Pronoun ($\beta = 1.077$, $SE = 0.337$, $t = 3.192$, $p = .001$) and an interaction of Clause Type and Type of Pronoun ($\beta = 1.033$, $SE = 0.453$, $t = 2.276$, $p = .02$). Only in the *who(m)*-clauses the scores on the subject relative clauses were better than on the object relative clauses ($\beta = 0.979$, $SE = 0.343$, $t = 2.846$, $p = 0.004$). Additionally, there was a significant effect of LexTALE score ($\beta = 0.034$, $SE = 0.012$, $t = 2.742$, $p = .006$): across all the conditions, there was a positive correlation between the LexTALE score and the score of the test. The higher the LexTALE score, the more accurate the test scores were (see Figure 7.5).

Figure 7. 5 *Interaction of Clause Type and Type of Pronoun Conditions in the Accuracy Data about the Content of the Relative Clauses and LexTALE Scores as Covariate.*

7.3.1.2 Accuracy Data for the Statements about the Content of the Matrix Sentence

We analysed the accuracy data about the content of the matrix sentences separately. The participants answered 84.75% of the items correctly. Table 7.3 shows the mean percentage of accurate answers for the statements about the content of the matrix sentences in the four conditions.

Table 7.3 *Mean Percentage of Accurate Answers and Standard Deviations in Parentheses for Statements about the Content of the Matrix Sentences in Part 1.*

	That	Who(m)
Subject Relative Clause	80.13(40.00)	88.88(31.55)
Object Relative Clause	81.67(38.83)	88.51(31.99)

Adding the interaction did not improve the model ($\chi^2(1) = 0.069$, $p = .8$). Adding the LexTALE scores as a covariate to the main effect model did improve the model ($\chi^2(1) = 7.209$, $p = .007$). Adding the interaction with LexTALE score did not improve the model further ($\chi^2(2) = 3.420$, $p = .18$). In the optimal model (marginal R^2 squared = 0.079), there was no significant effect of Clause Type ($\beta = 0.116$, $SE = 0.305$, $t = 0.381$, $p = .703$), but there was a significant effect of Type of Pronoun ($\beta = 0.850$, $SE = 0.315$, $t = 2.694$, $p = .007$): the statements about the matrix sentences in *who(m)*-clause condition were scored more correctly than those in *that*-clause condition. Moreover, there was a significant effect of LexTALE score ($\beta = 0.047$, $SE = 0.017$, $t = 2.67$, $p = .007$). Across all conditions, there is a correlation between LexTALE scores and scores of the tests (also see Figure 7.6).

Figure 7. 6 *The Main Effects of Type of Pronoun and LexTALE Score and LexTALE Scores as Covariate in the Accuracy Data about the Content of the Matrix Sentences.*

7.3.1.3 *Reaction Times to the Statements about the Content of the Relative Clauses*

In a subsequent analysis, we looked at the reaction times on the verification statements about the content of the relative clauses. Adding the interaction did not improve the model ($\chi^2(1) = 0.681, p = .40$). Adding LexTALE score as a covariate did not improve the model either ($\chi^2(1) = 0.259, p = .61$). Adding interaction with LexTALE score did improve the model ($\chi^2(3) = 11.227, p = .01$). In the optimal model (marginal R^2 squared = 0.028), there was a significant effect of Clause Type ($\beta = 0.11, SE = 0.032, t = 3.401, p = .000$). In addition, there was a significant interaction of LexTALE score and Clause Type ($\beta = 0.007, SE = 0.002, t = 3.070, p = .002$). In the reaction times to the statements about the content of the subject relatives, there was no correlation with LexTALE score. In the object relative clauses, the reaction times became *longer* with increasing LexTALE score (Figure 7.7).

Figure 7. 7 *Reaction Time to the Statements about the Content of the Relative Clauses with Clause Type and Type of Pronoun Conditions and Interaction with the LexTALE Scores in Part 1.*

7.3.1.4 Reaction Times to the Statements about Content of the Matrix Sentences

We also analysed the reaction times in verifying statements and choosing the *True/False* options in questions about the content of matrix sentences. Adding the interaction did not improve the model ($\chi^2(1) = 0.206, p = .64$). Adding LexTALE scores as a covariate did not improve the model either ($\chi^2(1) = 0.538, p = .46$), neither did adding the interaction with LexTALE scores ($\chi^2(3) = 2.318, p = .50$).

In the optimal model (marginal R^2 squared = 0.0063), there was a significant effect of Type of Pronoun ($\beta = -0.129, SE = 0.040, t = -3.206, p = .001$): the reaction times in verifying statements about the content of

matrix sentences in *who(m)*-clause conditions were faster than those in *that*-clause conditions (Figure 7.8).

Figure 7. 8 *Reaction Time to the Statements about the Content of the Matrix Sentences with Clause Type and Type of Pronoun Conditions in Part I.*

7.3.1.5 Reading Time in the Relative Clause Sentences

In Part1, first, a relative clause sentence was presented, then a verification statement was shown on a separate page. We analysed the reading times in the relative clause sentences. In the analysis of the reading times of the relative clause sentences, adding the interaction did not improve the model ($\chi^2(1) = 1.359, p = .24$). Adding LexTALE as a covariate to the main effect model did not improve the model fit either ($\chi^2(1) = 0.257, p = .61$). Also, adding the interaction with LexTALE to the main effect model did not improve the model fit ($\chi^2(1) = 0.257, p = .61$). In the optimal model (marginal R² squared = 0.0081), there was a significant effect of Type of Pronoun ($\beta = -0.124, SE = 0.033, t = -3.764, p = .0001$): the reading times

in the *who(m)*-clause conditions were shorter than the reading time in *that*-clause conditions (Figure 7.9).

Figure 7. 9 *Reading Times of the Relative Clause Sentences with Clause Type and Type of Pronoun Conditions in Part 1.*

7.3.2 Discussion Part 1

In Part 1 of the comprehension experiment, we investigated whether the subject-object asymmetry in relative clause processing in *that*-clause and *who(m)*-clause conditions evidenced in the eye-tracking study in chapter 5 is mirrored in reading comprehension. Another issue in the comprehension experiment involved the question of how the English language proficiency of the Farsi speakers moderates the comprehension of relative clauses in L2 English. Moreover, reaction times on the questions might show the relative ease or difficulty of comprehension of the relative clauses.

In Part 1 of the comprehension experiment, we stayed as close as possible to the processes in the reading experiment, by presenting the

relative clause sentences in isolation, and then testing the representation the participants had constructed based on the sentence. A relative clause sentence was presented first, then on the next page, the verification statement and the True/False options were presented. There was an interaction of Clause Type and Type of Pronoun in the accuracy scores of the questions about the content of relative clause sentences. Accuracy levels were relatively high in the subject relative clauses with the relative pronoun 'who', which is in line with the results of the relative clause processing experiment in Chapter 5: Reading times in the object relative clauses in the *who(m)*-clause condition were longer than those in the subject relatives, and subject relative clauses with 'who' were read faster than subject relative clauses with 'that'. Most importantly, there was no difference in comprehension scores between subject and object relative clauses in the *that*-clause conditions, which is consistent with the results in Chapter 5, as there was no difference in reading times between subject and object relatives in the *that*-clause conditions. Additionally, the reading times of the relative clause sentences in the *who(m)*-clause conditions were shorter than those in the *that*-clause conditions, which means that probably participants could comprehend the relative clauses with a morphological cue faster than those without a cue, which is comparable to the results of the processing experiment in Chapter 5 where reading times were longer in the *that*-clause relative clauses than in the *who(m)*-clause relative clauses in sentence wrap-up and in the total reading time. The verification statements about the content of the matrix clause in *who(m)*-clause condition are scored more accurately than those in *that*-clause conditions. This is reflected in the reaction times in verifying statements about the content of matrix clauses, which were faster in *who(m)*-clause conditions than in *that*-clause conditions.

Across all the conditions there was a correlation between LexTALE score and the score of the verification statements about the content of the relative clause and matrix sentences: the higher the LexTALE score, the more accurate the scores are. This means that a higher

English proficiency helps the Farsi-speaking English learners to understand English relative clauses with or without a cue. This is consistent with the interpretation that proficiency makes them switch from morphological cue to structural cue in English relative clauses (cf. McDonald, 1987).

There was a significant interaction of LexTALE score and Clause Type: in object relative clauses participants with higher LexTALE scores reacted to the statements about the content of the object relative clauses more slowly. At face value, this effect is surprising, because usually, reaction and reading times become shorter with increasing comprehension. However, we know that object relative clauses are difficult even for native speakers of the language. If readers do not have longer reaction times, this may be a sign that they do not see the difficulty and cannot differentiate between the subject and object relatives. If readers process an object relative clause as a native speaker does, then their processing time increases. Probably, the proficient participants interpreted the relative clauses in the present experiment correctly; having a longer reading time is then a sign of understanding that this sentence is an object relative clause.

For the *that*-clause conditions, the participants spent more time thinking about the answers, which is evidence of less certainty about the interpretation, and this is reflected in the scores. In the *that*-clause conditions, there is no difference between subject and object relative clauses regarding the reaction times and accuracy of the responses to the questions about both the content of the relative clause or the matrix sentences. This is in line with the results of the relative clause processing experiment in Chapter 5. Total reading times in the *that*-clause condition were longer than that in *who(m)*-clause conditions, which show more difficulty in the processing of the sentences in these conditions.

The absence of a difference in the reading times between subject and object relatives in *that*-clause conditions, is thus not that these relative clauses were not difficult for the participants, but more likely that the readers did not realize that they were object relative clauses. Hence, the

lack of a Clause Type effect in the reading comprehension accuracy and the longer readings on the *that*-clause conditions indicate more difficulty of processing and comprehension of the relative clauses without a morphological cue.

All in all, these results illustrate that for the Farsi speakers, subject relative clauses with the relative pronoun '*who*' are easier to comprehend than object relatives with the relative pronoun '*whom*', which is in line with the relative clause processing preference in the eye-tracking experiment. Additionally, fast reaction times to the questions in the *who(m)*-clause conditions and accurate responses in this condition are in line with the relative clause processing results in Chapter 5, which illustrate that the Farsi speakers apply the morphological cues in the processing of the relative clauses in *who(m)*-clause condition, but they may not be able to use the word order cue in the *that*-clause condition. The reading comprehension experiment revealed that the Farsi-speaking English learners understand the relatives in *that*-clause conditions too because they score above chance, but they can comprehend the relative clauses in *who(m)*-conditions easier and faster than those in *that*-clause conditions.

The comprehension scores are quite low, especially in the *that*-clause relatives. The question is whether that means that the readers often do not understand these clauses at all, or whether they will understand the sentences if they have all the time and opportunity to read and think about the relatives. Therefore, in the second part, we decided to allow the participants to look back at the sentence while answering the comprehension questions. Thus, we removed the memory effect by presenting the relative clause sentence and verification statements together on one page in the next part of the experiment. In this way, we could investigate to what extent the participants arrive at the correct interpretation when they still have access to all the information in the sentence.

7.4 Reading Comprehension Experiment Part 2

In Part 2 of the comprehension experiment, to allocate more information to the participants while answering the questions, we presented the relative clause sentence, and the related verification statements on one page altogether to control the possible effect of memory by letting them look back to the relative clause sentences as they need.

7.4.1 Result

7.4.1.1 Accuracy data for statements about the content of the relative clauses

In this part of the comprehension experiment, the relative clause sentence and the related verification statements were presented together on one page. The mean percentage of accurate responses to comprehension questions was 88.29 %. Table 7. 4 shows the percentage of correct answers for the statements about the content of the relative clauses within Clause Type and Type of Pronoun conditions.

Table 7. 4 Mean Percentage of Accurate Answers and Standard Deviations in Parentheses for Statements about the Content of the Relative Clauses in Part 2.

	That	Who(m)
Subject Relative Clause	89.28(31.11)	92.13(27.00)
Object Relative Clause	88.39(32.11)	84.25(36.58)

Adding the interaction did not improve the main effect model ($\chi^2(1) = 1.25, p = .26$). Adding LexTALE as a covariate did not improve the model significantly ($\chi^2(1) = 3.303, p = .06$). Adding interaction with LexTALE did improve the model significantly ($\chi^2(3) = 9.284, p = .02$). In the optimal model (marginal R^2 squared = 0.17), there was an interaction of LexTALE scores and Type of Pronoun ($\beta = 0.081, SE = 0.039, t = 2.05, p = .04$). In the *that*-clauses, there was no correlation between LexTALE

score and accuracy, but in the *who(m)*-clauses the accuracy of the responses increased with increasing LexTALE score. The extent to which the participants took benefit from the morphological cue depends on the LexTALE score (Figure 7.10). Moreover, there was a significant effect of Clause Type ($\beta = -1.10$, $SE = 0.524$, $t = -2.096$, $p = .03$): there were more correct answers in the subject relative clauses than in the object relatives.

Figure 7. 10 *Interaction of Type of Pronoun with LexTALE Scores in the Accuracy Data about the Content of the Relative Clauses.*

7.4.1.2 Accuracy data for statements about the content of the matrix sentences

We checked the reading and reaction times in the items which have the verification statements about the content of the matrix sentences. The participants answered 93.6% of the questions correctly. Table 7.5 shows the mean percentage of accurate answers for the statements about the content of the matrix sentences within Clause Type and Type of Pronoun conditions.

Table 7.5 *Mean Percentage of Accurate Answers and Standard Deviations in Parentheses for Statements about the Content of the Matrix Sentences in Part 2.*

	That	Who(m)
Subject Relative Clause	92.59(26.31)	98.05(13.86)
Object Relative Clause	91.25(28.43)	91.66(27.80)

In the comprehension scores, adding the interaction did not improve the model ($\chi^2(1) = 1.922$, $p = .16$). Adding LexTALE as a covariate did not improve the model significantly either ($\chi^2(1) = 0.893$, $p = .34$). Neither did adding LexTALE as an interaction ($\chi^2(3) = 1.085$, $p = .78$). In the optimal model (marginal R^2 squared = 0.029), there was neither a significant effect of Clause Type ($\beta = 0.498$, $SE = 0.489$, $t = 1.019$, $p = .30$) nor an effect of Type of Pronoun ($\beta = 0.660$, $SE = 0.472$, $t = 1.398$, $p = .16$).

7.4.1.3 *Reading and Reaction Times to the Content of the Relative Clauses*

We checked the reading and reaction times in the items which have the verification statements about the content of the relative clauses. Adding the interaction did not improve the model ($\chi^2(1) = 0.681$, $p = .40$). Neither did adding the LexTALE score as a covariate ($\chi^2(1) = 0.2595$, $p = .61$) nor adding interaction with the LexTALE score as an interaction ($\chi^2(3) = 0.4376$, $p = .93$). In the optimal model (marginal R^2 squared = 0.017), there was a significant effect of Clause Type ($\beta = 0.107$, $SE = 0.0482$, $t = 2.22$, $p = .02$): the time to read the subject relative clauses and to react to the statements about their content were shorter than those in the object relatives. Moreover, there was a significant effect of Type of Pronoun ($\beta = -0.120$, $SE = 0.0422$, $t = -2.844$, $p = .004$): the time to read the *who(m)*-clause relatives and to react to the statements about their content were shorter than those in the *that*-clause relatives.

Figure 7. 11 *Reading Reaction Time to the Statements about the Content of the Relative Clauses with Clause Type and Type of Pronoun Conditions in Part 2.*

7.4.1.4 Reading and Reaction Times to the Content of the Matrix Sentences

We checked and analysed the reading times in the items which have the verification statements about the content of the matrix sentences. Adding the interaction did not improve the model ($\chi^2(1) = 0.206, p = .64$). Neither did adding the LexTALE score as a covariate ($\chi^2(1) = 0.538, p = .463$) or adding interaction with the LexTALE score ($\chi^2(3) = 1.504, p = .68$). In the optimal model (marginal R^2 squared = 0.012), there was an effect of Type of Pronoun ($\beta = -0.129, SE = 0.040, t = -3.206, p = .001$): the time to read the matrix sentences in the *who(m)*-clause conditions and to react to the statements about their content was shorter than that in the *that*-clause conditions (Figure 7.12).

Figure 7. 12 *Reading and Reaction Times to the Statements about the Content of the Matrix Sentences with Clause Type and Type of Pronoun Conditions in Part 2.*

7.4.2 Discussion Part 2

The reading comprehension experiment Part 2 was designed as a follow up to Part 1, giving a chance to the participants who may have needed more information to answer the comprehension questions. In this part, the participants did not need to keep in mind the relative clause sentence because both the relative clause sentences and verification statements were presented on the same page. So, by removing the possible effect of memory, the Farsi speakers could reveal their relative clause comprehension by choosing the correct statement related to the content of the relative clauses or the matrix sentences. One of the main goals of the present experiment was to investigate whether the Farsi speakers would be able to comprehend relative clause sentences without a morphological cue which is the case in the *that*-clause conditions. The results show that the Farsi speakers can comprehend relative clauses either with or without a

morphological cue; they understand the relative clauses in the *that*-clauses equally well. Thus, given enough time, and without the need to keep the sentence in mind, the participants did understand the relative clauses without a morphological cue.

However, looking at the reading times in Part 2, we observe that reading times in items with subject relative clauses were shorter than those in items with object relative clauses, and the reading time in the *who(m)*-clause conditions were shorter than those in the *that*-clause conditions. There was an interaction of LexTALE scores and Type of Pronoun; the higher the LexTALE scores, the more the difference in accuracy in the *who(m)*-clause conditions and those in the *that*-clause conditions. In the subject relatives, the higher LexTALE scores induced more accurate answers in the statements about content of the subject relative clauses than in the object relatives.

In the statements about the content of the matrix sentences, there is no difference in the accuracy between statements about the subject relative clauses and those about the object relative clauses. The other interesting effect is that the reading times in the *who(m)*-clause conditions are shorter than those in the *that*-clause conditions. This finding is in line with the results of the eye-tracking experiment in Chapter 5, in which the total reading times in the *that*-clause conditions were longer than those in the *who(m)*-clause conditions. This finding is again in line with the interpretation that the Farsi-speaking English learners have much difficulty with the object relative clauses in *that*-clause conditions.

In sum, the Farsi-speaking learners of English can comprehend the relative clauses both in the *who(m)*-clause and the *that*-clause conditions, even though the scores were still higher in object relative clauses. However, morphological cues help them to understand the relative clauses in *who(m)*-clause conditions faster than those in *that*-clause conditions.

7.5 General Discussion

In this chapter, we reported an experiment with native speakers of Farsi on the reading comprehension of L2 English relative clauses with an on-line survey method. We investigated how well Farsi speakers understand English relative clauses with or without a morphological cue. We set out to answer the question of how the processing results in the eye-tracking experiment (as discussed in Chapter 5) translate into the reading comprehension of the relative clauses. Also, we explored the effect of English language proficiency of the participants on the comprehension of the English subject and object relative clauses.

The accuracy levels of the questions about the content of relative clause sentences are high in subject relative clauses with the relative pronoun '*who*'. This result is in line with the short reading times on the similar relative clauses in the eye-tracking experiment. However, there is no difference in the comprehension scores between subject and object relative clauses in the *that*-clause conditions, which is also in line with the results of the eye-tracking experiment as there is no processing difference between the subject and object relatives in *that*-clause conditions.

The main question was whether Farsi-speaking learners of English can comprehend the relative clauses in *that*-clause conditions. Given enough time to reflect on the sentences, the readers understood all types of relative clauses, but if they had to answer the statements based on their memory of the sentences, they still made many mistakes, especially in the *that*-clause conditions. In a paper-based study, using a sentence comprehension task in which the participants identified the subject and object of the relative clause sentences with the relative pronoun '*that*', Rahmany and Haghpour (2015) found that SS relative clauses are the most difficult types for comprehending and object-modifying relative clauses are comprehended easier than the subject modifying relatives. Contrary to Rahmany and Haghpour (2015), in the present experiment, in *that*-clause conditions, there is no significant difference in the accuracy of the answers to the statements about the content of the subject and the object relative

clauses. Moreover, regarding the matrix sentences, there is no significant difference in the subject and object scores in both *that*-clause and *who(m)*-clause conditions. By comparing the two conditions, we observe that the statements about the content of the matrix sentences in *who(m)*-clause conditions are scored more accurately than those in the *that*-clause conditions. However, as the relative clause sentences in Abdolmanafi and Rahmani's (2012) contained the relative pronouns of 'who' and 'whom', we compared the results of comprehension scores of the statements about the content of relative clauses in *who(m)*-clause conditions and we found the same results: SS relatives are easier to comprehend than SO relatives. The results are compatible with the interpretation that Farsi speakers apply Farsi cues; they rely heavily on the morphological cues, but they cannot shift properly to structural word order cues in L2 English.

McDonald (1987) showed that with increasing exposure/proficiency to L2, the ability to use L2 cues increases, and the performance of L2 learners becomes more similar to that of the native speakers. In Part 1 of the comprehension experiment, which is more similar to the eye-tracking experiment, there is a correlation between LexTALE scores and the scores of the verification statements about the content of the relative clause and matrix sentences across all conditions and relative clause types. A higher English proficiency helps the Farsi-speaking English learners to understand English relative clauses both with and without a morphological cue; proficiency apparently helps them switch from morphological cues to the structural cue in English relative clauses. Also, the significant interaction of the LexTALE scores and Clause Type reveals that highly proficient participants spend more time on reading the object relative clauses and reacting to the statements about their content, which indicates that these readers deal with the object relative clauses as the native speakers do.

In Part 2 of the comprehension experiment the participants did not need to keep the relative clause sentences in mind but could see them on the screen. In this experiment, the higher English language proficiency

induced more accurate answers in the subject relative clauses than in the object relatives. Additionally, the responses to the statements about the content of the relative clauses in the *who(m)*-clause are more accurate than those in the *that*-clause conditions, which indicates the extent to which benefit of the morphological cues depends on the L2 proficiency. However, there is no correlation or effect of language proficiency on the accuracy of the scores and reading/reaction times in the statements about the matrix sentences as in the paper-based experiments.

In sum, the Farsi-speaking L2 learners of English comprehend subject relative clauses more easily than object relative clauses in *who(m)*-clause conditions. Higher English language proficiency helps them to comprehend the relative clauses sentences more accurately and more quickly. Regarding the comprehension of relative clauses without a morphological cue, the Farsi-speaking L2 learners are not completely at a loss, but the average percentage of correct answers is quite low. Therefore, the morphological cues like the relative pronouns ‘*who*’ and ‘*whom*’ help them to understand and react to the comprehension questions fast. This can be explained in terms of a cross-linguistic effect of L1 transfer on L2 English in the comprehension of relative clauses. As in the eye-tracking experiment in Chapter 5, this reading comprehension experiment illustrates L1 transfer on L2. Moreover, the higher levels of English language proficiency show L2 learners’ switching from L1 morphological cue to L2 English structural cue application. We observe a negative transfer from L1 Farsi on L2 English relative clause comprehension as the Farsi-speaking learners of English cannot benefit from the word order cues properly and rapidly, which is due to the relative difficulty in comprehending the relative clauses in *that*-clause conditions. We may conclude that the reading comprehension of English relative clauses by L1 Farsi speakers converge with their on-line relative clause processing results.

Chapter 8

Chapter 8

General discussion, Pedagogical Recommendations, Conclusion

In this dissertation, we aimed to determine whether there is a cross-linguistic transfer from L1 to L2 English in the processing and comprehension of relative clauses by Farsi-speaking learners of English. In this final chapter, the research questions will be revisited briefly in Section 8.1. The main findings of this dissertation will be summarized: the interaction of structure, processing, and comprehension in Section 8.2, resumptive pronouns in Section 8.3, and animacy in Section 8.4. The findings will be related to the discussed processing theories in Section 8.5. Finally, pedagogical implications will be presented in Section 8.6 to end with a conclusion in Section 8.7.

8.1 Research Questions and Overall Findings

The first research question is about crucial differences between English and Farsi in terms of syntax, such as sentence word order, relative clauses, and markers that may influence Farsi speakers' English learning, processing, and comprehension. In Chapter 2, we learned that in Farsi relative clauses, an enclitic morpheme, an object marker and a resumptive pronoun are morphological cues that help a reader to distinguish between restrictive and non-restrictive relative clauses and between subject and object relative clauses. In contrast, in English relative clauses, word order and the relative pronouns '*who*' and '*whom*' are reliable cues for distinguishing subject and object relative clauses.

The second research question is about the frequency of relative clauses in the Farsi language and about the factors that influence the frequency of those relative clauses. In Chapter 3, we learned that in the Farsi corpus, the majority of the relative clauses are restrictive relative clauses. Subject-extracted relative clauses are more frequent than object-extracted relative clauses and oblique-extracted relative clauses are more frequent than genitive relative clauses. This is consistent with the Noun Phrase Accessibility Hierarchy of Keenan and Comrie (1977). Regarding the correlation of relative clause type and the animacy of the antecedent (NP1) and the embedded noun phrase (NP2), we obtained almost the same results as found in Dutch and German by Mak et al. (2002). Object relative clauses never occur in the animate NP1-inanimate NP2 condition and subject relative clauses occur most often in the animate NP1-inanimate NP2 condition in restrictive and non-restrictive relative clauses. Since resumption is a noticeable difference between English and Farsi, we looked at the distribution of resumptive pronouns in different relative clauses. There is an inverse relationship between the use of resumptive pronouns and place of the relative clause type in the hierarchy of relative clauses.

The third research question is whether there is any processing asymmetry in processing Farsi object and subject relative clauses by L1 Farsi speakers. The results in Chapter 4 showed that processing Farsi

object relative clauses is more complicated than processing subject relative clauses, which is similar to the effect found in many other languages.

The fourth research question is whether the frequency distribution of Farsi restrictive and non-restrictive object and subject relative clauses is reflected in their processing by L1 Farsi speakers. Farsi speakers processed restrictive relative clauses differently from non-restrictive relative clauses: The processing delay in the object relative clauses was more distinctive in non-restrictive relative clauses than in restrictive relative clauses. The challenge in processing object Farsi relative clauses is in line with their frequency distribution in the Farsi corpus (Chapter 3); non-restrictive object relative clauses are less frequent than their restrictive equivalents.

The fifth research question is how Farsi-speakers process English subject and object relative clauses in *that*-clause and *who(m)*-clause conditions and whether there is a cross-linguistic effect of L1 Farsi on the L2 English relative clause processing. The results in Chapter 5 revealed that processing difficulty in the object relative clauses appeared only for the *who(m)*-clause conditions. In the *that*-clause conditions, reading times in the object relative clauses were similar to those in the subject relative clauses. This might indicate that *that*-clauses were easy. However, there were long reading times on the matrix verb and post-matrix verb regions only in *that*-clause conditions indicating that these relative clauses were actually difficult to process. Thus, the absence of a difference between subject and object relative clauses in the *that*-conditions may have a different explanation. We will return to that in Paragraph 8.2.

Unexpectedly, the noun phrases were read more slowly in the subject relative clauses than in the object relative clauses. The reason for this effect might be that the canonical word order in an English subject relative clause is different from its Farsi equivalent, but the word order in an English object relative clause is similar to its Farsi equivalent. Farsi speakers transfer their L1 to L2 English while processing relative clauses. We assume that because they have not acquired the ability to process the structural cues in English effectively properly, they are not able to rely on

the word order in processing L2 relative clauses without a morphological cue like a relative pronoun. This difficulty with the English word order may lead the participants to process object relative clauses as subject relative clauses (see Paragraph 8.2).

The sixth research question is how Dutch participants process English subject and object relative clauses in *that*-clause and *who(m)*-clause conditions and whether Dutch and Farsi-speakers process English relative clauses similarly. In Chapter 6, the results show that unlike the Farsi speakers, the Dutch participants have a clear subject relative clause preference in both *that*-clause and *who(m)*-clause conditions. There are also similarities in the processing of L2 English relative clauses by Dutch and Farsi speakers such as the embedded noun phrase effect in subject relative clauses and the effect on matrix verb and post-matrix verb regions in *that*-clause conditions. We conclude that like Farsi speakers there is an L1 influence on L2 relative clause processing by Dutch, but unlike Farsi speakers, Dutch speakers are better at using structural word order cues as they are more experienced in English.

The seventh research question is how Farsi speakers comprehend English subject and object relative clauses in *that*-clause and *who(m)*-clause conditions and whether their English language proficiency influences their comprehension of the subject and object relative clauses in *that*-clause and *who(m)*-clause conditions. In Chapter 7, we learned that the Farsi-speaking learners of English comprehend subject relative clauses more easily than object relative clauses in *who(m)*-clause conditions. Regarding the comprehension of relative clauses without a morphological cue, the Farsi-speaking L2 learners are not completely at a loss, but the average percentage of correct answers is quite low, which can be explained in terms of a cross-linguistic effect of the L1 transfer on L2 English. The higher the level of English language proficiency, the better the comprehension of the relative clauses. This can be interpreted along the lines of McDonald (1987): L2 learners' switch from using the L1 morphological cue to using the L2 English structural cue.

8.2 Interaction of Structure, Processing, and Comprehension

In Chapter 2, we described the crucial differences between English and Farsi in terms of syntax, such as sentence word order, relative clauses, and markers that may influence Farsi speakers' English learning. In English, the canonical word order in a subject relative clause is SVO (see 1) but an object relative clause has an OSV word order. By changing the place of an embedded noun phrase and verb, a subject relative clause (NP V NP) changes into an object relative (NP NP V). Therefore, the presence of an NP after the relative pronoun is the cue that the sentence is an object relative clause.

1)
(subject modifying and subject extracted RC)

(Object modifying and Object extracted RC)

In the English subject relative clauses (SS), the word orders in both the relative clause '*who likes the girl*' and the matrix clause '*The boy admires the artist*' are canonical, but in the object relative clause (SO), the word order in the relative clause '*whom the girl likes*' is non-canonical (OSV).

The diagrams for the Farsi subject and object relative clauses are given in (2). In the sentence with a subject relative clause, both the matrix sentence ‘*The boy the artist ra admires*’ and the relative clause preposition ‘*ke the girl ra likes*’ have canonical word order (SOV). Note, that the relative clause lacks a subject, but that is regular for Farsi since it is a prodrop language. Even in a matrix sentence, the proposition ‘*the artist ra admires*’ is a complete sentence because it follows the normal rules of the language. The Farsi object relative clause ‘*ke the girl likes*’, lacks an object. Note, that this does not result in a regular sentence: It is not possible to leave out the object, even when it is the topic of a sentence. The object cannot be overlooked in a normal Farsi sentence with a transitive verb. Therefore, the fact that a resumptive pronoun can be omitted in an object relative clause indicates that the relative clause has a special status. The status is that the reader can easily derive the object from the context and that is easier if the reader already knows that the antecedent is the topic of the clause.

2)
 (Subject modifying and subject extracted RC)

The boy_i ke the girl ra likes the artist ra admires.

(Object modifying and Object extracted RC)

The boy_i ke the girl likes the artist ra admires.

Whereas the word order was the main cue to distinguish between subject and object relative clauses in English, in Farsi the main cue in differentiating a subject and an object relative clause is the object marker after the embedded noun phrase. In both cases the constituent after the complementizer is an NP, which is unmarked in the object relative clauses and marked (as the object) in the subject relative clauses (see 2). So, basically, there is no canonical or non-canonical word order in the Farsi subject and object relative clauses since in both cases the word order is NP V.

Note that in terms of the hierarchy of distribution frequency of SS and SO relative clauses, there is no difference between Farsi and many other languages like English and Dutch. That may explain why in Chapter 4, we found a processing asymmetry; subject relative clauses are more frequent than object relative clauses and they are preferred in processing. In Dutch, word order and morphology are not reliable cues to distinguish between subject and object relative clause as illustrated in (3). In the Dutch translation of the example sentences, the subject and object relative clause are completely the same.

3)

(Subject modifying and subject extracted RC)

The boy_i die_i the girl likes admires the artist.

(Object modifying and Object extracted RC)

The boy_i die_i the girl likes admires the artist.

Since the antecedent and the embedded noun phrases have the same number, the relative clauses cannot be disambiguated as a subject or object relative clause. Thus, speakers of Dutch have to use a different cue to determine whether the sentence is a subject or object relative clause.

When Farsi speakers encounter an English relative clause with *'that'*, they do not know whether the antecedent is the subject or the object. In fact, the antecedent might be the subject of the relative clause because there is no cue at all to determine which analysis they should make. In the object relative clauses, the readers have to make some effort to create the object.

In reading English relative clauses, the Farsi speakers may apply the Farsi rule: Encountering a noun phrase, they have to derive a subject or object. Since there is no marker, they have to rely on another cue, which may lead the readers to derive a subject in the object relative clause like *'the boy that the girl likes'* as is the case in Dutch in example (3). The Farsi speakers may apply the same rule as the Dutch apply in globally ambiguous relative clauses in these English relative clauses, which would lead to misinterpretation of an object relative clause as a subject relative clause.

Moreover, we see that restriction has an important role in this processing asymmetry. Restrictive relative clauses provide necessary information for defining an antecedent; however, in non-restrictive relative clauses, the relative clause adds extra information about the antecedent to the sentence. In Farsi, there is a formal distinction between restrictive and non-restrictive relative clauses (Comrie, 1983); the antecedent carries an obligatory pronominal enclitic morpheme */-i/*, which links the noun to the following relative clause to make them distinctive from their non-restrictive counterparts (see 4).

4)

(Restrictive object relative clause)

The boy-i ke the girl likes the artist ra admires.

(Non-restrictive object relative clause)

The boy ke the girl likes the artist ra admires.

In Farsi, the object relative clauses may involve a resumptive pronoun (a pronoun inside the relative clause that refers to the antecedent) as in (5). In Chapter 3, we learned that resumptive pronouns are infrequent in restrictive object relative clauses, but frequent in non-restrictive object relative clauses. The corpus analysis showed that in general, the distribution of Farsi relative clauses is very similar to that of other languages like English, Dutch, and German, but there is a clear distribution of resumptive pronouns depending on the restrictiveness. This will be discussed in Paragraph 8.3.

5)

The boy_i ke the girl he_i ra likes the artist ra admires.

In the eye-tracking and reading comprehension experiments, we learned that in terms of relative clause processing and comprehension, there is no difference between Farsi and English. Additionally, in terms of frequency, there is no difference between Farsi and other languages. The English object relative clauses are difficult for Farsi speakers if they can manage to read an object relative clause as an object relative clause. As we learned in Chapter 5 and Chapter 7, Farsi speakers have more difficulty in the object relative clauses just like every native speaker in English, but due to the structural differences, which are illustrated in (1), they misinterpret the object relative clauses and the subject relative clauses with the relative pronoun '*that*', which leads to a lot of errors in reading comprehension and long reading times. This difficulty is revealed as a lack of difference between the subject and object relative clauses in the reading experiment. In short, in the Farsi relative clauses, an enclitic morpheme, an object marker and a resumptive pronoun are morphological cues which help a reader to distinguish restrictive/ non-restrictive and subject/ object relative clauses. Nonetheless, in English relative clauses, the word order and the relative pronouns '*who*' and '*whom*' are reliable cues for distinguishing subject and object relative clauses.

8.3 Resumptive Pronouns

8.3.1 Distribution of Resumptive Elements

In Farsi, resumption comes as a pronoun or a pronominal enclitic form. Out of 738 relative clauses, 643 (87.1%) of relative clauses include a gap and resumption is shown with resumptive pronouns (11.1%) or pronominal enclitics (1.8%). There is no resumptive pronoun in subject relative clauses, but all genitive relative clauses and most of the oblique relative clauses take a resumptive pronoun (6). Although the object relative clauses have a resumptive pronoun and a pronominal enclitic, they mainly occur with a gap.

6)

سه کشور در مورد مسائلی که با آن روبرو هستند گفتگو و رایزنی میکنند.
se keşvar darmored-e masāel-i ke bā ān
three country about-EZ issue.PL-RES COMP with that
ruberu hastand goftogu ve rāyzani mikonanad.
face be-PRS.3PL discussion and consultation do-PRS.3PL.
'The three countries are discussing and consulting on the issues that they
face.' (Lit. 'The three countries are discussing and consulting on the
issues that they face **with it**').

The distribution of resumptive pronouns across languages follows the NPAH of Keenan and Comrie (1977). They predict that going down the accessibility hierarchy, languages will tend to use pronoun retaining relative clause forming strategies. As resumption exists in a position, in the rest of the lower positions, pronoun retaining should be present. Keenan and Comrie state that 'this a natural consequence hypothesis that application of resumptive pronouns is in proportion to the difficulty of the position being relativized, though the critical point of difficulty is different for different languages' (p.92). They demonstrate this for several languages, including Farsi, that apply resumptive pronouns. In our corpus, the frequency of resumptive pronouns increases as we go down the hierarchy of relative clauses in the Farsi corpus. Therefore, we can say that the usage of resumptive pronouns increases as the frequency of a relative clause decreases in the Farsi corpus. There is a gap in all subject relative clauses, but it does not occur in the genitive.

Just like Taghvaipour (2005), Keenan and Comrie (1977) conclude that resumption in object relative clauses is optional in Farsi. However, they only studied restrictive relative clauses. In our corpus, resumptive pronouns occur rarely in restrictive object relative clauses (5 out of 105 cases), but they are much more frequent in non-restrictive object relative clauses (5 out of 8 cases).

According to Ariel (2014), when the application of a gap or resumptive pronoun is optional in the object relative clause position, the

distance between the antecedent and the relativized position determines whether a resumptive pronoun is used. In long distances, a resumptive pronoun is preferred, but in short ones, a gap is obligatory. Ariel (2014) indicates that ‘Resumptive pronouns support the idea that linkage is a crucial factor in the distribution of anaphoric expressions’ (p.161). The tendency of speakers to use a resumptive pronoun in a condition when there is a long distance between the antecedent and the relativized position and when the relative clause is non-restrictive type indicates that a pronoun is preferred when the clauses are less tightly related (Ariel, 2014). Also, Ariel states that the antecedent in a non-restrictive relative clause is an independent referring expression, but in a restrictive relative clause, it is uninterpretable without a relative clause, so it is linked to the relative clause. This may be the reason why resumptive pronouns are used more frequently in non-restrictive relative clauses. In our corpus, there is a close link between the antecedent and relative clause in the restrictive object cases as in (7), so this is why a resumptive pronoun is not needed. On the other hand, it is also true that when there is a resumptive pronoun, there are some cases where the sentences are long.

7)

شرکت تویوتا به خاطر خدماتی که به ایران داده از آمریکا عذرخواهی کرده است.

şerkate toyota bexātere xadamāt-i ke be iran
company-EZ Toyota for-EZ service.PL-RES COMP to Iran
dāde az amrikā ozrxāhi karde ast.

give-PTCP from America apology do-PTCP be-PRS.3SG.

‘Toyota company has apologized to the United States for the services that it gave to Iran.’ (Lit. ‘Toyota company because of [**services ke to Iran gave**] from the US apologized.’)

In the majority of object relative clauses with a resumptive pronoun, the antecedent is a compound noun (8) or the embedded verb phrase is a compound verb. Moreover, there is a long distance between the

antecedent and the relativized position in one case, and in another two cases, the relative clause is of the extraposed type. In the object relative clauses, a resumptive pronoun and an object marker are placed right before the embedded verb. The relative clause type in example (9) is non-restrictive extraposed; the matrix verb occurs between the antecedent and the complementizer /*ke*/ and the resumptive pronoun with an object marker is placed between the auxiliary verb and the compound verb in the relative clause sentence (8). It seems that to provide a tight link between the antecedent and the relative clause a resumptive pronoun is preferred in the cases that the antecedent is composed of many words and in the cases that there is no relative clause marker in the antecedent. Therefore, it seems that lack of a restrictive marker in the antecedent of non-restrictive relative clauses, which makes a loose link with the relative clause and makes the relative clause independent, is compensated with a resumptive pronoun in the object relative clauses.

8)

حذف کامل گزینه‌ها از بازخوانی موضوع که بسیاری از متخصصان آن را
توصیه می‌کنند ...

hazf-e kām-e gozinehā az
removal-EZ complete-EZ option-PL from
bāzxāniy-e mozu ke besiyāri az motaxasesān
re-reading-INF-EZ subject COMP many from expert-Pl
ān rā tosiye mikonand...
that OM recommendation do-PRS.3PL...

‘Complete removal of the options from re-reading the topic, which many experts recommend...’ (Lit. Complete removal of the options from re-reading the topic **ke** many experts **it ra** recommend...)

9)

ما پارلمان داریم که طبق قانون اساسی هیچ قدرتی نمی‌تواند آن را منحل کند.

mā pārlemān dārim ke tebq-e qānun-e asāsi
 we parliament have-PRS.3PL COMP based-EZ regulation-EZ essential
 hiç qodrati nemitavānad ān rā
 none power-INDF can-PRS-NEG.3SG that OM
 monhal konad.
 dissolved do-SBJV-PRS.

‘We have a parliament, which no power can dissolve according to the constitution.’ (Lit. We parliament have **ke** based on the constitution no power can **it ra** dissolve.)

8.3.2 The role of Resumptive Pronouns in Acquisition

If the use of resumptive pronouns is related to the difficulty of the sentence, one might expect that children use resumptive pronouns more than adults. Rahmany et al. (2014), extracted 100 relative clauses from the Family Farsi corpus (Family et al., 2009 as cited in Rahmany et al., 2014) from the speech of Minu (age 4;9–5;2) and 100 relative clauses from his caregiver. They state that gapped relative clauses were frequent. Minu more frequently produced subject relative clauses (47%) than object relative clauses (33%). In the input (from caregivers) the distribution of subject (38%), and object (42%) relative clauses was more even. Interestingly, there was no resumptive pronoun in any of the object relative clauses and only very few of the object relative clauses contained pronominal clitics (Minu = 4% and caregivers = 3%). In the cases where there was a clitic, the distance between the antecedent and the gap was long.

Other studies did find effects of resumptive pronouns on the comprehension of object relative clauses. By administering a referent selection task, Rahmany et al. (2014) tested the comprehension by Farsi-speaking children of gapped subject relative clauses, gapped object relative clauses, object relative clauses with a resumptive pronoun, and object relative clauses with a pronominal clitic. They aimed to investigate whether resumption helps the comprehension of object relative clauses and whether there is a difference in comprehension between gapped subject

and object relative clauses. Since both noun phrases come before the embedded verb, they hypothesised that processing subject and object relative clauses will not show any asymmetry because gapped object and subject relative clauses have the same NP NP VP word order. Moreover, they claimed that since a resumptive pronoun is optional in the Farsi object relative clauses, they are probably used when the sentence will otherwise be difficult to comprehend. Rahmany et al. (2014) stated that in gapped subject and object relative clauses, thematic role assignment is delayed until the children find the presence or absence of an object marker after the embedded noun phrase. A resumptive pronoun with an object marker or a resumptive clitic added to a verb in the object relative clause can solve this problem. The resumptive pronoun and clitic provide an overt cue in the object relative clauses. The results did not suggest any subject/object asymmetry in comprehension, but resumption did help children's comprehension. Although resumptive pronouns and clitics have a facilitative effect on relative clause comprehension, they are not frequent in their corpus. Regarding the asymmetry in gapped subject/object relative clause comprehension, they are not certain whether their result is based on the structural properties of the Farsi language or because of the fact that they presented the experimental sentences within a supportive discourse, as in example (10), which probably helped the object relative clause comprehension.

10)

Narrated background scene:

'The dog kisses this horse. The dog pushes the other horse.'

Test sentence:

'Can you give me the horse that the dog kissed?'

In their previous work, Rahmany et al. (2011) reported a subject relative clause preference in their experiment without a supportive context. Other studies (e.g., Mak et al., 2008; Roland et al., 2012) also showed that

when a facilitative context is provided in which the NP in the relative clause refers to a discourse topic, the difference in processing between subject and object relative clauses disappears.

It is well known that beginning L1 Farsi learners of L2 English sometimes erroneously use resumptive pronouns in English relative clauses. As explained in Chapter 1, Rezaeian et al. (2015) studied to what extent Farsi-speaking learners of English reject resumptive pronouns. They applied a grammaticality judgement task and a production (translation) task. They found that Farsi-speaking L2 learners with lower English proficiency levels accepted resumptive pronouns less in oblique than in object relative clauses. This was not in line with the presence of resumptive pronouns in Farsi, which are very frequent in oblique relative clauses, but infrequent in object relative clauses. The reason might be that in English, oblique relative clauses are often marked by a preposition attached to the relative pronoun or inserted at the end of the sentence. In Farsi, a preposition never attaches to the complementizer */ke/*.

Advanced learners were not as competent as native speakers but better than students at beginner levels as they did not accept a pronoun in the subject relative clauses, but they did not reject a resumptive pronoun in the object and oblique relative clauses. In the translation task, their participants with an elementary or intermediate level of English did not translate relative clauses accurately. They used resumptive pronouns in subject relative clauses, although this is not allowed in Farsi. Although the advanced participants translated the subject relative clauses accurately, in the object and oblique relative clauses, their translations were less accurate as they used resumptive pronouns in translating Farsi to English sentences. The findings of Rezaeian et al. were in line with the Interpretability Hypothesis: The Farsi speakers try to acquire L2 by transferring L1. As applying a resumptive pronoun may decrease the memory load, they generalise it in all three relative clause types.

8.3.3 Suggestions for Further Research

These observations lead to interesting questions for further research. Referring to Taghvaipour (2005) in the Farsi relative clause studies, all scholars state that resumptive pronouns are optional in object relative clauses, but as illustrated in the corpus, they are almost absent in restrictive relative clauses, but in non-restrictive relative clauses, they are frequent. It is very interesting to consider a more extensive corpus of non-restrictive object relative clauses and see when resumptive pronouns are used and when they are not. In the following non-restrictive object relative clause, the antecedent is a very long compound noun (11).

11)

حذف کامل گزینه‌ها از بازخوانی موضوع که بسیاری از متخصصان آن را
توصیه می‌کنند ...

hazf-e kâmel-e gozinehâ az
removal-EZ complete-EZ option-PL from
bâzxâniy-e mozu ke besiyâri az motaxasesân
re-reading-INF-EZ subject COMP many from expert-Pl
ân râ tosiye mikonand...
that OM recommendation do-PRS.3PL...

‘Complete removal of options from the subject re-reading, which many experts recommend.’ (Lit. Complete removal of options from the subject re-reading, which many experts **it-ra** recommend,)

In the following restrictive object relative clause (12), the antecedent is only one word and the distance between the antecedent and the relativized position is very short, accordingly, there is no resumptive pronoun in this relative clause.

12)

مادر ارتباط با سیاستی که ترکیه در منطقه دارد اظهار نظر نمی‌کنیم.

mā dar ertebāt bā siyāsāt-i ke torkiyye dar
 we in relation to policy-RES COMP Turkey in
 mantaqe dārad ezhārnazar nemikonim.
 region have.1SG comment do-PRS-NEG.3SG.
 ‘We do not comment on the policy that Turkey has in the region’.

It would be useful to look at the antecedent type and the distance between the antecedent and the relativized position in the relative clause. The type of the embedded verb phrase may be investigated as well since, in our corpus, they were often in the compound forms.

In addition to a corpus study, relative clause production research might be fruitful; the application of a sentence combining task might be used to explore in which type of Farsi relative clauses the Farsi speakers apply a resumptive pronoun.

To find out what the effect is of relative clause type and restrictiveness on the well-formedness of Farsi relative clauses with or without resumptive pronouns, one can conduct an experiment with an acceptability judgement task. In this task, the L1 Farsi speakers are asked to listen to the stimuli sentences, then rate their acceptability. Afterwards, one can conduct the same experiment in English to elicit any trace of L1 transfer on L2 English. The example sentences can be as in (13). The 8 conditions with *that*-clause and *who(m)*-clause conditions provide the participants with subject and object relative clause with or without a morphological cue. Relative clauses with or without a resumptive pronoun will be compared in this task. It is expected that beginners will find resumption in the subject relative clauses as in (b) and (d) acceptable. But with increasing proficiency, the acceptance of resumption will descend in the hierarchy. Moreover, it is speculated that the resumptive pronouns will be more accepted in *that*-cases than in *who(m)* cases. Since they do not see *that* as a relative pronoun, it makes more sense to add a pronoun to the sentence.

13)

- a. The man that followed the woman is very tall
- b. The man that **he** followed the woman is very tall.
- c. The man, who followed the woman, is very tall
- d. The man, who **he** followed the woman, is very tall.
- e. The man that the woman followed **him** is very tall.
- f. The man that the woman followed is very tall.
- g. The man, whom the woman followed **him**, is very tall.
- f. The man, whom the woman followed, is very tall.

8.4 Animacy

In line with previous corpus research, animacy is an essential factor in our corpus study or the use of relative clauses. The influence of animacy has also been found in studies on the processing of relative clauses. Focussing on relative clauses with full NPs, we obtained almost the same results as found in Dutch and German by Mak et al. (2002). Object relative clauses rarely occur in the animate NP1-animate NP2 condition (the type of relative clause predominantly used in research on relative clause processing), and they never occur in the animate NP1-inanimate NP2 condition. They predominantly occur in the inanimate NP1-animate NP2 condition. An example is given in (14).

14)

پیروزی‌هایی که ارتش عربی سوریه و نیروهای هم‌پیمان در عرصه نبرد
به دست آورده اند.

piruzihā-i ke arteş-e arabiy-e suriyye va niruhāye
victory.PL-RES COMP army-EZ Arabic-EZ Syria and force.PL-EZ
hampeyman dar arsey-e nabard be dast āvordeand.
ally.PL on field-EZ battle to hand bring-PTCP-PRS.3PL.

'The victories that the Syrian Arab Army and allied forces achieved on the battlefield.

Subject-extracted relative clauses occur most often in the animate NP1-inanimate NP2 condition (15), but they are also frequent in the inanimateNP1-inanimateNP2 condition. We found the same trend in the effect of animacy of antecedents and embedded noun phrases in non-restrictive relative clauses.

15)

دانشجویایی که در فضاي آزاد بعد از انقلاب تمام تحلیل ها را می شنوند، متوجه اند.
dāneşjuhā-i ke dar fazāy-e āzād-e bad az
student.3PL-RES COMP in situation-EZ free-EZ after from
engelāb tamām-e tahlilāh rā mişenavand
revolution all analysis.PL OM hear-PRS.3PL
motavajeh-and.
notice-PTCP be-PRS.3PL.

Our corpus study shows that relative clauses come in an enormous number of different types. However, most relative clause processing studies have been done on a minimal subset of all the relative clauses that we encountered in the corpus. As mentioned before, the majority of relative clause processing studies are built upon stimuli with an animate NP1-animate NP2 condition. This subsection of relative clauses is just a small proportion of relative clauses in our corpus (1.6%). The results of the corpus study (Chapter 3) indicate the importance of taking into account the frequency of relative clauses and animacy of antecedents and embedded noun phrases in relative clause processing and comprehension studies. According to Frequency-based models, experience has an important role in explaining the complexity that influences sentence processing. Generally, it is believed that people understand easily the structures that they encounter frequently. Building object relative clauses with

animateNP1-animateNP2 conditions certainly makes the processing very difficult because this condition is very rare in the corpus. Somehow there is something with this type of relative clauses why they are not used in the normal language. What does that mean for processing?

Previous online experiments in different languages such as Spanish, Dutch, and English (Betancort et al., 2009; Mak et al., 2002; Traxler et al., 2002) revealed that by manipulating the animacy of object relative clauses as an inanimate antecedent and an animate embedded noun phrase, the difficulty in the processing of object relative clauses is modulated.

Thus, in line with the majority of studies on relative clause processing, we presented the participants the sentences that are somehow not natural: They do not have experience with this type of sentence. In particular, cues besides word order, such as a difference in animacy between the subject and the object of the relative clause, were not available. In Chapter 5 and Chapter 7, we discovered that Farsi-speaking learners of English have a problem in comprehending and processing relative clauses that have only the word order cue, as in the *that*-clause conditions. In order to get a full picture of how Farsi speakers process relative clauses in general, it might be a good idea to manipulate animacy, since this is a cue that is frequently available in the relative clauses in the corpus. Providing the readers with the animacy cue as in (16) and (17) which is frequent in their L1 like the other languages may reduce the processing difficulty.

16)

The man that wrote the book ... (SR)

Animate Inanimate

17)

The book that the man wrote ... (OR)

Inanimate Animate

Considering that these animacy conditions in the subject and object relative clauses are the same in English and Farsi, animacy would be a reliable and helpful cue for the Farsi speakers in the processing of English and Farsi relative clauses. If there is a doubt about what is the subject and object, animacy may help the readers to determine the idea that the animate noun is the subject and the inanimate is the object. According to the Competition Model (Bates & MacWhinney, 1982, 1989), L2 learners interpret the meaning of a sentence by comparing some linguistic cues through the competition of underlying cognitive mechanisms inside a productive linguistic environment. They take into account various linguistic cues in the sentence context, such as word order, morphology, and semantic characteristics like animacy to compute a probabilistic value for each interpretation, eventually choosing the interpretation with the highest likelihood. The question is whether animacy will outweigh the word order cue in the relative clauses in *that*-clause conditions. Since the most frequent animacy condition in the subject and object relative clauses in the Farsi-speaking L2 learners' L1 is the same as in English, it is speculated that in the competition of the word order and animacy cues, animacy will win and help the readers in the processing of the relative clauses.

Therefore, building experiments on the processing and comprehension of Farsi and English relative clauses by taking into account the frequent animacy conditions by providing an extra cue may help the readers to overcome the tendency to interpret the object relative clauses as subject relative clauses, which was found in sentences with an animate NP1 and animate NP2.

We found that the distribution of animacy in the Farsi relative clauses is similar to what has been found for other languages. The question of whether the animacy cue will have the same effect as in other languages is interesting because of how animacy is reflected in Farsi. As explained in chapters 2 and 3, inanimate plural nouns come with a singular verb. Here the cut-off point between animate and inanimate is between living things

on the one hand (human beings, animals, plants) and non-living and abstract entities on the other hand.

17)

این زنان زیبا هستند.

in zanān zibā hastand.

in woman.PL pretty be.3PL

‘These women are pretty.’

18)

گاوها در این روستا بسیار بزرگ هستند.

gāvhā dar in rustā besyār bozorg hastand

cow.PL in this village very huge be-3PL.

‘The cows in this village are huge.’

19)

درختان خیابان بسیار بلند هستند.

deraxtān-e xiyābān besyār boland hastand.

tree.PL-EZ street very tall be-PRS.3PL.

‘The trees in the street are very tall.’

20)

این دفترها مال من نیست.

in daftarhā māl-e man nist

this notebook.PL property-EZ I be-PRS-NEG.3SG.

‘These notebooks are not mine.’ (Lit. This **note books** is not mine.)

However, in terms of pronouns, the cut-off point is like in English: humans on the one hand versus animals, plants and non-living things on the other hand. In the Farsi language, two interrogative pronouns occur in both subject and object positions as the following examples.

21)

چه کسی/ کی پنجره را باز کرد؟

çekasi/ ki panjare rā bāz kard?

who/ who window OM open do-PST.3SG?

‘Who opened the window?’

22)

حمید با چه کسی/ کی رفت؟

Hamid bā **çekasi/** ki raft?

Hamid with who/ who go-PST.3SG?

‘Whom did Hamid go with?’

23)

چه چیزی/ چی آنجا پرواز میکند؟

çeçizi/ çi ānja parvāz mikonad?

what / what there fly do-PRS.3SG?

‘What is flying there?’

24)

چه چیزی/ چی خوردی؟

çeçizi/ çi xordi?

what/ what eat-PST.2.SG?

‘What did you eat?’

When the subject or object of a sentence is of concern, the interrogative pronoun *چه کسی/ کی* (*who/whom*) is used for human beings, but *چه چیزی/ چی* (*what*) is applied for animals, objects, non-living entities and abstract nouns. The personal pronoun for the third person singular for both men and women is /U/ او. The personal pronoun for an animal and a non-living entity is /ān/ آن, which is a demonstrative adjective as well.

Given the distinction between subject-verb agreement on the one hand and pronouns, on the other hand, it is interesting to look at the cases where it is actually important. In our corpus, there are ($n=106$) inanimate plural antecedents which go with a singular verb ending.

25)

دیدگاه‌های مختلفی که ممکن است در برخی از زمینه‌ها وجود داشته باشد.

didgāhhāy-e moxtalef-i ke momken ast dar

perspective.PL-EZ different COMP possible be-PRS.3SG in

barxi az zaminehā vojūd dāšte bāšad.

some from area.PL existence have-PTCP be-SBJV.

‘Different **perspectives** that maybe exist in some areas’ (**verb ending in Exist is singular**).

In addition to subject-verb disagreement in number in plural inanimate antecedents, we found disagreement in number between inanimate plural antecedents and resumptive pronouns in the ($n=19$) relative clauses; object, oblique and genitive relative clauses with a plural inanimate antecedent occur with a singular resumptive pronoun.

26)

چالش‌هایی که جنبش‌های تحریم اسرائیل در منطقه خلیج فارس با آن مواجه هستند.

çāleṣhā-i ke jonbeṣhāy-e tahrim-e esrāil dar

challeng.PL-RES COMP movement.PL-EZ sanction-EZ Israel in

mantagey-e xalij-e fārs bā ān movājeh hastand.

region-EZ gulf-EZ fars with that face be-PRS.3PL.

‘Challenges which the movements of Israel sanctions are faced in the Persian Gulf region.’ (Lit. ‘**Challenges** which the movements of Israel sanctions in the Persian Gulf region **with it** are faced.’)

If animacy in the relative clauses both in terms of subject-verb agreement and resumptive pronouns shows a different pattern from other languages, maybe it also affects Farsi speakers differently. However, if on the other hand, it is not grammatical animacy but semantic animacy that plays a role, Farsi speakers should treat the animacy cue in the same way as English speakers do.

In sum, in interrogative pronoun aspect, the animacy system is similar as in English, but in the subject-verb agreement in number, it is different. The issue could be the subject of another study of how the grammaticality of animacy influences processing L1 and L2 sentences. We could investigate to what extent the Farsi-speaking learners of English have acquired the application of animacy cue in their L1 and to what extent they transfer this animacy cue to the L2 English sentences, by administering a grammaticality judgement task including relative clause sentences with singular/plural and animate/inanimate antecedents and resumptive pronouns and singular/plural verb endings. It is expected that the beginning learners of English will use a singular verb ending with the inanimate plural subjects by adding the /s/ to the verbs like simple past verbs in the passive as in (27).

27)

These buildings was built five years ago.

However, with proficient English learners, it is actually possible that they will transfer L2 on L1. They may make errors like the one in (28), in which the English animacy rule is applied in Farsi.

28)

These buildings were built five years ago.

این ساختمان ها پنج سال پیش ساخته شده اند.

in sâxtemānhā panj sal-e piş sâxte
this building five year-EZ.PL ago build-PTCP
şodeand.
become-SBJV-PST.3PL.

8.5 Processing Theories

In this section, we will review briefly the theories that are applicable for interpreting the results of processing Farsi and English relative clauses and the theory that is relevant to the frequency distribution of Farsi relative clauses.

8.5.1 Competition Model

The first theory we discussed in the introduction is the Competition Model (Bates & MacWhinney, 1989). This theory indicates that during comprehension, surface forms like cues compete to help the reader interpret the sentences. The strength of any relevant cue determines the outcome of cue competition during comprehension. For instance, in English, the preverbal position of a noun makes it likely that it has the role of agent or perspective. Another example might be the pronoun ‘*her*’ which indicates the role of an object of the verb and feminine gender. However, if the word ‘*her*’ occurs before a noun, it will be a possessive pronoun. According to the Unified Competition Model (MacWhinney, 2005), for learning multiple languages, individuals need to learn cues that are important to each of the languages that they learn.

At the beginning stages of learning a second language, the language cues that are essential in the first language will be used by L2 learners. If the cues in L1 and L2 are similar, positive transfer, which facilitates processing of L2, will occur. In contrast, if L1 and L2 are very different like English and Farsi, the cues that L1 Farsi speakers transfer from Farsi to English may not be appropriate to their L2, and hence hinder processing. The cues that a bilingual person uses to process sentences depends on a range of factors, such as the age of acquisition, proficiency in L1 and L2 and language dominance. It is important to mention that more

experience with the L2 decreases the level of language transfer (MacWhinney, 2005).

In English, the word order cue is required for differentiating subject relative clauses from object relative clauses, but in Farsi relative clauses, the word order in both types is similar, NP NP V. Instead, a morphological cue, the object marker /*rā*/, disambiguates between subject and object relative clauses. In Chapter 5, we learned that Farsi-speaking English learners, do not show a processing difference between English subject and object in *that*-clause conditions, presumably because there is no morphological cue in these conditions. This effect indicates that they have difficulty applying the structural word order cue in English relative clauses. In contrast, the *who(m)*-clause conditions do provide a morphological cue of ‘*who*’ and ‘*whom*’ for recognizing the subject and object relative clauses, which makes those sentences easier to comprehend for Farsi readers as long as they focus on morphological cues.

Comparing Farsi speakers with Dutch, we learned that although Dutch and Farsi have the same NP NP V word order, L1 Dutch speakers can overcome L1 transfer in L2 processing English relative clause without a morphological cue in *that*-clause conditions. The reason may be that the L1 Dutch speakers are more experienced in English and have been exposed to English more than the L1 Farsi speakers. Therefore, the L1 Dutch could switch from Dutch case marking cue into the word order cue properly (McDonald, 1987). The Competition Model is applicable in interpreting the results of the comprehension experiment in Chapter 7 as well. We learned that although Farsi speakers understand the English relative clauses without a morphological cue, the average of accurate answers to the comprehension statements in *that*-clause conditions is quite low. This effect elaborates that they have not obtained the word order cue in English properly; consequently, they transfer their L1 on L2 English. The proficient L2 learners in this experiment comprehend the L2 relative clauses more accurately and more quickly, which is consistent with the

idea of MacWhinney (2005) that more experienced L2 learners reduce the level of language transfer.

8.5.2 Noun Phrase Accessibility Hypothesis

Based on typological studies on the restrictive relative clauses in 50 languages, Keenan and Comrie (1977) proposed the Noun Phrase Accessibility hypothesis. According to their hypothesis, all languages conform to the following hierarchy in relativisability of noun phrases with different grammatical roles in a sentence.

Subject > Direct Object > Indirect Object > Oblique > Genitive > Object of comparison

In our corpus study in Chapter 3, we investigated whether the NPAH also holds for the Farsi restrictive relative clauses. We discovered that the frequency distribution of restrictive relative clauses follows the hierarchy of Keenan and Comrie (1977):

Subject > Direct object > Oblique > Genitive

Interestingly, non-restrictive relative clauses also follow their hierarchy, but the only difference is that frequency of oblique and genitive relative clauses is not very different.

The frequency distribution of the resumptive pronouns also follows Keenan and Comrie's (1977) hierarchy; the usage of resumptive pronouns increases as the frequency of a relative clause decreases in the Farsi corpus. It is notable to mention that the occurrence of resumptive pronouns in restrictive object relative clauses is not optional. This is explained in this chapter (see Section 8.3). Keenan and Comrie propose that the accessibility hierarchy directly reflects the psychological ease of comprehension. Comprehension of an object relative clause is harder than that of a subject relative clause because object relative clauses are

positioned lower than subject relative clauses. This is reflected in both the processing and comprehension data.

8.5.3 Frequency-based Theory

In their frequency-based theory, MacDonald and Christiansen (2002) argue that there is an important role for experience in the acquisition and processing of subject and object relative clauses. The word order in subject relative clauses is frequent and regular, but in object relative clauses it is very infrequent and irregular. Individuals' relative clause processing is influenced by the previous experience related to similar input. This is reflected in the processing of both Farsi and English relative clauses.

Reali and Christiansen (2007) based on their large-scale corpus study and four self-paced reading tasks indicate that the processing differences reflect the pattern of distribution of pronominal subject and object relative clauses. In addition to the general pattern that subject relative clauses are more frequent than object relative clauses in Chapter 3, we also found that restrictive relative clauses are more frequent than non-restrictive relative clauses in the Farsi corpus. In Chapter 4, we conducted an eye-tracking reading task, which showed that the differences in subject and object relative clause processing in restrictive and non-restrictive conditions mirror the pattern of distribution revealed by the corpus study in Chapter 3. Accordingly, we see subject relative clause preference in the processing experiment. Additionally, the non-restrictive relative clauses are processed slower than their restrictive counterparts.

8.5.4. Active Filler Strategy

The Active Filler Strategy proposed by Frazier (1987) suggests that as soon as the parser encounters a relative pronoun as a filler, a gap is presumed in the place of a subject relative clause, which is the earliest possible filler-gap construction. This strategy works for the subject relative clauses correctly. But the presence of an embedded noun phrase right after the relative pronoun in object relative clauses indicates that this initial analysis

is incorrect, which increases the processing complexity. In Farsi, the complementizer /*ke*/ links an antecedent to all types of relative clauses regardless of animacy and number of the antecedent, and it does not take any preposition in the oblique relative clauses. Since in the Farsi relative clause there is no relative pronoun, we may say that this strategy is not applicable for explaining the processing difficulty in the Farsi relative clauses.

The data in English for Farsi speakers point in the direction that there is indeed such a distinction between subject and object relative clauses in *who(m)*-clause conditions, where the relative pronoun is clearly recognizable. However, in *that*-clause conditions, there is no difference probably because they took '*that*' as a complementizer. As a clause subordinator (Huddleston et al., 2002), '*that*' similar to /*ke*/ does not provide any cue for the Farsi-speaking English learners.

8.5.5 Structural Distance Hypothesis

Based on the Structural Distance Hypothesis (O'Grady et al., 2003), the structural distance between a relativized antecedent and a gap correlates with the difficulty or ease of processing a relative clause. The structural distance corresponds to the number of syntactic nodes or projections which intervenes between the antecedent and the gap. In English relative clauses, the structural distance between an antecedent and gap in a subject relative clause is always shorter than that in an object relative clause because the gap is embedded deeper in the object relative clause. Therefore, the Structural Distance Hypothesis predicts a subject relative clause advantage in processing and comprehension. The subject relative clause preference in Chapter 5 and Chapter 6 and reading comprehension in Chapter 7 are consistent with the Structural Distance Hypothesis. In Farsi relative clauses, the complementizer /*ke*/ has no role, so when a reader encounters the embedded noun phrase, if there is an object marker, a subject gap will be constructed, but if there is no object marker, the reader has to construct the object gap at the same point. Once a reader processes this noun phrase,

which is either marked as the object or unmarked as the subject, the reader has to posit that there is a gap at the same point in both cases. Basically, in Farsi relative clauses, in terms of processing, there is no difference in terms of structural distance as in English; therefore, Structural Distance Hypothesis is irrelevant to Farsi.

8.5.6 Perspective Hypothesis

MacWhinney (2005) argues that perspective-taking and shifting are essential for maintaining a successful communication. Languages provide listeners with grammatical cues for marking perspective and shifting perspective. 'Language allows us to integrate information from the domains of direct experience, space/time, plans, roles, and mental acts. Across each of these dimensions, we assume and shift between perspectives in order to construct a fully human, unified conscious awareness' (p.27-28).

We applied two types of subject modified-subject extracted (SS) and subject modified-object extracted (SO) relative clauses in the eye-tracking and reading comprehension experiments. In SS, perspective taking begins with the subject of the matrix sentence, which is also the antecedent of the relative clause sentence. Thus in the relative clause, the perspective is maintained, but in SO, perspective changes two times. First, the perspective shifts to the embedded noun phrase. Then, as the reader encounters the second verb, the perspective shifts back to the first noun phrase which is the subject of the matrix sentence.

In Farsi, there is an extra element, namely the restrictiveness marker, which leads to a different process than when it is not present. The restrictive marker attached to the antecedent helps the reader take the perspective of the restrictive relative clauses more easily than of the non-restrictive relative clauses because the restrictive marker shows that this noun phrase is not grounded and has not already been explained, but is going to be explained by the following relative clause. The antecedent in non-restrictive relative clauses is not new; it is already grounded in the

context, and the relative clause provides extra information about this previously established referent. If the referent is presented in the discourse, the expectation will be even stronger in keeping the perspective of an already known referent. In line with that, in the corpus data non-restrictive relative clauses are relatively more often subject relative clauses. Therefore, in non-restrictive relative clauses, the tendency to keep the same perspective as in the antecedent is consistent with more difficulty in the processing of the object. However, restrictive relative clauses are more amenable to change the perspective because the sentences are often used to ground the new referent from the perspective of an established referent.

In the Farsi SS relative clauses, when the readers encounter the embedded noun phrase, they are sure that there is no perspective shift, but in SO relative clauses, when the readers encounter the unmarked embedded noun phrase, they know that they need a perspective shift since this noun phrase is the subject of the relative clause. The long reading times on the pre-matrix verb in the object relative clauses (Chapter 4), especially in the non-restrictive ones are congruent with the perspective shift to the subject of the matrix sentence. In the English stimuli, there is no cue on the antecedent, but readers have access to the relative pronoun ‘*who*’ which may help the readers take the perspective of the relative clause quickly. The verification statements about the subject of the relative clause in the reading comprehension experiment (Chapter 7), showed a clear perspective shift in the object relative clauses, with less accurate answers than those in the subject relative clauses. Short relative clause reading times in the *that*-clause conditions may reveal that the relative pronouns ‘*who*’ and ‘*whom*’ worked as cues in the perspective-taking procedure.

8.6 Pedagogical Recommendations

The eye-tracking studies revealed that L2 English relative clause processing is more problematic for Farsi-speakers than for the Dutch participants. Despite the similarities in the relative clause structure of Dutch and Farsi, Dutch participants could move from a case inflection cue

in L1 to a word order cue in L2 English, probably because they are more experienced as a result of their higher exposure to English. Thus, to move from the L1 structure and cue frequency into L2 structure cue frequency, L2 learners should enrich their L2 exposure. This can be done by being exposed to an L2 environment and by creating a semi-L2 environment in the educational setting by teachers. Regarding that there is a scarcity of English input in and out of educational settings in Iran, the primary solution for exposing the language learners to English can be to prepare authentic materials for reading, listening, and writing, creating webpages at school to encourage the learners to interact with each other in English and recommending appropriate games, cartoons, and movies in English or with English subtitles.

Advanced English learners might benefit from a different teaching style for gaining input and noticing the problematic structures in their L1 and L2 English. With a pedagogical purpose in mind, language teachers might use the findings from the corpus studies in the Farsi language and English to gain knowledge about the similarities and differences between these two languages. Then, they can provide language learners with the appropriate cues for how to act in processing different structures in L2 in the close reading of texts. According to Leow (1998), multiple learner-centred exposure is a “More active approach to grammatical exposure in the classroom appears to promote attention at the level of noticing of linguistic forms” (p. 62). Therefore, we recommend problem-solving learner-centred tasks that promote noticing relative clause structures during exposure in L2 courses. Leow (1998) also indicates the importance of recycling the noticed grammatical information by repeated exposure to the linguistic form in upcoming sessions since it provides the language learners with a chance to reactivate their prior knowledge of linguistic items. Accordingly, activating the prior knowledge of learners about relative clauses by exposing them in later sessions is suggested.

Munkhtsetseg (2017) reports a study on L1 Mongolian learners of L2 English. Mongolian is a head-final and right-branching language with

no relative pronoun as an explicit marker of the relative clause. In a translation task, Mongolian L2 English learners avoided the application of English relative pronouns. They did not make complex sentences, and most of them had a problem with the English word order in the relative clause. After conducting a pre-test, the Mongolian participants received a treatment phase for three hours. Munkhtsetseg administered a translation task to one group and a putting words in order task to another group. Her post-test data showed the effectiveness of the grammar-translation method for learning relative clause structures for L1 Mongolian learners of L2 English as the first group made fewer errors of omission of the relative pronoun, selection of the relative pronoun, and disordering than the second group. Munkhtsetseg further emphasises that it is important to have knowledge of complex structures such as relative clauses in teaching and learning any language. Accordingly, because of the striking differences between Farsi and English relative clauses, we suggest applying translation tasks with texts including different types of relative clauses in Farsi. By translating Farsi texts, including all types of relative clauses into English, language learners will learn to recognize the necessary cues for processing and comprehending the relative clauses in both languages.

In conclusion, negative transfer from L1 into L2 is inevitable, but we can decrease the amount of transfer by exposing the language learners to the target language, and accordingly help them to be more proficient L2 speakers. According to the Frequency $\times$ regularity approach (MacDonald & Christiansen, 2002), the frequency of a structure determines its processing speed and the regularity of that structure modulates this relationship. The structural complexity cannot be altered, but increasing the exposure learners have can change the frequency of a structure, such as an object relative clause, within the language (Hutton & Kidd, 2011). Following the Frequency $\times$ Regularity argument, we speculate that the increase in the frequency of subject and object relative clauses with or without a morphological cue will be associated with a greater increase in processing speed for object relative clauses with or without a

morphological cue and in increasing the accuracy rate of the same relative clause comprehension by L2 learners. Accordingly, we recommend structural priming by exposing L2 learners several times to the aforementioned relative clause sentences with verifying statements within some days of intervals between the exposures.

The findings of the corpus study regarding the role of animacy of the antecedents and the embedded noun phrases in the Farsi language and some other languages would be beneficial for ESL teachers. Teaching different types of relative clauses that occur naturally would help learners acquire a language properly. Moreover, taking into account the animacy and frequency distribution of relative clauses in making tests is necessary to have a clear view of item difficulty in making related language exams.

8.7 Conclusion

On the basis of the corpus data, the processing data, and the comprehension data, the conclusion is that the processing and comprehension of relative clauses by Farsi speakers are best explained by the theories that take human conceptualization and behaviour into account: the noun phrase accessibility hierarchy, the competition model, and frequency-based theories. The present research shows that L1 strongly impacts the processing and comprehension of L2, but this is moderated by a higher L2 language proficiency which is obtained by more exposure into L2. Accordingly, high exposure to L2 leads to a better performance and less cross-linguistic influence.

All in all, even though relative clauses are only one small aspect of the language system, they provide a wealth of useful data to look into various factors that play a role in L1-L2 transfer and the role of experience and exposure.

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Nederlandse Samenvatting

Nederlandse Samenvatting

In dit project is onderzocht in hoeverre er cross-linguïstische invloed is van de eerste taal (L1) van op Engels als tweede taal (L2) in de verwerking en begrip van relatieve bijzinnen door moedertaalsprekers van het Farsi. In **hoofdstuk 1** is het theoretisch kader voor het onderzoek geschetst.

Hoofdstuk 2 bespreekt de vraag wat de cruciale verschillen tussen de syntaxis van het Engels en het Farsi zijn die van invloed kunnen zijn op het leren van Engels door moedertaalsprekers van het Farsi. De canonieke woordvolgorde in het Farsi is SOV, die van het Engels is SVO. In het Farsi hebben zowel subject als object-relatieve bijzinnen een NP NP VP woordvolgorde, die vergelijkbaar is met object-relatieve bijzinnen in het Engels. In het Engels worden relatieve bijzinnen geïntroduceerd door een betrekkelijke voornaamwoord, die in sommige gevallen (bijvoorbeeld ‘*who*’ en ‘*whom*’) case-markers zijn. Relatieve bijzinnen in het Farsi worden altijd geïntroduceerd door het voegwoord /*ke*/. In het Farsi kunnen object-relatieve bijzinnen een resumptief voornaamwoord bevatten (een voornaamwoord in een relatieve bijzin dat een herhaling is van het antecedent). Een enclitisch morfeem /-i/ gehecht aan een antecedent maakt onderscheid tussen restrictieve en niet-restrictieve relatieve bijzinnen en een objectmarker /*rā*/ markeert een object. Dit zijn morfologische cues die een lezer helpen om subject- en object-relatieve bijzinnen te onderscheiden. In Engelse relatieve bijzinnen daarentegen, is naast de case-marking op sommige betrekkelijke voornaamwoorden, met name de woordvolgorde belangrijk voor het onderscheiden van subject- en object-relatieve bijzinnen.

In **hoofdstuk 3** was het doel in detail te verkennen wat de distributie van relatieve bijzinnen in Farsi is, met behulp van een corpusstudie. De resultaten geven inzicht in de verdeling van relatieve bijzinnen in de input die sprekers van Farsi krijgen, en wat de overeenkomsten en verschillen in deze verdeling zijn tussen Engels en Farsi. Deze inzichten werden gebruikt bij het opzetten van een serie

experimenten die tot doel hadden de verwerking van relatieve bijzinnen in het Engels en Farsi te vergelijken.

In het corpusonderzoek is de tweede onderzoeksvraag beantwoord, die gaat over de frequentieverdeling van relatieve bijzinnen in het Farsi en over de factoren die de frequentie van die relatieve bijzinnen beïnvloeden. Het overgrote deel van de relatieve bijzinnen in het Farsi zijn beperkende relatieve bijzinnen. Belangrijk is dat de verdeling van relatieve bijzinnen in dit corpus overeenkomt met de Noun Phrase Accessibility Hierarchy van Keenan en Comrie (1977); subject-relatieve bijzinnen komen vaker voor dan object-relatieve bijzinnen, en oblique-relatieve bijzinnen komen vaker voor dan genitief-relatieve bijzinnen. Keenan en Comrie (1977) voorspellen dat er een omgekeerde relatie bestaat tussen het gebruik van resumptieve voornaamwoorden en de plaats van het relatieve bijzinstype in de hiërarchie van relatieve bijzinnen. In het Farsi komt resumptie voor in de vorm van een voornaamwoord of als een pronominale enclitische vorm. In het corpus komen geen resumptieve voornaamwoorden voor in de subject-relatieve bijzinnen, maar in alle genitief-relatieve bijzinnen en in de meeste oblique-relatieve bijzinnen wordt wel een resumptief voornaamwoord gebruikt. Hoewel sommige object-relatieve bijzinnen een resumptief voornaamwoord of een pronominaal enclitisch hebben, komen ze vooral voor met een gap. Keenan en Comrie (1977) laten zien dat hervatting in object-relatieve bijzinnen optioneel is in het Farsi. Ze bestudeerden echter alleen beperkende relatieve bijzinnen. In ons corpus komen resumptieve voornaamwoorden zelden voor in beperkende object-relatieve bijzinnen, maar ze komen veel vaker voor in uitbreidende object-relatieve bijzinnen.

Wat betreft de correlatie van het type relatieve bijzin en de levendheid (animacy) van het antecedent (NP1) en de ingebed naamwoordgroep (NP2), vonden we bijna dezelfde patroon van resultaten als Mak et al. (2002) rapporteren voor het Nederlands en Duits. Object-relatieve bijzinnen komen nooit voor in de conditie met een levende NP1 en een niet-levende NP2 en subject-relatieve bijzinnen komen het vaakst

voor in de conditie met een levende NP1 en een niet-levende NP2. Dit geldt zowel voor beperkende als voor uitbreidende relatieve bijzinnen.

In **hoofdstuk 4** onderzochten we met behulp van eye-tracking of er een asymmetrie is in de verwerking van object- en subject-relatieve bijzinnen in het Farsi en of de frequentieverdeling van restrictieve en niet-restrictieve relatieve bijzinnen blijkt uit verwerking door L1 Farsi sprekers. In het experiment hebben we het effect van Clause Type (subject- versus object-relatieve bijzinnen) en Restrictiveness (beperkende versus uitbreidende relatieve bijzinnen) in Farsi getest. Het materiaal voor dit experiment bestond uit 36 items, die gebaseerd waren op het materiaal van Staub et al. (2017), dat werd gebruikt in de experimenten in het Engels die hoofdstuk 5 en 6 zijn gerapporteerd. Voor het experiment in hoofdstuk 4 werden de items zorgvuldig in het Farsi vertaald, zoals in de volgende voorbeelden.

a. (Restrictive subject relative clause)

همسایه ای که پیرمرد را لوداد خانه اش را به سرعت ترک کرد.

kard tark sorat be rā xāneaş lodād rā pirmard ke hamsāyei

“The neighbor that betrayed the old man left his home quickly.”

b. (Restrictive object relative clause)

همسایه ای که پیرمرد لوداد خانه اش را به سرعت ترک کرد.

.kard tark sorat be rā xāneaş lodād pirmard ke hamsāyei

“The neighbor that the old man betrayed left his home quickly.”

c. (Non-restrictive subject relative clause)

همسایه که پیرمرد را لوداد خانه اش را به سرعت ترک کرد .

.kard tark sorat be ra xāneaş lodād rā pirmard ke hamsāye

“The neighbor, who betrayed the old man, left his home quickly.”

d. (Non-restrictive object relative clause)

همسایه که پیرمرد لوداد خانه اش را به سرعت ترک کرد.

.kard tark sorat be rā xāneaš lodād pīrmard ke hamsāye

“The neighbor, whom the old man betrayed, left his home quickly.”

Op basis van de bevindingen van het corpusonderzoek in **hoofdstuk 3** veronderstelden we dat het verwerken van object-relatieve bijzinnen in het Farsi in het algemeen meer tijd zou vergen, vooral in uitbreidende relatieve bijzinnen. In het Farsi is de belangrijkste aanwijzing bij het onderscheiden van een subject- en een object-relatieve bijzin de objectmarkering /rā/ na de NP. In zowel subject- als object-relatieve bijzinnen is het zinsdeel na het voegwoord een NP, die ongemarkeerd is in object-relatieve bijzinnen en gemarkeerd is als het object in subject-relatieve bijzinnen. Er is dus geen canonieke of niet-canonieke woordvolgorde in subject- en object-relatieve bijzinnen in het Farsi aangezien in beide gevallen de woordvolgorde NP V is. Wat betreft de hiërarchie van frequentieverdeling van subject- en object-relatieve bijzinnen, is er geen verschil tussen Farsi en vele andere talen zoals Engels en Nederlands. Dat kan verklaren waarom we een asymmetrie in de verwerking vonden; subject-relatieve bijzinnen komen vaker voor dan object-relatieve bijzinnen en hebben de voorkeur bij de verwerking.

De vierde onderzoeksvraag was of de frequentieverdeling van beperkende en uitbreidende bijzinnen in het Farsi terug te zien is in de verwerking van deze bijzinnen door sprekers van het Farsi. Sprekers van het Farsi verwerken beperkende relatieve bijzinnen anders dan uitbreidende relatieve bijzinnen: De vertraging in de object-relatieve bijzin was groter in uitbreidende relatieve bijzinnen dan in beperkende relatieve bijzinnen. De verwerkingsmoeilijkheid van object-relatieve bijzinnen komt overeen met de voorspellingen van de frequentiegerichte benadering (MacDonald & Christiansen, 2002); de voorkeur voor de verschillende typen relatieve bijzinnen in het Farsi is in overeenstemming met de frequentieverdeling in het Farsi-corpus. Uitbreidende object-relatieve bijzinnen komen veel minder vaak voor in het corpus dan restrictieve object-relatieve bijzinnen.

De vijfde onderzoeksvraag is hoe Farsi-sprekers Engelse subject- en object-relatieve bijzinnen in verwerken in bijzinnen met *that* en *who(m)* en of er een cross-linguistisch effect is van L1 Farsi op de verwerking van L2 Engelse relatieve bijzinnen. Daartoe hebben we Experiment 2 in **hoofdstuk 5** uitgevoerd door L1-sprekers van het Farsi soortgelijke stimuli te laten lezen in het Engels, zoals in de volgende voorbeelden.

- a. The babysitter that liked the child was a qualified nurse.
- b. The babysitter that the child liked was a qualified nurse.
- c. The babysitter, who liked the child, was a qualified nurse.
- d. The babysitter, whom the child liked, was a qualified nurse.

Dit experiment repliceerde slechts gedeeltelijk de resultaten verkregen door Staub et al. (2017), de studie waaruit de materialen in dit experiment zijn gehaald. Zij meldten dat de moeilijkheid in de verwerking van object-relatieve bijzinnen door lezers die het Engels als moedertaal hebben, werd gevonden op de naamwoordgroep en het werkwoord in de relatieve bijzin, waarbij de verwerkingsmoeilijkheid met name werd gevonden in de naamwoordgroep. De Farsi-lezers lieten alleen verwerkingsmoeilijkheden zien in object-relatieve bijzinnen met het betrekkelijk voornaamwoord *whom*. In relatieve bijzinnen met het betrekkelijke voornaamwoord '*that*' waren de leestijden in de object-relatieve bijzinnen vergelijkbaar met die in subject-relatieve bijzinnen. Het uitblijven van een verschil in de verwerking van deze relatieve bijzinnen, is consistent met de interpretatie dat de deelnemers moeite hebben om het deze relatieve bijzinnen correct te interpreteren. Deze interpretatie wordt ondersteund door het feit dat de lezers bij het vervolg van de hoofdzin na relatieve bijzinnen met *that* heel lang bezig waren met de interpretatie van de zin.

Volgens het Unified Competition Model (MacWhinney, 1997) moeten mensen voor het leren van meerdere talen de cues leren die belangrijk zijn voor elk van de talen die ze leren. De Farsi-sprekers vertoonden geen

verwerkingsverschil tussen Engelse subject- en object-relatieve bijzinnen in relatieve bijzinnen met *that*, vermoedelijk omdat er in deze omstandigheden geen morfologische cue is. Dit resultaat suggereert dat ze moeite hebben met het toepassen van de woordvolgorde-cue in Engelse relatieve bijzinnen. Relatieve bijzinnen met het de betreffende voornaamwoorden *who* of *whom* daarentegen bieden wel een morfologische aanwijzing voor het herkennen van subject- en object-relatieve bijzinnen, waardoor die zinnen gemakkelijker te begrijpen zijn voor Farsi-lezers, omdat ze zich op basis van hun L1 richten op morfologische cues bij de interpretatie van relatieve bijzinnen.

Tegen de verwachting in werd de naamwoordgroep in de relatieve bijzin langzamer gelezen in de subject-relatieve bijzinnen dan in de object-relatieve bijzinnen. De reden voor dit effect zou kunnen zijn dat de canonieke woordvolgorde in een Engelse subject-relatieve bijzin verschilt van die in het Farsi, maar de woordvolgorde in een Engelse object-relatieve bijzin is vergelijkbaar met het equivalent in het Farsi. Farsi-sprekers gebruiken de verwerkingsvoorkeuren in hun L1 bij het verwerken van het Engels bij de verwerking van relatieve bijzinnen. We nemen aan dat, omdat ze niet het vermogen hebben verworven om de structurele cues in het Engels effectief te verwerken, ze niet in staat zijn om de woordvolgorde te gebruiken bij het verwerken relatieve bijzinnen in het Engels, wanneer die geen morfologische cue bevatten. Deze moeilijkheid met de Engelse woordvolgorde kan ertoe leiden dat de deelnemers object-relatieve bijzinnen verwerken als subject-relatieve bijzinnen wanneer het betreffende voornaamwoord *that* is gebruikt.

Gezien de structurele overeenkomsten tussen Farsi en Nederlands, onderzochten we in **hoofdstuk 6** de verwerking van de Engelse relatieve bijzinnen door moedertaalsprekers van het Nederlands. De vraag is of moedertaalsprekers van het Nederlands en het Farsi de Engelse relatieve bijzinnen op dezelfde manier verwerken. MacDonald (1987) heeft aangetoond dat tweedetaalleerders bij de verwerking aanvankelijk gebruik maken van de cues die in de eerste taal helpen bij de verwerking. Wanneer

L2-leerders bekwaamer worden in de L2, kunnen ze overschakelen van de cues in hun eerste taal naar cues in de tweede taal. Op basis van die bevinding verwachtten we voor de moedertaalsprekers van het Nederlands andere resultaten dan voor de moedertaalsprekers van het Farsi, aangezien moedertaalsprekers van het Nederlands vaardiger zijn in het Engels, en meer input hebben van het Engels. Het belangrijkste verschil met de resultaten van de Farsi-sprekers was dat de Nederlandse deelnemers ook een vertraging laten zien in relatieve bijzinnen met het betreffende voornaamwoord *that*, wat aangeeft dat de Nederlandse deelnemers de woordvolgorde kunnen gebruiken in de verwerking van Engelse relatieve bijzinnen, terwijl de Farsi-sprekers moeite hebben bij de verwerking van Engelse relatieve bijzinnen zonder een morfologische aanwijzing. Zoals reeds vermeld, zijn de Nederlandse L2-sprekers in ons experiment bekwaamer in het Engels dan Farsi-sprekers, zodat ze de woordvolgorde in Engelse relatieve bijzinnen kunnen gebruiken zonder de hulp van een morfologische aanwijzing.

Er zijn ook overeenkomsten in de verwerking van de Engelse relatieve bijzinnen door Nederlandse en Farsi moedertaalsprekers, bijvoorbeeld het effect op de ingebedde naamwoordgroep in subject-relatieve bijzinnen en het effect op de matrix werkwoord en post-matrix werkwoord regio's in relatieve bijzinnen met het betreffende voornaamwoord *that*.

In de oogbewegingsexperimenten hebben we de leestaak niet gecombineerd met begripsvragen, omdat dat het leesproces zou kunnen beïnvloeden. In **hoofdstuk 7** hebben we een experiment uitgevoerd met moedertaalsprekers van het Farsi, waarin het begrip van Engelse relatieve bijzinnen is onderzocht met een online onderzoeksmethode. Het begripsexperiment was opgedeeld in twee delen. In het eerste deel werden de relatieve bijzin en de verificatiestelling op afzonderlijke schermen gepresenteerd. In het tweede deel verschenen de relatieve bijzin en verificatiestelling samen op één scherm. Het doel was om vast te stellen of Farsi-sprekers Engelse subject- en object-relatieve bijzinnen correct

interpreteren en of hun score samenhangt met hun taalvaardigheid in het Engels. De resultaten van het eerste deel toonden aan dat de proefpersonen subject-relatieve bijzinnen beter begrijpen dan object-relatieve bijzinnen wanneer de betreffende voornaamwoorden *who* of *whom* worden gebruikt. Als de proefpersonen genoeg tijd kregen om over de zinnen na te denken (wat het geval was in het tweede deel van het experiment), begrepen ze alle soorten relatieve bijzinnen.

McDonald (1987) heeft aangetoond dat naarmate de blootstelling aan L2 en de vaardigheid in L2 toeneemt, het vermogen om de cues van L2 te gebruiken toeneemt, en de prestaties van L2-leerders meer lijken op die van moedertaalsprekers. In deel 1 van het begripsexperiment is er een correlatie tussen de taalvaardigheidsscores (gemeten met LexTALE) en de scores van het begrip over de inhoud van de relatieve bijzin en matrixzinnen voor alle condities en typen relatieve bijzinnen. Een hogere Engelse taalvaardigheid helpt de Farsi-sprekende Engelse leerlingen om de Engelse relatieve bijzinnen te begrijpen, zowel met als zonder een morfologische cue; de taalvaardigheid helpt hen om over te schakelen van de morfologische cue naar de structurele cue in Engelse relatieve bijzinnen. Ook laat de significante interactie tussen de LexTALE-scores en het type relatieve bijzin zien dat zeer bekwame deelnemers meer tijd besteden aan het lezen van object-relatieve bijzinnen en het reageren op de uitspraken over hun inhoud, wat aangeeft dat deze lezers de object-relatieve bijzinnen behandelen als de moedertaalsprekers doen.

De begripsscores van relatieve bijzinnen zonder een morfologische cue zijn laag. Morfologische cues zoals de relatieve voornaamwoorden '*who*' en '*whom*' helpen de moedertaalsprekers van het Farsi om de begripvragen snel te begrijpen en erop te reageren. Dit kan worden geïnterpreteerd als een cross-linguïstisch effect van L1 op L2 bij het begrijpen van relatieve bijzinnen. Bovendien laat de correlatie met taalvaardigheid zien dat de L2-sprekers overschakelen van het toepassen van de morfologische uit het Farsi naar de structurele cue uit het Engels.

Kortom, het huidige onderzoek illustreert dat de moedertaal de verwerking en het begrip van de tweede taal beïnvloedt, maar dit wordt gemodereerd door een hogere taalvaardigheid in de tweede taal die wordt verkregen door meer blootstelling aan L2. Een hogere blootstelling aan de tweede taal leidt tot betere prestaties en minder cross-linguïstische invloed. Hoewel relatieve bijzinnen slechts een klein aspect van het taalsysteem zijn, bieden ze een schat aan nuttige gegevens om verschillende factoren te onderzoeken die een rol spelen bij de overdracht van L1 op L2 en de rol van ervaring en input.

Appendices

Appendices

Appendix A

Stimuli sentences for the eye-tracking experiment in Chapter 5 and 6.

- 1 The bus driver that the passerby guided wondered about the location of the hotel.
- 2 The bus driver that guided the passerby wondered about the location of the hotel.
- 3 The bus driver, whom the passerby guided, wondered about the location of the hotel.
- 4 The bus driver, who guided the passerby, wondered about the location of the hotel.

- 5 The chef that the waiter distracted poured the flour onto the counter.
- 6 The chef that distracted the waiter poured the flour onto the counter.
- 7 The chef, whom the waiter distracted, poured the flour onto the counter.
- 8 The chef, who distracted the waiter, poured the flour onto the counter.

- 9 The babysitter that the child liked was a qualified nurse.
- 10 The babysitter that liked the child was a qualified nurse.
- 11 The babysitter, whom the child liked, was a qualified nurse.
- 12 The babysitter, who liked the child, was a qualified nurse.

- 13 The students that the teachers threatened canceled the exam for the week.
- 14 The students that threatened the teachers canceled the exam for the week.
- 15 The students, whom the teachers threatened, canceled the exam for the week.
- 16 The students, who threatened the teachers, canceled the exam for the week.

- 17 The dancer that the audience loved overlooked the director's instructions.
- 18 The dancer that loved the audience overlooked the director's instructions.
- 19 The dancer, whom the audience loved, overlooked the director's instructions.
- 20 The dancer, who loved the audience, overlooked the director's instructions.

- 21 The employees that the firemen spotted hurried across the open field.
- 22 The employees that spotted the firemen hurried across the open field.
- 23 The employees, whom the firemen spotted, hurried across the open field.
- 24 The employees, who spotted the firemen, hurried across the open field.

- 25 The farmer that the customer approached lifted the chickens from their coop.
- 26 The farmer that approached the customer lifted the chickens from their coop.
- 27 The farmer, whom the customer approached, lifted the chickens from their coop.
- 28 The farmer, who approached the customer, lifted the chickens from their coop.

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- 29 The worker that the rancher hired planted the seeds in long rows.
30 The worker that hired the rancher planted the seeds in long rows.
31 The worker, whom the rancher hired, planted the seeds in long rows.
32 The worker, who hired the rancher, planted the seeds in long rows.
- 33 The firemen that the residents signaled sprayed the fire with high-powered hoses.
34 The firemen that signaled the residents sprayed the fire with high-powered hoses.
35 The firemen, whom the residents signaled, sprayed the fire with high-powered hoses.
36 The firemen, who signaled the residents, sprayed the fire with high-powered hoses.
- 37 The actor that the director watched forgot a critical line.
38 The actor that watched the director forgot a critical line.
39 The actor, whom the director watched, forgot a critical line.
40 The actor, who watched the director, forgot a critical line.
- 41 The investigator that the agency phoned suspected the new person from accounting.
42 The investigator that phoned the agency suspected the new person from accounting.
43 The investigator, whom the agency phoned, suspected the new person from accounting.
44 The investigator, who phoned the agency, suspected the new person from accounting.
- 45 The judge that the witness addressed noticed the defense of attorneys.
46 The judge that addressed the witness noticed the defense of attorneys.
47 The judge, whom the witnesses address, noticed the defense of attorneys.
48 The judge, who addressed the witness, noticed the defense of attorneys.
- 49 The manager that the foreman visited remembered some inconvenient facts.
50 The manager that visited the foreman remembered some inconvenient facts.
51 The manager, whom the foreman visited, remembered some inconvenient facts.
52 The manager, who visited the foreman, remembered some inconvenient facts.
- 53 The mathematician that the chairman admired created a solution to the well-known problem.
54 The mathematician that admired the chairman created a solution to the well-known problem.
55 The mathematician, whom the chairman admired, created a solution to the well-known problem.
56 The mathematician, who admired the chairman, created a solution to the well-known problem.
- 57 The monkeys that the visitors watched rattled the bars of their cage.
58 The monkeys that watched the visitors rattled the bars of their cage.
59 The monkeys, whom the visitors watched, rattled the bars of their cage.
60 The monkeys, who watched the visitors, rattled the bars of their cage.
- 61 The movie star that the philanthropist invited proposed an annual prize.
62 The movie star that invited the philanthropist proposed an annual prize.
63 The movie star, whom the philanthropist invited, proposed an annual prize.
64 The movie star, who invited the philanthropist, proposed an annual prize.
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- 65 The woman that the broker negotiated purchased the old Victorian house.
66 The woman that negotiated the broker negotiated the old Victorian house.
67 The woman, whom the broker negotiated, purchased the old Victorian house.
68 The woman, who negotiated the broker, purchased the old Victorian house.
- 69 The pilot that the ground crew delayed remained on the runway for a long time.
70 The pilot that delayed the ground crew remained on the runway for a long time.
71 The pilot, whom the ground crew delayed, remained on the runway for a long time.
72 The pilot, who delayed the ground crew, remained on the runway for a long time.
- 73 The soldiers that the natives helped climbed the big rocks.
74 The soldiers that helped the natives climbed the big rocks.
75 The soldiers, whom the natives helped, climbed the big rocks.
76 The soldiers, who helped the natives, climbed the big rocks.
- 77 The speaker that the economist invited predicted a good year for the industry.
78 The speaker that invited the economist predicted a good year for the industry.
79 The speaker, whom the economist invited, predicted a good year for the industry.
80 The speaker, who invited the economist, predicted a good year for the industry.
- 81 The executives that the employees resented filed a grievance with the judge.
82 The executive that resented the employees filed a grievance with the judge.
83 The executives, whom the employees resented, filed a grievance with the judge.
84 The executive, who resented the employees, filed a grievance with the judge.
- 85 The old man that the jockey called rubbed the horse's back.
86 The old man that called the jockey rubbed the horse's back.
87 The old man, whom the jockey called, rubbed the horse's back.
88 The old man, who called the jockey, rubbed the horse's back.
- 89 The tennis player that the coach admired defeated his greatest rival.
90 The tennis player that admired the coach defeated his greatest rival.
91 The tennis player, whom the coach admired, defeated his greatest rival.
92 The tennis player, who admired the coach, defeated his greatest rival.
- 93 The visitor that the student introduced walked through the quad.
94 The visitor that introduced the student walked through the quad.
- 95 The visitor, whom the student introduced, walked through the quad.
96 The visitor, who introduced the student, walked through the quad.
- 97 The diners that the waiters angered left the restaurant without eating food.
98 The diners that angered the waiters left the restaurant without eating food.
99 The diners, whom the waiters angered, left the restaurant without eating food.
100 The diners, who angered the waiters, left the restaurant without eating food.
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- 101 The artist that the audiences respected took her final bow.
102 The artist that respected the audiences took her final bow.
103 The artist, whom the audiences respected, took her final bow.
104 The artists, who respected the audiences, took her final bow.
- 105 The witch that the girl killed was resurrected eventually.
106 The witch that killed the girl was resurrected eventually.
107 The witch, whom the girl killed, was resurrected eventually.
108 The witch, who killed the girl, was resurrected eventually.
- 109 The student that the researcher persuaded wrote a paper about a new study.
110 The student that persuaded the researcher wrote a paper about a new study.
111 The student, whom the researcher persuaded, wrote a paper about a new study.
112 The student, who persuaded the researcher, wrote a paper about a new study.
- 113 The doctor that the patient saw thought about the cause of pain.
114 The doctor that saw the patient thought about the cause of pain.
115 The doctor, whom the patient saw, thought about the cause of pain.
116 The doctor, who saw the patient, thought about the cause of pain.
- 117 The man that the woman betrayed left the home very quickly.
118 The man that betrayed the woman left the home very quickly.
119 The man, whom the woman betrayed, left the home very quickly.
120 The man, who betrayed the woman, left the home very quickly.
- 121 The actress that the director resented walked off the movie set.
122 The actress that resented the director walked off the movie set.
123 The actress, whom the director resented, walked off the movie set.
124 The actress, who resented the director, walked off the movie set.
- 125 The tenant that the landlord disliked phoned the police to complain.
126 The tenant that disliked the landlord phoned the police to complain.
127 The tenant, whom the landlord disliked, phoned the police to complain.
128 The tenant, who disliked the landlord, phoned the police to complain.
- 129 The professor that the student ignored continued with his lecture.
130 The professor that ignored the student continued with his lecture.
131 The professor, whom the student ignored, continued with his lecture.
132 The professor, who ignored the student, continued with his lecture.
- 133 The doctor that the patient beat decided to stop working at the hospital.
134 The doctor that beat the patient decided to stop working at the hospital.
135 The doctor, whom the patient beat, decided to stop working at the hospital.
136 The doctor, who beat the patient, decided to stop working at the hospital.
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- 137 The woman that the neighbour irritated yelled at her husband loudly.
138 The woman that irritated the neighbour yelled at her husband loudly.
139 The woman, whom the neighbour irritated, yelled at her husband loudly.
140 The woman, who irritated the neighbour, yelled at her husband loudly.
- 141 The journalists that the rebels supported were arrested by police.
142 The journalists that supported the rebels were arrested by police.
143 The journalists, whom the rebels supported, were arrested by police.
144 The journalists, who supported the rebels, were arrested by police.

Appendix B

Stimuli sentences in Farsi for the eye-tracking experiment in Chapter 4.

- 1 راننده اتوبوسی که رهگذر راهنمایی کرد از موقعیت هتل شگفت زده شد.
- 2 راننده اتوبوسی که رهگذر را راهنمایی کرد از موقعیت هتل شگفت زده شد.
- 3 راننده اتوبوس که رهگذر راهنمایی کرد از موقعیت هتل شگفت زده شد.
- 4 راننده اتوبوس که رهگذر را راهنمایی کرد از موقعیت هتل شگفت زده شد.
- 5 سرآشپزی که پیشخدمت ناراحت کرد آرد را روی پیشخوان ریخت.
- 6 سرآشپزی که پیشخدمت را ناراحت کرد آرد را روی پیشخوان ریخت.
- 7 سرآشپز که پیشخدمت ناراحت کرد آرد را روی پیشخوان ریخت.
- 8 سرآشپز که پیشخدمت را ناراحت کرد آرد را روی پیشخوان ریخت.
- 9 پرستار بچه ای که کودک دوست داشت یک پرستار حرفه ای بود.
- 10 پرستار بچه ای که کودک را دوست داشت یک پرستار حرفه ای بود.
- 11 پرستار بچه که کودک دوست داشت یک پرستار حرفه ای بود.
- 12 پرستار بچه که کودک را دوست داشت یک پرستار حرفه ای بود.
- 13 دانش آموزانی که معلمها تهدید کردند امتحان هفته بعد را لغو کردند.
- 14 دانش آموزانی که معلمها را تهدید کردند امتحان هفته بعد را لغو کردند.
- 15 دانش آموزان که معلمها تهدید کردند امتحان هفته بعد را لغو کردند.
- 16 دانش آموزانی که معلمها را تهدید کردند امتحان هفته بعد را لغو کردند.
- 17 رقاصه ای که تماشاگر دوست داشت دستور العمل کارگردان را نادیده گرفت.
- 18 رقاصه ای که تماشاگر را دوست داشت دستور العمل کارگردان را نادیده گرفت.
- 19 رقاصه که تماشاگر دوست داشت دستور العمل کارگردان را نادیده گرفت.
- 20 رقاصه که تماشاگر را دوست داشت دستور العمل کارگردان را نادیده گرفت.
- 21 کارکنانی که آتش نشانها پیدا کردند فوراً به بیرون منتقل شدند.
- 22 کارکنانی که آتش نشانها را پیدا کردند فوراً به بیرون منتقل شدند.
- 23 کارکنان که آتش نشانها پیدا کردند فوراً به بیرون منتقل شدند.
- 24 کارکنان که آتش نشانها را پیدا کردند فوراً به بیرون منتقل شدند.
- 25 مزرعه داری که مشتری دوست داشت مرغها را از قفس برداشت.
- 26 مزرعه داری که مشتری را دوست داشت مرغها را از قفس برداشت.
- 27 مزرعه دار که مشتری دوست داشت مرغها را از قفس برداشت.
- 28 مزرعه دار که مشتری را دوست داشت مرغها را از قفس برداشت.
- 29 کارگری که کشاورز استخدام کرد دانه ها را در یک ردیف کاشت.
- 30 کارگری که کشاورز را استخدام کرد دانه ها را در یک ردیف کاشت.
- 31 کارگر که کشاورز استخدام کرد دانه ها را در یک ردیف کاشت.

32	کارگر که کشاورز را استخدام کرد دانه هارا در یک ردیف کاشت.
33	آتش نشانهای که ساکنین مجتمع جستجو کردند آتش را با شلنگ های فشار قوی خاموش کردند.
34	آتش نشانهای که ساکنین مجتمع را جستجو کردند آتش را با شلنگ های فشار قوی خاموش کردند.
35	آتش نشانها که ساکنین مجتمع جستجو کردند آتش را با شلنگ های فشار قوی خاموش کردند.
36	آتش نشانها که ساکنین مجتمع را جستجو کردند آتش را با شلنگ های فشار قوی خاموش کردند.
37	بازیگری که کارگردان تماشا کرد نکته خیلی مهمی را فراموش کرد.
38	بازیگری که کارگردان را تماشا کرد نکته خیلی مهمی را فراموش کرد.
39	بازیگر که کارگردان تماشا کرد نکته خیلی مهمی را فراموش کرد.
40	بازیگر که کارگردان را تماشا کرد نکته خیلی مهمی را فراموش کرد.
41	کارآگاهی که آژانس خبر کرد به حسابدار جدید مشکوک بود.
42	کارآگاهی که آژانس را خبر کرد به حسابدار جدید مشکوک بود.
43	کارآگاه که آژانس خبر کرد به حسابدار جدید مشکوک بود.
44	کارآگاه که آژانس را خبر کرد به حسابدار جدید مشکوک بود.
45	دادرسی که شاهد خطاب کرد به دفاع وکلا توجه کرد.
46	دادرسی که شاهد را خطاب کرد به دفاع وکلا توجه کرد.
47	دادرسی که شاهد خطاب کرد به دفاع وکلا توجه کرد.
48	دادرسی که شاهد را خطاب کرد به دفاع وکلا توجه کرد.
49	مدیری که کارشناس ملاقات کرد بعضی حقایق ناخوشایند را بیاد آورد.
50	مدیری که کارشناس را ملاقات کرد بعضی حقایق ناخوشایند را بیاد آورد.
51	مدیر که کارشناس ملاقات کرد بعضی حقایق ناخوشایند را بیاد آورد.
52	مدیر که کارشناس را ملاقات کرد بعضی حقایق ناخوشایند را بیاد آورد.
53	ریاضیدانی که رئیس تحسین کرد راه حلی برای مسئله پیدا کرد.
54	ریاضیدانی که رئیس را تحسین کرد راه حلی برای مسئله پیدا کرد.
55	ریاضیدان که رئیس تحسین کرد راه حلی برای مسئله پیدا کرد.
56	ریاضیدان که رئیس را تحسین کرد راه حلی برای مسئله پیدا کرد.
57	میمونهای که باز دیککننده ها تماشا میکردند میله های قفس را تکان دادند.
58	میمونهای که باز دیککننده هارا تماشا میکردند میله های قفس را تکان دادند.
59	میمونها که باز دیککننده ها تماشا میکردند میله های قفس را تکان دادند.
60	میمونها که باز دیککننده هارا تماشا میکردند میله های قفس را تکان دادند.
61	ستاره سینمایی که بانی خیر دعوت کرد پیشنهاد یک جایزه سالانه را داد.
62	ستاره سینمایی که بانی خیر را دعوت کرد پیشنهاد یک جایزه سالانه را داد.
63	ستاره سینما که بانی خیر دعوت کرد پیشنهاد یک جایزه سالانه را داد.
64	ستاره سینما که بانی خیر را دعوت کرد پیشنهاد یک جایزه سالانه را داد.
65	خانمی که کارگذار همراهی کرد خانه قدیمی ویکتور را خرید.

66	خانمی که کارگذار را همراهی کرد خانه قدیمی ویکتور را خرید.
67	خانم که کارگذار همراهی کرد خانه قدیمی ویکتور را خرید.
68	خانم که کارگذار را همراهی کرد خانه قدیمی ویکتور را خرید.
69	خلبانی که متخصص فنی معطل کرد در باند فرودگاه منتظر ماند.
70	خلبانی که متخصص فنی را معطل کرد در باند فرودگاه منتظر ماند.
71	خلبانی که متخصص فنی معطل کرد در باند فرودگاه منتظر ماند.
72	خلبانی که متخصص فنی را معطل کرد در باند فرودگاه منتظر ماند.
73	سربازانی که بومیان کتک زدند از صخره ها بالا رفتند.
74	سربازانی که بومیان را کتک زدند از صخره ها بالا رفتند.
75	سربازان که بومیان کتک زدند از صخره ها بالا رفتند.
76	سربازان که بومیان را کتک زدند از صخره ها بالا رفتند.
77	سخنرانی که اقتصاددان دعوت کرد سال خوبی را برای صنعت پیش بینی کرد.
78	سخنرانی که اقتصاددان را دعوت کرد سال خوبی را برای صنعت پیش بینی کرد.
79	سخنران که اقتصاددان دعوت کرد سال خوبی را برای صنعت پیش بینی کرد.
80	سخنران که اقتصاددان را دعوت کرد سال خوبی را برای صنعت پیش بینی کرد.
81	مدیرانی که کارمندان عصبانی کردند نارضایتی خود را با وکلا در میان گذاشتند.
82	مدیرانی که کارمندان را عصبانی کردند نارضایتی خود را با وکلا در میان گذاشتند.
83	مدیران که کارمندان عصبانی کردند نارضایتی خود را با وکلا در میان گذاشتند.
84	مدیران که کارمندان را عصبانی کردند نارضایتی خود را با وکلا در میان گذاشتند.
85	پیرمردی که سوارکار صدا زد داشت پشت اسب را تیمار میکشید.
86	پیرمردی که سوارکار را صدا زد داشت پشت اسب را تیمار میکشید.
87	پیرمرد که سوارکار صدا زد داشت پشت اسب را تیمار میکشید.
88	پیرمرد که سوارکار را صدا زد داشت پشت اسب را تیمار میکشید.
89	بازیکن تنیسی که مربی تحسین کرد بزرگترین رقیب خود را شکست داد.
90	بازیکن تنیسی که مربی را تحسین کرد بزرگترین رقیب خود را شکست داد.
91	بازیکن تنیس که مربی تحسین کرد بزرگترین رقیب خود را شکست داد.
92	بازیکن تنیس که مربی را تحسین کرد بزرگترین رقیب خود را شکست داد.
93	بازدیدکننده ای که دانشجو معرفی کرد از راهرو ساختمان رد شد.
94	بازدیدکننده ای که دانشجو را معرفی کرد از راهرو ساختمان رد شد.
95	بازدیدکننده ای که دانشجو معرفی کرد از راهرو ساختمان رد شد.
96	بازدیدکننده ای که دانشجو را معرفی کرد از راهرو ساختمان رد شد.
97	مشتر پیهائی که پیشخدمت ها آوردند بدون شام رستوران را ترک کردند.
98	مشتر پیهائی که پیشخدمت ها را آوردند بدون شام رستوران را ترک کردند.
99	مشتر پیهاکه پیشخدمت ها آوردند بدون شام رستوران را ترک کردند.
100	مشتر پیهاکه پیشخدمت ها را آوردند بدون شام رستوران را ترک کردند.

-
- 101 هنرمندانی که تماشاگران محترم شمر دند در مقابلشان تعظیم کردند.
- 102 هنرمندانی که تماشاگران را محترم شمر دند در مقابلشان تعظیم کردند.
- 103 هنرمندان که تماشاگران محترم شمر دند در مقابلشان تعظیم کردند.
- 104 هنرمندان که تماشاگران را محترم شمر دند در مقابلشان تعظیم کردند.
- 105 جادوگری که دختر کشت در نهایت زنده شد.
- 106 جادوگری که دختر را کشت در نهایت زنده شد.
- 107 جادوگری که دختر کشت در نهایت زنده شد.
- 108 جادوگری که دختر را کشت در نهایت زنده شد.
- 109 دانشجویی که محقق تر غیب کرد مقاله ای در مورد یک موضوع جدید نوشت.
- 110 دانشجویی که محقق را تر غیب کرد مقاله ای در مورد یک موضوع جدید نوشت.
- 111 دانشجو که محقق تر غیب کرد مقاله ای در مورد یک موضوع جدید نوشت.
- 112 دانشجو که محقق را تر غیب کرد مقاله ای در مورد یک موضوع جدید نوشت.
- 113 دکتری که بیمار ملاقات کرد در مورد علت درد به فکر فرو رفت.
- 114 دکتری که بیمار را ملاقات کرد در مورد علت درد به فکر فرو رفت.
- 115 دکتر که بیمار ملاقات کرد در مورد علت درد به فکر فرو رفت.
- 116 دکتر که بیمار را ملاقات کرد در مورد علت درد به فکر فرو رفت.
- 117 همسایه ای که پیرمرد لوداد خانه را به سرعت ترک کرد.
- 118 همسایه ای که پیرمرد را لوداد خانه را به سرعت ترک کرد.
- 119 همسایه که پیرمرد لوداد خانه را به سرعت ترک کرد.
- 120 همسایه که پیرمرد را لوداد خانه را به سرعت ترک کرد.
- 121 هنر پیشه ای که تهیه کننده ناراحت کرد از مجموعه فیلم خارج شد.
- 122 هنر پیشه ای که تهیه کننده را ناراحت کرد از مجموعه فیلم خارج شد.
- 123 هنر پیشه که تهیه کننده ناراحت کرد از مجموعه فیلم خارج شد.
- 124 هنر پیشه که تهیه کننده را ناراحت کرد از مجموعه فیلم خارج شد.
- 125 مستاجری که صاحبخانه دوست نداشت برای شکایت به پلیس زنگ زد.
- 126 مستاجری که صاحبخانه را دوست نداشت برای شکایت به پلیس زنگ زد.
- 127 مستاجر که صاحبخانه دوست نداشت برای شکایت به پلیس زنگ زد.
- 128 مستاجر که صاحبخانه را دوست نداشت برای شکایت به پلیس زنگ زد.
- 129 استادی که دانشجو نادیده گرفت با ناراحتی به تدریس خود ادامه داد.
- 130 استادی که دانشجو را نادیده گرفت با ناراحتی به تدریس خود ادامه داد.
- 131 استاد که دانشجو نادیده گرفت با ناراحتی به تدریس خود ادامه داد.
- 132 استاد که دانشجو را نادیده گرفت با ناراحتی به تدریس خود ادامه داد.
- 133 دکتری که بیمار کتک زد تصمیم گرفت کار در بیمارستان را ترک کند.
- 134 دکتری که بیمار را کتک زد تصمیم گرفت کار در بیمارستان را ترک کند.
-

135	دکتر که بیمار کتک زد تصمیم گرفت کار در بیمارستان را ترک کند.
136	دکتر که بیمار را کتک زد تصمیم گرفت کار در بیمارستان را ترک کند.
137	خانمی که همسایه اذیت کرد با صدای بلند سر همسرش داد زد.
138	خانمی که همسایه را اذیت کرد با صدای بلند سر همسرش داد زد.
139	خانم که همسایه اذیت کرد با صدای بلند سر همسرش داد زد.
140	خانم که همسایه را اذیت کرد با صدای بلند سر همسرش داد زد.
141	خبر نگارهایی که شور شیها تشویق کردند توسط پلیس دستگیر شدند.
142	خبر نگارهایی که شور شیها را تشویق کردند توسط پلیس دستگیر شدند.
143	خبر نگارها که شور شیها تشویق کردند توسط پلیس دستگیر شدند.
144	خبر نگارها که شور شیها را تشویق کردند توسط پلیس دستگیر شدند.

Appendix C

Four items with their four versions which were added to the stimuli sentences in reading comprehension experiment in Chapter 7.

ITEM 37

ORES The professor that the student criticised turned away angrily.

SRES The professor that criticised the student turned away angrily.

ONONRES The professor, whom the student criticised, turned away angrily.

SNONRES The professor, who criticised the student, turned away angrily.

ITEM 38

ORES The client that the psychologist confronted attacked her in the night.

SRES The client that confronted the psychologist attacked her in the night.

ONONRES The client, whom the psychologist confronted, attacked her in the night.

SNONRES The client, who confronted the psychologist, attacked her in the night.

ITEM 39

ORES The golfer that the caddy liked played on the professional tour.

SRES The golfer that liked the caddy played on the professional tour.

ONONRES The golfer, whom the caddy liked, played on the professional tour.

SNONRES The golfer, who liked the caddy, played on the professional tour.

ITEM 40

ORES The civilian that the soldier assisted died near the end of the war.

SRES The civilian that assisted the soldier died near the end of the war.

ONONRES The civilian, whom the soldier assisted, died near the end of the war.

SNONRES The civilian, who assisted the soldier, died near the end of the war.

Appendix D

Sociolinguistic and Personal Questionnaire

- 1. Name:
- 2. Age:
- 3. Nationality:
- 4. Gender: Male Female
- 5. What is the highest level of education you have completed?
- 6. What is your current profession?
- 7. Do you have trouble reading? Yes No
If so, please specify that problem:
- 8. Do you have an eyesight problem? Yes No
If so, please specify the problem:
- 9. What is your first language?
- 10. What language(s) did you acquire before starting school?
.....
- 11. When and how did you acquire the English language?
.....
- 12. When and how did you acquire English?
- 13. What languages did you acquire at school or at work?
.....
- 14. What languages did you acquire out of school and work?
.....

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