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Faculty of Humanities, Social Science, and Teacher Education

STUDY OF THE BOTTLENECK HYPOTHESIS IN L2 ACQUISITION: *The acquisition of functional morphology and syntax by Persian L2 learners of English*

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Abstract (max150 words):

The current study tried to test the Slabakova's Bottleneck Hypothesis which claims that "*functional morphology is the bottleneck of the SLA*" (Slabakova, 2006, 2008, 2013). A total of 44 participants in 3 groups answered three kinds of questions including Proficiency Test, GJT, and Background questionnaire. Subject-verb agreement and past tense -ed were selected to test functional morphology while two declarative sentences including subject initial and non-subject initial sentences were chosen to test the word order. The correlation of language proficiency, age, length of exposure with the Judgment Test also involved in the analysis. The results fully support the Bottleneck Hypothesis even though one of the morphological conditions had a high mean score in the Judgment Test. Subject-verb agreement (third-person singular -s) has been the most difficult conditions. Past tense -ed, non-subject initial sentences, and subject initial sentences were in the hierarchy of the difficulty respectively.

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Minoo Gholami

TABLE OF ABBREVIATIONS

TERMS	DEFINITION
BH	BOTTLENECK HYPOTHESIS
L1	FIRST LANGUAGE
L2	SECOND LANGUAGE
SLA	SECOND LANGUAGE ACQUISITION
TL	TARGET LANGUAGE
LAD	LANGUAGE ACQUISITION DEVICE
P	P-VALUE
ST.ERR	STANDARD ERROR
GJT	GRAMMATICALITY JUDGMENT TEST
AJT	ACCEPTABILITY JUDGMENT TEST
UG	UNIVERSAL GRAMMAR
VP	VERB PHRASE
DP	DETERMINER PHRASE, ECTENSIONOF NOUN PHRASE
SOV	SUBJECT OBJECT VERB
SVO	SUBJECT VERB OBJECT

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1 INTRODUCTION

A number of studies have been done in the field of Second Language Acquisition. Also, many theories and Hypotheses have attempted to study the cognitive process of the first and second language acquisition. In the given thesis, the Bottleneck Hypothesis proposed by Romyana Slabakova (2006; 2008; 2013) is tested by Persian learners of English. The goal of this thesis is to take into account how Persian speakers acquire the English functional morphology. In the present study, it is attempted to observe the cognitive process of functional morphology acquisition. Bottleneck Hypothesis suggests that the functional morphology is the bottleneck of the Second Language Acquisition (SLA) which means functional morphology is the most difficult part of the second language to acquire; in other words, other linguistic domains like syntax and semantics are easier to be acquired than functional morphology. It is worth mentioning that the framework of the Bottleneck Hypothesis is based on Generative linguistics of Chomsky (1957), (1965) who considers Universal Grammar (UG) as part of the innate language faculty limited by linguistic universals. In fact, the Bottleneck Hypothesis tries to investigate the most difficult cognitive process. In the case of the cognitive process, it should be pointed out that Selinker (1972) proposed five cognitive processes related to the term "*interlanguage*" of second language acquisition (see section 2.1).

This thesis focuses on two linguistic domains including syntax and functional morphology in order to investigate the most difficult part of second language acquisition. Based on the Bottleneck Hypothesis, the acquisition of syntax will be easier for Persian L2 learners of English. Although there will be mismatches in verb inflection and syntactic structure between English and Persian, it is hypothesized that the performance of the acquisition of syntax will be more successful than functional morphology. In order to test the Hypothesis, three questions are addressed in the following.

RQ1: Is functional morphology more difficult to acquire than narrow syntax in L2 acquisition?

RQ2: Are the two morphological conditions equally difficult in L2 acquisition?

RQ3: Which of the morphological and syntactic conditions is a more persistent problem in L2 acquisition?

Research question 1 focuses on the Bottleneck hypothesis's predictions that the acquisition of functional morphology is more difficult than narrow syntax. In order to compare

these two phenomena, the experiment is designed, and the performance of the participants indicates the functional morphology and syntax acquisition process.

Research question 2 is also related to the Bottleneck Hypothesis. Two constructions including past tense -ed and subject-verb agreement (third-person singular -s) have been selected to test functional morphology while word order including declarative subject initial and non-subject initial sentences tests the syntax. These constructions are considered since certain similarities and differences between verb inflection and word order in Persian and English. Persian is a prodrop language. Since the subject is optional and the ending of a verb agrees with its subject, personal suffixes play an important role in the construction of Persian verbs. In this study, the formal language will be studied since the verb endings in formal and informal language are different (see section 2.4.1). In the case of the past tense, Persian does not have any tense marker in the verb and L1 Persian speakers intuitively recognize the verb because it is built immediately after the omission of the infinitive suffix of /æn/. So, based on the results of all previous studies related to BH (Jensen 2016, Jensen2017, Slabakova & Gajdos and Basnet 2017), it is expected that there will be a hierarchy of difficulties in the results of morphological and syntactic conditions, but in the case of the morphological conditions, it is expected that there will be more possible reasons to explain if one of them is more difficult than the other.

Research question 3 goes deeply beyond the assumed hierarchy and asks the most persistent problem of the conditions whether it will be syntactic or morphological. It also asks the most difficult and persistent problem of each condition. Based on the results of Jensen (2017) which did not fully support the Bottleneck Hypothesis, it is expected that the other reasons like an L1 transfer can be effective on the difficulty of a condition. In the current study, it is tried to include considering the possible reasons regarding the results of each condition.

The given study is inspired by Jensen (2016) who designed the test particularly for testing the Bottleneck Hypothesis for the first time, and Jenson (2017) tested one more construction (past tense -ed and third-person singular-s) for functional morphology. The results in Jensen's (2016) test supported the Bottleneck hypothesis as functional morphology is more difficult than syntax while Jensen's (2017) results do not entirely support the Bottleneck Hypothesis since past tense -ed was easier than one of the syntactic conditions. She explained the results based on L1 transfer and interpretability (see section 2.5.3). These differences in the results made me interested to work on the present experiment in Persian and English. Since not many studies have been done on difficulties of English as a second language for L1 Persian speakers, and particularly no study has been done on Bottleneck Hypothesis on the Persian

language, I decided to test the Hypothesis in the hope that results will help the pedagogy of English.

The methodology employed to conduct this research is inspired by Jensen (2016)but it differs in some aspects. An off-line experimental method is implemented, and all participants have answered three kinds of tests including 1) an English proficiency test, 2) a background questionnaire, and 3) a Grammaticality judgment test to collect the data regarding the acquisition of the selected conditions. In this study, 44 participants in three age groups between 16-23 with different backgrounds of English proficiency answered the 3 tests. Two groups from the 10^{th} and 11^{th} school grades and one group of university students. Among 44 participants of this study, 11 students are in the 10th grade and aged 16 years old, 20 participants are in the grade 11 and are 17 years of age, and 13 participants make up the university group and are between the ages of 21-23. The main test as mentioned was based on a Grammaticality Judgment Test including 45 sentences that the participants had to answer the questions were shown on a screen via a projector. Each question was shown on one slide, and the students had 20 seconds on each slide to decide whether the sentence was wrong or right. They were supposed to write their decision on the answer sheet. Each slide was played only once because of the aim of the test that was testing the judgment of the participants. All 45 sentences of the test were also pseudo-randomized to avoid repetition, and two constructions of the same sort do not follow each other.

The results of this study which were the output of the Proficiency Test and Grammaticality Judgment are analysed. The proficiency test results are also analyzed and certain components like the length of exposure and age are included in this analysis. In the Grammaticality Judgment test also, the participants divided based on their grades of study (see section 4.2), and the effects of age, length of exposure, and proficiency test are also investigated in the analysis of this experiment. The results of this experiment support the predictions when they show the hierarchy in the conditions. The results show that both morphological conditions are more challenging than two syntactic conditions. Although the results of one of the morphological conditions, past tense -ed, were close to the results of the syntactic condition, the judgment mean score of this condition is still lower than both syntactic conditions. In the case of two morphological conditions, the results of this test fully supported the previous studies of Jensen (2016) and Basnet (2017) when the morphological conditions are more difficult to acquire than the syntax. The agreement also has the lowest judgment mean score which shows that it has been the most difficult condition among all other conditions which is relatively the same results as Jensen (2016), Jensen (2017), and Basnet (2017).

The results fully support the Bottleneck Hypothesis even though the judgment mean scores of the past tense -ed is close to other syntactic conditions and can be considered as an easy condition. Based on Slabakova (2013), functional morphologies are the part of the language that must be learned lexically while syntax is part of the UG and can be transferred from L1 (see section2). The reason why the agreement is more difficult than past tense -ed is discussed based on Morales's (2014) studies on verb inflections of L1 and L2 who claimed that languages with rich verb inflection may have problems with poor verb inflection system. Since Persian has richer verb inflection in the present tense than English, the agreement third-person singular-s is more difficult for Persian learners while English past tense inflection is richer than Persian in the case of the tense marker; therefore, the past tense -ed is easy for Persian learners. Moreover, the results indicate a correlation between language proficiency and all conditions particularly the agreement even though this condition has the lowest mean score. The correct judgment mean-scores increase when language proficiency improves.

The current thesis is structured into 9 chapters as follows. While chapter 1 is the introduction, chapter 2 discusses the theoretical framework of the thesis, constructions used in tests, and previous studies related to the Bottleneck Hypothesis. Chapter 3 includes the research questions and predictions of the experiment. The methodology of the tests and details about test material, participants, and the procedure is discussed in chapter 4. The results of the tests including the Grammaticality Judgement Test and Proficiency Test are presented in chapter 5. Also, the analysis of these results is discussed here based on the figures and tables. Chapter 6 contains the discussion while it is tired to answer the research questions based on the results. Also, the conclusions of the study are mentioned in chapter 7. All references are mentioned in chapter 8 while the appendices are presented in chapter 9.

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2 LITERATURE REVIEW

Since the current study is intended to test the Bottleneck Hypothesis, testing whether the functional morphology is more difficult than narrow syntax or not, the related theoretical background of this experiment is discussed in this chapter. Certain important fields including the second language acquisition, the Transfer, and the Bottleneck Hypothesis which all are based on generative linguistics, are reviewed. Section 2.1 addresses the theoretical background of second language acquisition in generative linguistics. The theory of transfer has been discussed in 2.2 and the Bottleneck Hypothesis is introduced in section 2.3. In sections 2.4, a comparison between the Persian and English languages, including the constructions and sentences used in the main test is illustrated, and in 2.5, the final section of this chapter, some previous studies on the aforesaid hypothesis are introduced.

2.1 Second Language Acquisition

Second language acquisition is one of the most important subjects in Linguistics which has been widely studied over recent years. There are also some definitions from different points of view, all with one aspect in common to which Ellis (1997, p. 3) refers: "other than mother language, people attempt to learn another language inside or outside the classroom." However, acquisition of L2 follows some objectives including a description of the L2 and identification of the "*external and internal factors*" that influence the acquisition process. While external factors are those that characterize the particular language learning situation and concentrate on the type of input the learners receive, internal factors focus on the cognitive mechanism of the acquisition that lets them extract information of L2 from the input. The term "interlanguage" was first introduced by Selinker (1972) is a unique systematic concept developed by an L2 learner that effects the learner's first and target language and at the same time is different from both of them. Also, he considers five different processes for SLA including " *language transfer, transfer of training, strategies of second language learning, strategies of second language communication, and overgeneralization of TL linguistic material*." (Selinker, 1972, p. 229). Furthermore, he proposed this idea based on principles of nativism for L1 acquisition which claimed that language belongs only to human beings while input is required as a trigger to activate language acquisition device (LAD)[1].

[1] "In early generative grammar (e.g. Chomsky 1965) it was proposed that human infants have a special mental function – the LAD – whose job it is firstly to analyze the samples of language a learner encounters and assign those samples grammatical descriptions. Secondly, it must evaluate the set of possible grammars that results from this process to find the one that best fits all the primary linguistic data." (Herschensohn & Young-Scholten, 2013, p. 719)

According to Gass (2013, p. 160), nativism has two subcategories including "*general nativism and special nativism*". In the general account of nativism, general principles of instructed language acquisition are not specific to language learning. No established mechanism is defined in general nativism while special nativism includes theories of learning which are specific to language learning. This and other formal approaches mainly concentrate on the analysis of the linguistic system underlying Learners `L2 development. "In fact, while functionalists mostly focus on semantic, discourse, and pragmatic concerns during investigating the learners' language and their developmental stages, nativists and then generativists concentrate on morpho-syntactic and phonological aspects of the language" (Myles, 2013, p. 57).

The present thesis in *the Generative approach* is based on a special nativism account that will focus on the acquisition of functional morphology and syntax. Gass (2013, p. 160) refers to special nativism as Universal Grammar (UG) which was first introduced by Chomsky (1965) who argued that "a language is composed of some principles and parameters in which the principles provide the parameters for a given specific setting in different languages" (Ellis R. , 1997, p. 65). Chomsky's definition in 1995 considers UG as a theory of language and the resulting linguistic module is universal grammar while the theory of a specific language is just a grammar of that language. Actually, in the UG theory, the mental grammar which relates sound patterns with meaning is developed by universal principles and they all belong to the human mind`s properties. (Gass & Selinker, 2008, pp. 160,-161)

In learning L1, children have to trust their innate knowledge of the language. Ellis (1997, p. 66) explains the idea put by Chomsky as such: only children's exposure to language doesn`t provide vast quantities of linguistic input and these children are not able to discover the rules of the language they are learning. This inadequacy is known as the poverty of the stimulus. In fact, Chomsky presented UG to define the "*initial state*" of language faculty as a set of principles and parameters in order to explain the logical problem of language acquisition. Based on Myles (2013), one position is that "UG *is available to second language learners in the same way that it is available to the child`s first language*". Like L1 acquisition, L2 learners' hypotheses about L2 are constrained by the restricted possibilities involved in UG. (Myles, 2013, p. 59)

As White (1989, p. 37) indicates, the L2 projection problem motivates the claims for UG as in L1 acquisition and since some properties of language are not explicit in the input,

there is a mismatch between the type of input accessible to L1 acquirers and their final output. As a matter of fact, White considers the same mismatch between L2 learners' input and their output in L2 acquisition. If these problems with language input still hold in this context, then UG probably also plays a role that innate linguistic principles mediate L2 acquisition.

UG can help to solve the L2 projection problem with innate linguistic principles that mediate L2 acquisition if input problems still hold in this context. All these issues can be illustrated as follows in Figure 2.1:

Figure 2. 1: Input and L2 Grammar, (White, 1989, p. 37)

Two alternative approaches including" *solved L2 projection problem*" without UG and "*unsolvable projection problem*" i.e. L2 learners may never attain a grammar which goes beyond the input in any significant aspect despite the fact that indication of L2 projection problem motivates claims for UG. White (1989, p. 48) also discussed some logical possibilities between UG and L2 acquisition including availability and adequate performance of UG in L1 acquisition, unavailability of UG in L2, and availability of UG to L2 acquisition through L1 grammar. This latter view considers two hypotheses: 1) UG is available and works exactly as it does in L1 acquisition even though it is inaccessible and 2) UG parameters are assumed by L2 learners initially but are still able to tap UG. As a result, they can reset to L2 parameter settings.

Ellis (1997, p. 69) states some theoretical positions on the access of UG. He mentions "*complete access, no access, partial access, and dual access*" as theoretical positions on the access of UG. Complete access claims that parameter settings of L1 learners are started by themselves; however, they learned to switch to L2 parameter settings subsequently so that full target language competence is possible.

In contrast, No access hypothesis claims that UG is not available in adult L2 learners. Moreover, L1 and L2 are totally two different issues and it is impossible for the adult L2 learners to achieve "full target language competence". On the other hand, partial access considers the partial accessibility of UG to L2 learners assuming that UG regulates only some parts of L2 acquisition. Thus, general learning strategies regulate the other parts of L2

acquisition; in other words, the learners have access to only some parts of UG. Ellis (1997, p. 69) explains that in dual access, UG and general learning strategies are used by L2 learners, but the performance of UG can be blocked by learning strategies that cause impossible errors and L2 learners' failure to achieve full competence. In order to gain a better understanding of the access to UG in L2 acquisition and the role of the L1 in the acquisition of L2 I will discuss the theory of the transfer in the following section.

2.2 Transfer

Language transfer has been an important, challenging, and relatively controversial subject in second language acquisition and it is difficult to have a fully adequate definition of transfer. The role of L1 with its both "positive and negative" effects is undeniable. Language acquisition is a creative process in which there is an interaction between L1 grammar and exposure to L2 grammar. The process of L2 learning is a continuous process so that as long as learners continue to learn, the internal representation which is their interlanguage competence is changing and developing (Corder S. P., 1992, p. 20).

In order to explain the initial state and transfer of L1, White (2003, p. 60)considers two logical possibilities: " *the grammar of L1 as initial state or UG is the initial state*". She considers the initial state as indeed a specific grammar and it is assumed that L2 learner begins with grammatical representations. These grammatical representations by her idea partially or completely are taken from L1 grammar. She considers five categories including *Full Transfer/Full access Hypothesis, Minimal Trees Hypothesis, Values features, initial Hypothesis of syntax and Full Access (no transfer)* all of which assumed that UG constrains interlanguage grammar despite the fact that some "*accounts imply an impairment*" to some "UG-related domains". In fact, this issue that the L2 learner may start by adopting a particular grammar representation (based on the L1) doesn't avoid "UG-constrained" changes in response to the properties of the L2 input. (White, 2003, p. 60)

Gass (2013) introduces the "*initial state*" in "*Full Transfer /Full Access Hypothesis"* introduced by Schwartz and Sprouse (1996), as a particular grammar assuming that L1 grammar is the initial state and the starting point while during the whole process there will be full access to UG. (Gass S. M., 2013, p. 168) . When L1 is not sufficient for learning tasks in order to gain full access to the UG, the learners utilize the L1 grammar as a basis. Moreover, because of the differences between L1 and L2 learning and it is difficult to predict the full access of the learners to the L2 grammar. L1 and L2 are different so that having complete knowledge of L2 is not predictable because it is impossible to reach L2 grammar if it is started

with an L1 grammar assuming that only positive evidence can be helpful for grammar formation. In other words, L1 grammar contains the L1 parameter settings that constitute the initial state of the L2 acquisition. Lexical categories are excluded from Full Transfer conveying this notion that the initial state is made up of the L1 grammar while Full Access hypothesis claims that UG is fully accessible to L2 learners during the process of L2 learning. In section 2.1, I explained that when a learner initiates the L2 acquisition process, and interlanguage is developed and consequently, a set of parameters also will be reset and the UG will be completely accessible.

According to Gass (2013, p. 168), "*Minimal Trees Hypothesis"* like the Full Transfer/Full access Hypothesis, holds that the initial state is a grammar but some parts of L1 grammars are included in the initial state whereas functional categories are absent at the initial state because functional categories are not from the L1 and there will be no transfer in it while "*lexical categories and their linear orientation*" can be transferred from L1 demonstrating that while an L2 learner attempts to learn the target language, the functional categories will be learned gradually through interlanguage. Acquisition of functional categories from different languages follows the same process of language development and depending on the L1 and L2 grammar of one's language, learners from one language may never be able to gain access to the L2 if they cannot have access to the final state or L2 grammar (2013, p. 168).

Therefore, based on Langfen (2010), linguists from behaviourists, nativists, cognitivist, and relativists have different points of view on language transfer and consider different reasons for it. SLA research also tried to find the reasons for the process of transfer. Behaviourists acknowledged the role of the native language, but they focused on the native language and forgot the other factors like individual differences. Cognitivist, on the other hand, considers some cognitive features during the L2 acquisition. Kellerman (1977) included some factors like "perception, problem-solving, information processing, and memory". Furthermore, based on SLA research, some reasons and factors are also included during the process of Language transfer. As Ellis (2000) considers certain factors like different linguistic level (syntax, semantics), social factors, markedness of a language, language distance, and prototypicality. Odlin (1989)'s point of view about the complexity of transfer which is the combination of various factors beyond the sole native language transfer made him define a language transfer as: "*Transfer is the influence resulting from similarities and differences between the target language and any other knowledge that has been previously (and perhaps imperfectly) acquired*". (Odlin, 1989, p. 27).

Furthermore, "*intra-group homogeneity, inter-group heterogeneity*" and similarities between interlanguage performance and L1 are the three criteria required to figure out language transfer while at least two of these criteria are needed to have reliable evidence of transfer (Ellis R. , p. 354). As mentioned above, measurement of the cross-linguistic influence is also an issue when studying the language transfer. Error or negative transfer, facilitation or positive transfer, avoidance, and overuse are some possible measures.

There is some evidence in the language transfer literature indicating that the learner`s use and acquisition of L2 are affected by their L1. Hence, Ellis (2008, p. 352)distinguishes between communication and learning and claims that the effects of transfer in communication fail to show the learner`s interlanguage system figured out by the forms of L1. He refers to Corder`s (1983) view of transfer as "borrowing" which is a communication strategy and also is a "performance phenomenon", not a learning process. He believes that borrowing is a feature of language use and not of language structure.

In short, transfer from the first language (L1) concerns the effects the learner`s L1 has left on the acquisition of an L2. This effect can be called negative transfer when the learners' L1 is one of the sources of error while positive transfer claims that the learner`s L1 can facilitate L2 acquisition. It can be observed that when the learners find certain linguistic structures complicated or difficult, they try to avoid using them due to the differences between their L1 and their target language. The L1 effect shows itself in what learners avoid using which leads to the omission of difficult structures. On the other hand, sometimes the learners overuse some structures in the target language which can be the result of an interlingual process; in other words, one of the results of the interlingual process is similar to overgeneralization of the regular past tense inflection which is used in irregular verbs, too. (Ellis R. , 2008, p. 354)

2.3 The Bottleneck Hypothesis

Bottleneck Hypothesis which firstly is proposed by Roumyana Slabakova (2006, 2008, 2013), suggests that "*functional morphemes and their features are the bottlenecks of L2 acquisition*". Since this idea has been a serious concern in second language research and based on the comparison of the research results in the acquisition of functional morphology, syntax, syntax-semantic, and syntax-discourse, Slabakova`s hypothesis is on basis of the Generative theory which considers the language competence as a grammar that allows perception and production of the language. So, syntax, semantics, and phonology are part of this system of UG (Universal Grammar) and UG Principles (Universal Properties), which are transferable from L1 despite the fact that "*Parameter Values*" are not the same with the target language but still

available from UG. These parameter values are known as potential sources of L2 language acquisition (Slabakova, 2013, p. 6). Before discussing the details of the Bottleneck Hypothesis, it is worth mentioning briefly what functional morphology is. While lexical categories include nouns, verbs, adjectives, adverbs, and so on that are known as "*content words*", the functional categories are those words that play particular functions like articles or categories containing grammatical morphemes, including plurals and tense markers which can be assumed as grammatical elements. Some examples of functional categories are determiners, complementizers and grammatical markers (past tense ending, case marking, plural endings and gender marking) which all stand for a fixed set of words in any language (Gass S. M., 2013, p. 165)

The acquisition of functional categories has been a vital issue in the L2 acquisition approaches. If the functional features are accessible at an early stage of L2 learning, many questions about language acquisition will be answered. As mentioned in section 2.2 certain approaches have been applied when considering the transfer process in L2. Gass (2013, p. 167) also mentions certain approaches in the acquisition of the functional categories including the *Representational Deficit Hypothesis*, *Missing Surface Inflectional Hypothesis*, *Prosodic Transfer Hypothesis,* and *Shallow Structure Hypothesis*. Gass (2013, p. 167) has a summary on these approaches as following:

The *Representational Deficit Hypothesis* which is also called the *Failed Functional Features Hypothesis* argues that only features that exist in L1 can be transferred to L2, while the Missing Surface Inflectional Hypothesis considers no underlying representational (syntactic) deficits. *In the Prosodic Transfer Hypothesis*, the L1 transfer of phonological representations causes one to not be able to acquire the L2 morphology by L2 learners. The *Shallow Structure Hypothesis;* on the other hand, compares the acquisition process in L1 grammar and L2 learners, and proposes that sentence processing can be native-like only if the representation involves "closely adjacent constituent[s]". So, it considers fundamental differences between native speakers and L2 learners in sentence processing. (Gass S. M., 2013, p. 167).

Based on what is discussed in section 2.1 on the Full Transfer/Full Access Hypothesis view on the acquisition, functional morphology acquisition for L2 learners happens through lexical learning which is a complicated and challenging task while in order to acquire the narrow syntax the learners can use positive transfer or access to UG. Thus, it is predicted that acquiring functional morphology is more problematic than the other linguistic domains like syntax in L2 acquisition (Slabakova, 2013, pp. 5,14,24,25).

Gass (2013, p. 180) states that based on the Bottleneck Hypothesis, learners can acquire syntax and semantics while the acquisition of inflectional morphology and formal features remain problematic. Based on Slabakova (2013, p. 5), inflectional morphology can precisely show the syntactic and semantic differences between languages, and the acquisition of these features is the bottleneck of L2 language acquisition. In other words, there are certain features in inflectional morphology, which represent the syntactic and semantic differences among world languages. Slabakova proposed Bottleneck Hypothesis in order to answer the question as to whether the knowledge of functional morphology motivates the acquisition of syntax, or if syntax precedes the knowledge of morphology. Slabakova suggested the Bottleneck Hypothesis according to White `s (2003, p. 182) perspective on ideas of *morphology-before-syntax* and *syntax-before-morphology* (Slabakova, 2013, p. 6). This is, therefore, in support of the idea that syntax is easier to acquire before morphology. Furthermore, functional morphology is the bottleneck of the L2 language acquisition as it reveals all the formal features of grammar, which are difficult to produce and comprehend. Processing studies also indicate the differential difficulty of functional morphology since it carries higher syntactic information.

Slabakova (2013, pp. 10,12,14) surveyed the relative difficulty of the subject-verb agreement and past tense. She compared these two constructions with word order, which shows that functional morphology for L1 children is also so challenging that native learners have problems with functional morphology. She also considers the possibility of acquiring the "*syntactic meanings encoded in a piece of inflectional morphology before the realization of obligatory usage*" of the same morphology in that language. Based on White (2003), she emphasizes that "*overexpression and underlying knowledge of abstract syntactic features might be dissociated*" (Slabakova, 2013, p. 9). She also provides evidence for this dissociation which is seen in child and adult production of L2 English by referring to the White's consideration of some studies like "*Lardiere (1988), Ionin & Wexler (2002) and Haznedar (2001)'s experiment*" which these studies show a clear separation between the "*incidence of verbal inflection and the other syntactic constructions related to it; such as overt subject and the verb staying in the VP*," see (Slabakova, 2013, p. 10) .

In another test conducted by McDonald (2006) which attempted to test several constructions and general cognitive measures in children and adult speakers, a relationship between "*emergence and error rates in the functional morphology process against the syntax*" across adult native speakers has been observed. The prominent part of the results was that subject-verb agreement and regular past tense, which were found to emerge last and were also

the hardest part to be processed. The results showed that even the oldest group of child participants could not have the adult`s level (Slabakova, 2013, p. 13).

For a better understanding of the acquisition procedure in different linguistic properties, it should be pointed out what Slabakova (2013, p. 7) shows as language architecture. This is the clear idea of different units that compose the language faculty and their interaction. This reveals those parts of the language that come easily from the L1 and those which must be learned. Reinhart (2006) modified the "*modular design*" of the language faculty shown in Figure 2.2 (Slabakova, 2013, p. 7).

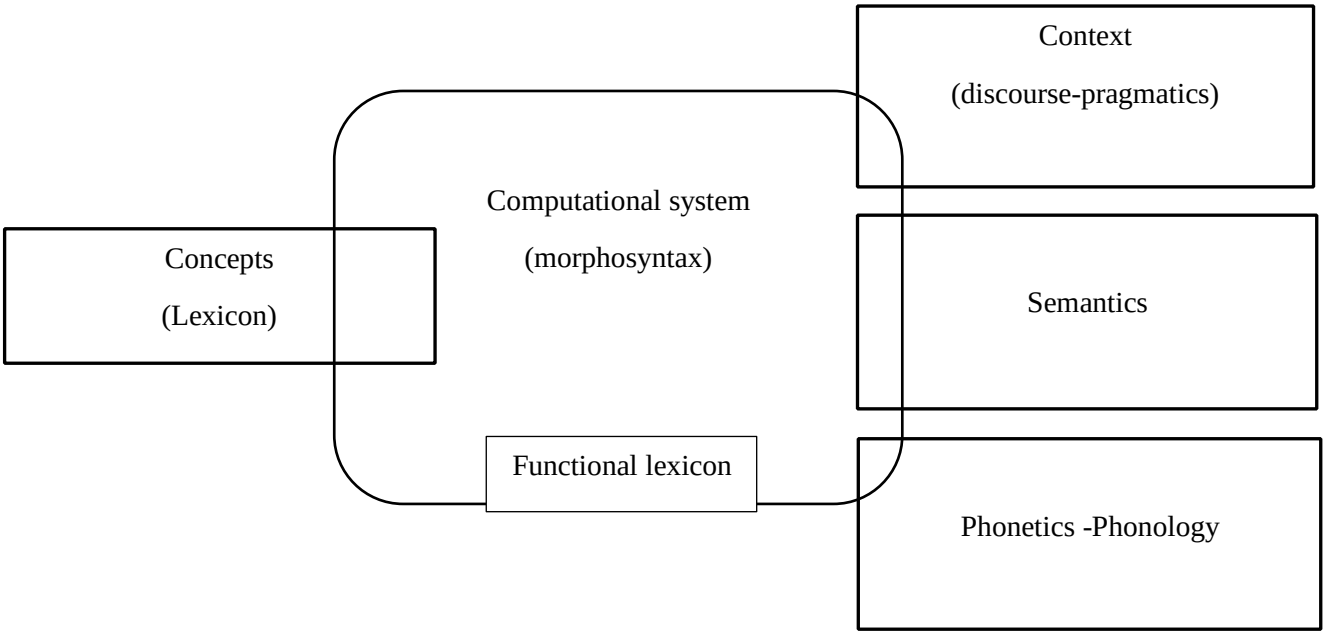


Figure 2. 2: Modular design of language faculty, (Slabakova, 2013, p. 7)

Based on the explanation provided by Slabakova (2013), computational systems accept the lexical items from the lexicon, then syntactic operations including merging, agreeing, and selecting can make bigger structures like phrases. All principles and parameters are in the computational system. All formal features will be checked by syntactic operations and this will continue by the time that all of the lexical items will be checked and all numeration will be "exhausted" (Slabakova, 2013, p. 8). Also, visible and invisible movement are found in computational systems. On the other hand, the phonetic-phonological system is used for pronunciation and the semantic system is responsible for the meaning and interpretation. It is observable from the model that the discourse-pragmatic system also has interaction with the computational system.

2.4 Constructions

This chapter discusses the constructions used in this experiment. As this experiment mainly focuses on testing the Bottleneck Hypothesis which argues that functional morphology is more challenging to acquire than narrow syntax, the construction used here has been chosen based on functional morphology and syntax. Subject-verb agreement and past tense were chosen to test the functional morphology while word order was a representative of narrow syntax. Declarative sentences include subject-initial declarative clauses, and non-subject initial declarative clauses will be discussed in this chapter. Since the two focus languages in this study i.e., English and Persian, have different morphological and word order systems, the aforesaid constructions will be discussed separately.

2.4.1 Subject-verb agreement

In modern English grammar, the agreement is "*the relationship between two grammatical units such that one of them displays a particular feature (e.g. plurality) that accords with a displayed feature on the other*" (Quirk, R, Greenbaum, S, Leech, G, & Svartvik, J, 1972, p. 755). It simply means that a singular subject takes a singular verb and if a subject is plural, its verb must also be plural and conveys a relationship between two or more elements in a sentence. This can be explained by an example of the subject-verb agreement which is, in fact, a link between subject and verb.

Vigliocco, Butterworth, & Garrett, (1996, p. 271)consider the third person singular as the marked and third-person plural as unmarked in the present tense. Moreover, Johnson, de Villiers, & Seymour (2005, p. 318) argue that third person singular is a verbal agreement or "concord marker" even though this morphological marker has always been considered as tense and agreement marker while tense marker in Persian is different from the agreement in the present tense (see table 2.1).

On the other hand, Mahootian (1997), classifies Persian as a pro-drop language with SOV word order. Also, she mentions Persian as a nominative-accusative language. Personal suffixes are vital in Persian since the subject can be dropped and the suffix ending of a verb is in the agreement with its subject. Since the subject is not obligatory, verb endings are crucial in both formal and informal language. Moreover, in the given study formal language is discussed because verb inflections in formal and informal language are different. In the following section, the verb inflection and agreement with related examples in Persian have been introduced, and in the second part, verb endings in Persian verbs are shown in table 2.2.

2.4.2 Verb inflection in Persian and English

Persian verb inflections in the present tense have been represented in the following table. This table is taken from the past tense verb conjugation presented in table 2.6 by Lotfi (2012). Table 2.1 and the differences in past tense verb inflections in Persian and English will be explained in the next section.

Table2. 1: *Verb inflection for "raftæn" (to go)*

	1st s person	**2nd person**	**3rd person**
Singular	mi(tense marker)-rav-am	mi-rav-i	mi-rav-æd
plural	mi(tense marker)-rav-im	mi-rav-id	mi-rav-ænd

Both singular and plural verbs are illustrated in this table. The full conjugation endings of Persian verbs in the present and past tense are given in table 2.2

Table2. 2: Verb endings of the Persian

Person	**Formal verb ending**
1 SG	/-æm/
2 SG	/-i/
3SG	/-æd/, Ø
1 PL	/-im/
2PL	/-id/
3PL	/-ænd/

Examples (5) and (6) of third-person singular are as follows:

(5) Mariam be daneshgah mi-rav- æd.
3SG to university goes
"Maryam goes to university."

(6)[2] yek tumor dar maghze Mariam hast-Ø.
One tumor in brain of Mariam exists.
"One tumor exists in Mariam's brain."

[2] Example (6) presents a verb (hast) in Persian. It is worth mentioning here since the verb has a high frequency.

The present tense is constructed by accepting the present stem of the verb, adding the prefix (mi-), and conjugating it. Table 2.3 illustrates this conjugation and the inconsistency between English and Persian.

Table2. 3: Present tense, subjective pronoun, and respective examples

Sub-pro	Person	Pronoun	Present tense /mi/	Examples
Man	1st person pronoun SG	I	mi-xor-æm	I eat
To	2nd person sg	You	mi-xor-i	You eat
U	3rd person sg	He /she/it	mi-xor-æd	He/she eats
Ma	1st person plural	we	mi-xor-im	We eat
Shoma	2nd person plural	you	mi-xor-id	You eat
Ishan	3rd person plural	they	mi-xor- *ænd*	They eat

It is worthwhile to mention that in the case of plural inanimate subjects, Feizmohammadpoor (2013, p. 35) shows that the verb for these kinds of subjects can be singular, i.e. when the subject of the sentence is the third-person plural and inanimate, the verb is optional. In this case, it is possible to use both alternatives of third-person singular and third-person plural. In fact, both forms are considered grammatical; inanimate third-person plural form is an exception and this rule does not apply to animate nouns. This is indicated in Example (7).

(7) bærge-ha xis shod-ænd /shod
paper-PL wet became-3PL / became.3SG (Feizmohammadpour, 2013, p. 35)
'The papers became wet.'

According to Mahootian (1997), personal endings play a vital role because all subjects are coded on the verb through those endings that exhibit person and number agreement so that if the subject is pro-dropped, it will be coded on the verb. There is also a person and number agreement between subject and verb in English expressing that the verb is required to reflect the agreement if the subject of the clause is singular or plural.

On the other hand, Johansson (2018, p. 5) demonstrated that English verb forms can vary and all forms of the verbs agree with the subject of the sentence. Subjects and verbs must usually agree with one another in person and number which is referred to as "overt-agreement". Since singular verb ending-s in simple present tense follows a singular subject, third person

singular can be an exception. As a result, Johansson (2018) offers some examples like He/she write-s and the dog bark-s (see example 8). Other singular and plural subjects don't need any addition of verb endings. Verb inflections in English are presented in table 2.4.

(8) a. He/she write-s

3SG verb-verb ending

b. The dog bark-s

3SG verb- verb ending

c. The dogs bark

3PL verb

(Johansson, 2018, p. 5)

As English is considered a non-pro-drop language, verb conjugation is presented with subjects (personal pronouns) in the following table2.4.

Table2. 4: Verb conjugation in English

Number	**1st person**	**2nd person**	**3rd person**
Singular	I write	You write	He/she write-s
Plural	We write	You write	They write

2.4.3 Past Tense Morphology in English and Persian

In English, the suffix-ed is added to the verb in order to make past tense and past participle of regular verbs. On the other hand, other verbs that do not follow the normal pattern of inflection are irregular that have to be memorized. The regular past tense is selected in this study to test the functional morphology. Bloch (1947, p. 402) considered some verbs like waited, passed, "and lived /weyt-ed, pos-t, liv-d/" and pointed out that these verbs illustrated three phonemic forms of the past tense suffix. In fact, choosing any of these alternatives depends on the last phoneme in the base form of the verb while some verbs " like "dwelt" /dwel-t/, instead of the expected /dwel-d/, " can explain that the" transition among the three forms is not completely determined by this criterion" (Bloch, 1947, p. 402). He also considered a zero suffix for some verbs such as "put". Therefore, in this study, the focus is on the regular verbs while their past tense is made by adding -ed to the base form of the verb. Table 2.5 represents verb inflection of the past tense in English grammar.

Table2. 5: English verb inflection for the verb "show/" (past tense)

Number	**1st person**	**2nd person**	**3rd person**
Singular	I showed	You showed	He/she showed
Plural	We showed	You showed	They showed

However, the past simple is formed with the infinitive stem and personal endings in Persian. There is no personal ending for the third-person singular and it is the past stem alone. According to (Bloch, 1947), zero endings are attached to the verb stem.

In the table, 2.6 conjugations of simple past in Persian are presented. Number, person, and tense are also provided, and it shows the simple past tense of the infinitive /raftæn/ (to go) in Persian. It is worth mentioning that there is no tense marker for the simple past tense and what is added to the verb is the pronoun which shows the person. The past tense in Persian is made by the only deletion of the infinitive suffix /æn/.

Table2. 6: Verb inflection for the past tense of "raftæn" (to go), (Lotfi, 2013, p. 125)

Number	**1st person**	**2nd person**	**3rd person**
Singular	Raft- Ø - æm "I went"	raft- Ø -i "you went"	Raft- Ø- Ø "she/he went"
Plural	Raft- Ø -im "we went"	raft- Ø -id "you went"	raft- Ø -ænd "they went"

In summary, the morphology of subject-verb agreement and past tense in Persian and English is discussed. Morphology in Persian is richer than English in general despite the fact that in certain tenses like past tense English is richer in regular verbs. In the case of third-person singular both languages have affixes, which shows the number and tense even though in Persian as shown in table 2.2, two morphemes can show the third person singular.

2.4.4 Word Order in Persian vs English

To test the narrow syntax in Bottleneck Hypothesis, two constructions were selected. Both constructions are declarative sentences. Examples (9) and (10) show these structures.

1. Subject-initial declarative sentence (SVO adv)

   (9) The police killed the thief last year.

2. Non-subject initial declarative sentence. (adv SVO)

   (10) Last year the man saved a boy from an accident.

These two constructions are selected because of the mismatches between the syntactic features of Persian and English.

Typically, Persian is classified as a pro-drop language with subject-verb-object (SOV) word order. The subject of the sentence usually comes at the beginning of a sentence and a direct or indirect object also follows the subject. Moreover, an adverb that typically expresses time or place follows the indirect object, and finally, the verb will come at the end of the sentence. Although Persian word order is SOV, according to Ramsay, Ahmed, & Mirzaiean (2005) , Persian word order is so flexible that it can be considered as a free word order. Accusative markers make the Persian language less ambiguous. Affixes can also help to clarify the tense and the subject(s) of the verb. Auxiliary verbs also always follow lexical verbs. Here are some examples of Persian declarative sentences. Izadi and Rahimi (2015, pp. 38,39) compared English and Persian word order according to Dabirmoghaddam (2001) and Dryer (1992). They considered 26 orders for their study and found certain differences between word order of these two languages including “relative clause, want and verb, content verb, auxiliaries, adverbial subordinator, and declaratives”. Examples (11) to (14) show certain samples of the Persian word order. On the other hand, many structures are not grammatical even though the word order seems so flexible. L1 Persian speakers may understand them intuitively, but they are usually marked as either unacceptable or ungrammatical structures.

(11) Dad	madar	be	pesar-æsh	yek ketab
verb	subject	preposition	Indirect object	direct object
gave	mother	to	Her son	a book

‘ I eat food ’

(12) Madar	yek ketab	be	pesar-æsh	dad
subject	direct object	p	indirect object	verb-Ø
mother	a book	to	son-her	gave

“mother gave a book to her son”

(13) Madar	yek ketab	dad	be	pesar-æsh
subject	Direct object	Verb-Ø	p	indirect object
Mother	a book	gave	to	son-her

"mother gave a book to her son"

(14) Diruz	madar	be	pesar-æsh	yek ketab	dad
time adverbial	subject	p	indirect object	direct object	verb-Ø
Yesterday	mother	to	son-her	a book	gave

"mother gave a book to her son yesterday"

In contrast, English is a subject-verb-object (SVO) language in which the verb has an absolutely fixed place in the sentence and always follows the subject of the sentence. So, the sentences (b) in the example (15) and (16) will be ungrammatical in English.

(15) a. The mother gave a book to her son

b. *gave the mother a book to her son

(16) a. The mother gave a book to her son

b. *The mother, a book to her son, gave

In Short, English is a strictly SOV language while Persian has flexible SOV word order. Although it seems both languages have an overt agreement, in Persian inanimate plural subjects can take either singular or plural verbs. Also, the subject is optional, so it can easily be dropped. It is worth emphasizing Feizmohammadpour (2013, p. 32) based on Mahootian (1997) mentions that the subject case in Persian is unmarked for all kinds of verbs including transitive and intransitive.

Persian doesn't have any tense marker in the past tense and the only verb endings in the past tense belong to number and person. Persian L1 speakers recognize the past tense intuitively since it is directly built with deleting the infinitive ending of /æn/. All these constructions have selected based on these similarities and mismatches. These mismatches will be tested in this study and finally will show the hierarchy of these structures' difficulty.

2.5 Previous studies

In this section, I have a review of certain previous studies related to second language acquisition (L2 acquisition). Particularly, the constructions used in this thesis include agreement, past tense, and word order as discussed previously in section 2.

2.5.1 Slabakova and Gajdos(2008): Verbal Morphology in L1 English L2 German

In order to test the L2 acquisition of the various forms of the German copula verb 'sein' in the present tense for L1 English speakers, Slabakova and Gajdos (2008) conducted a test where participants with beginner and intermediate level of proficiency were to take part. Their proficiency level was estimated based on the length of the exposures the participants had to do the German language. This length of exposure was calculated according to the length of time participants had attended German classes. Beginners had 40 hours and intermediates were exposed to the German classes for approximately 140 hours. The participants were learning German as a second language and had English as their first language. They answered a multiple-choice test which included 40 simple sentences without subjects. 10 questions out of 40 were fillers and since "sein" already has 5 forms (*bin, bist ,ist , sind* and *seid,*) participants were supposed to answer questions. The results of this test are presented in table 2.7 below.

Table2. 7: Percentage errors in all forms of 'sein' (Slabakova & Gajdos, 2008, p. 40)

Type of error	**Beginner**	**Intermediate learner**
Errors in choosing correct pronoun subjects	7.5	4.5
Errors in choosing correct DP subjects	20.2	29.8

The table shows the results of the test in both proficiency groups which indicates that when the subjects are DPs, the error rate is significantly higher than the errors in pronoun subjects. Also, language proficiency does not effect so much in reducing the errors of the DP subjects which shows that it is still difficult to learn. So, the results show the difficulty of functional morphology acquisition. (Slabakova & Gajdos, 2008, pp. 39,40).

2.5.2 Jensen (2016): Investigating the Bottleneck Hypothesis for Norwegian L2 learners of English

In the experiment conducted by Jensen (2016), she compares syntax and functional morphology. She hypothesized that the performance of learners in functional morphology is

weaker than that of syntax. She poses three main questions in order to test the Bottleneck Hypothesis including:

> *"RQ1: Is functional morphology more difficult than narrow syntax in L2 acquisition?*
> *RQ2: Is functional morphology a more persistent problem than narrow syntax?*
> *RQ3: Which of the syntactic and morphological conditions are more difficult?"*

Since there are mismatches between Norwegian and English in certain aspects of the languages, she uses two constructions that contain these mismatches for testing the Hypothesis. These include a subject-verb agreement for testing functional morphology and verb movement, to test the syntax. She tested morphology with 6 different testing conditions including "*long-distance agreement and local agreement, and singular and plural subjects*". She used prepositional phrases in the sentences with a long-distance agreement. Also, she experimented the syntax by two other conditions including *non-subject-initial declarative clauses* which have *lexical and auxiliary* verbs. 6 sentences are considered for each type of construction which means 36 sentences for all constructions. Since two types of grammatical and ungrammatical structures are considered the total of 72 questions are supposed to be judged by the participants. 13 questions were also used as grammatical fillers to distract the examinee from the procedure of the test. 60 Norwegian learners of English L2 between the age of 11 to 18 answered an acceptability judgment test (AJT). They also answered a Proficiency test and background questionnaire. The participants were divided into 4 groups of "*low intermediates, intermediate, high intermediate* and *advanced"*.

According to the results of the experiment, she discusses that subject-verb agreement is continually difficult for every learner in all proficiency groups; in other words, the acquisition of English subject-verb agreement is more difficult than the narrow syntax for these Norwegian speakers. The most difficult syntactic condition was the non-subject initial clauses, which have auxiliary verbs and long-distance agreement, and is more difficult than local agreement. Also, agreement with plural subjects is more problematic than singular subjects. As mentioned above, with the improvement of proficiency, judgments in syntactic constructions also improve while this improvement of agreement construction improves insignificantly. (Jensen I. N., 2016, pp. 9, 59, 90)

2.5.3 Jensen (2017): Investigating the Bottleneck Hypothesis in Norwegian L2 learners of English

Jensen tested the Bottleneck Hypothesis within two morphological constructions and narrow syntax in Norwegian L2 learners of English. She compared the two morphological constructions including past tense -ed and subject-verb agreement with the narrow syntax of Norwegian L2 learners of English. She used Jensen (2016) as a central model of her experiment. She addresses 2 questions as the research question:

> *"RQ1: Is functional morphology more difficult to acquire than narrow syntax in L2 acquisition?*
> *RQ2: Are the two morphological conditions equally difficult in L2 acquisition?"*

To test the main research questions, she uses the acceptability judgment test (AJT) and participants judge sentences on a Likert scale from 1 to 4. The constructions of agreement and past tense -ed is used for testing functional morphology while two conditions of verb movement across an adverb in subject-initial clauses and verb movement across the subject in non-subject initial clauses, test the narrow syntax. A total of 30 participants from grades 4 and 8 and 3 people from the university participated in the test.

The results of her experiment show that "subject-verb agreement is the most difficult construction to acquire for Norwegian learners of English among all tested construction". Also, one of the morphological constructions, i.e. agreement, is more difficult to acquire for Norwegian learners of English than the other one which is past tense -ed. On the other hand, past tense -ed is easier than one of the syntactic conditions. Although Jensen's results support the Bottleneck Hypothesis to some degree, the results also discuss how the past tense is easier to acquire than verb movement in subject-initial clauses where the verb moves across an adverb. She considers the Strong similarity of past tense inflection between Norwegian and English and concluded that based on *Full Transfer/Full Access Hypothesis* and *Contrastive Analysis,* that the positive transfer can make the process of acquisition easier, the acquisition of past tense is also easier for Norwegian L2 learners of English (Jensen M. G., 2017, pp. 45-48).

2.5.4 Basnet (2017): Investigating the Bottleneck Hypothesis in Nepali learners of English

This study focuses on the Bottleneck Hypothesis which suggests that functional morphology is more difficult than syntax. The thesis concentrates on Nepali L1speakers` knowledge of syntax and morphology in L2 English. In this study, Subject-verb agreement is used to study functional morphology while word order utilized to study syntax. The research questions formulated by Basnet are in the following:

1. Do Nepali learners of English have problems with the subject-verb agreement?

2. Does word order difference between two languages cause any difficulties in the acquisition of English word order by Nepali learners?

3. Is subject-verb agreement (functional morphology) more difficult than word order (syntax) in L2 acquisition?

In the case of subject-verb agreement, Basnet explains that English and Nepali show *overt agreement system* between subject and verb while in using inflection, they have different agreement system. So, both languages inflect contrast for number, person, and tense while Nepali verbs inflect to show contrast for "gender and honorifics" as well. The contrast concerning verb placement has been seen in the word order pattern of two languages (Basnet, 2017, pp. 8, 23).

The main test included 46 test items in total, out of which 10 were fillers. Acceptability judgment test which is the main method to collect the required data, a proficiency test, contains 40 multiple choice test items in order to examine the proficiency level of the participants and a background questionnaire have been used in this study that utilizes an online survey tool (Survey Gizmo). Simple declarative main clauses with lexical verbs and all of them begin with DP subjects have been used in this experiment. Therefore, subject-initial declarative sentence (in the simple past tense) tested word order (syntax) while subject-verb agreement (functional morphology) was tested by subject-initial declarative sentence (simple present tense) with 3rd person singular and plural subject. 48 Nepali participants between the ages of 15-18 from private boarding schools took part in this study. Therefore, 30 participants were taken from a higher secondary level in which 15 participants from each 11th and 12th graders and 18 were from secondary level 10th graders. In order to have various proficiency levels, all participants have been chosen from different grade levels.

Data from the study shows that "subject-verb agreement is more difficult than syntax". The findings also illustrate that subject-verb agreement is "persistently difficult" for the proficient learners too while all participants have acceptable performance in word order. The results show that there is not any relationship between word order and language proficiency. There is also a weak correlation between subject-verb agreement and proficiency scores suggests that although proficiency level increases, the performance of the participants on the agreement is still constant (Basnet, 2017, pp. 11, 68).

2.5.5 Picón Jara (2015): Difficulty of subject-verb agreement

Although the acquisition of third-person singular-s has been discussed with different points of view, Jara (2015) studied the inflection of third-person singular-s in order to understand whether this construction, which is one of the most difficult constructions for L2 learners of English, is easier in an oral presentation or in a written test? Jara collected data from six people between the ages of 11 to 15 of Spanish learners of English. Based on previous studies (Blom, Duncan, & Paradis, 2012) there is a link "between L1 inflection and L2 acquisition". In other words, the speakers of languages which are rich in inflections are more successful in acquiring the features of L2 like third-person singular-s than those languages that do not have such rich inflection. Based on "*High-frequency lemma*" in the input they are more successful in acquiring the language. High-frequency lemma is" the number of times that a verb appears in the learner's input despite its inflectional form". (Jara, 2015, p. 59)

It is addressed that the acquisition of third-person singular by L2 learners has been analyzed from a morphosyntactic point of view which argues that the replacement of inflectional forms by non-inflectional forms should also be considered. Her analysis shows that the acquisition of third-person singular -s for Spanish learners is difficult without any effect of the oral and written test. This means that errors of both kinds of tests show that production (output) of the third person singular-s is difficult for all Spanish learners of English. The initial which claims that oral register would provide with more instances of errors than written register was therefore not successful for the Jara`s study.

2.5.6 Dehghani, Bagheri, Sadighi, Tayyebi (2016): Hierarchical difficulties of English grammar for Persian learners of English

In another study done by Dehghani, Bagheri, Sadighi, and Tayyebi (2016) alongside 125 Persian participants from undergraduate senior English learners between the ages of 22-25 attempted to explain which English grammar features like tense, accusative, articles and so on are more or less difficult than the others. Besides, 12 experienced teachers are included in

the test. They were supposed to explain their own ideas regarding the English grammar features' difficulty level. The test included an Oxford Placement Test (2007), and researcher-developed tests of English. The researchers, based on some previous studies like Graus and Coppen (2015), Ellis (2006), and Scheffler (2008) as well as using common grammar books in Iran, the first 12 difficult features have been selected. Moreover, some experienced teachers were asked to specify the level of difficulty for these 12 features. These 12 tested "

grammar features are tense, passive, preposition, verbals, article, conditional, conjunction, reported speech, determiner, relative clause, causative, tag questions". A total of 60 questions have been made, and 5 questions were designed for each feature. As mentioned above, 12 experienced teachers as participants were asked to rate on a Likert scale from very easy to very difficult. In other words, based on the teachers' point of view, the features' difficulty is signified as they tested the items as "*very easy, easy, moderate, difficult, and very difficult"*

The analysis of the results shows that certain English grammar features were more difficult. All participants were senior students. The results show the ranking of the difficulty of the grammar features for Iranian learners of English. Based on the results, the features were classified in 4 groups of very difficult features include causatives, reported speech, and articles, difficult features contain conditional sentences, passive structures, and verbals; relatively difficult features including prepositions, tag questions, and less difficult conjunctions, tenses, determiners, and relative clauses. So, tenses are in the less difficult categories which shows that it is not difficult for Persian learners. In the current thesis, I will test the past tense and will see the difficulty of the acquisition of the past tense for Persian speakers.

2.5.7 Morales (2014): The effects of morphological structure in L2 acquisition of English and Spanish

In order to test child L2 learners acquiring verbal morphology, Morales focuses on the acquisition of agreement morphology in school-age children learning Spanish who are learning English as a second language. For this test, Morales asked 32 participants with the age from 7.5 to 11 to take part in this test in the United States of America. These participants were learning Spanish as L2. Furthermore, 32 Spanish L1 speakers who were learning English aged from 7.7 to 9.9 were tested in Puerto Rico. Both groups had started acquiring their second language at the age of 4 or 5. Based on the results of this test, L2 learners of Spanish had high mean score accuracy in using the third person plurals and the performance was native-like in verbal agreement comprehension. While L2 learners of English showed low accuracy in both

comprehension and production of third-person singular (verbal agreement). The study proposed that these results are because of the "*parallelism of verbal morphology acquisition between the native language and target language*". It suggests that the morphological structure of the language plays a role in the process of acquisition i.e. rich inflected systems like Spanish can be acquired faster than poorly inflected languages like English (Morales, 2014, pp. 182,183,218).

In short, different studies have been done on the acquisition of certain linguistic domains like syntax and morphology. Based on these previous studies, functional categories are considered as a challenging part of the second language acquisition. As discussed in Jensen (2017), some other items may affect the difficulty of a condition's acquisition that may differ from one language to another because of the different inflectional system of that language. Since the current thesis focuses on testing the Bottleneck Hypothesis which suggests that functional morphology is the most challenging part of the second language acquisition, these previous studies would help to propose the questions and predictions of this study which are available in the following section.

3 RESEARCH QUESTIONS AND PREDICTIONS

This section covers the research questions and predictions in the present thesis. The thesis aims to test the bottleneck hypothesis to clarify whether the functional morphology is more difficult for Persian second language learners of English. The following, research questions, predictions, and hypotheses of this study are addressed.

RQ1: Is functional morphology more difficult to acquire than narrow syntax in L2 acquisition?
RQ2: Are the two morphological conditions equally difficult in L2 acquisition?
RQ3: Which of the morphological and syntactic conditions is a more persistent problem in L2 acquisition?

Research question 1 focuses on the Bottleneck hypothesis predictions that the acquisition of functional morphology is more difficult than narrow syntax (see section 2.3). So, the results of the main test will show the difficulty of the acquisition of all four conditions including two morphological constructions (third-person singular-s and past tense -ed) and two syntactic conditions (subject initial and non-subject initial sentences). The cognitive process of the acquisition will be surveyed, and the performance of the participants reveals whether there is a hierarchy of difficulty for morphological and syntactic conditions or not.

Research question 2 is also related to the Bottleneck Hypothesis that functional morphology is more difficult to acquire than narrow syntax. Since the two morphological constructions of past tense -ed and third-person singular –s from the BH behave differently research question 2 is included. Therefore, RQ2 tests whether the two constructions are approximately equally difficult, as these are the two morphological conditions the bottleneck hypothesis concentrates on as the most difficult part of L2 acquisition when the second language is English.

Research question 3 is addressed whether the problems of L2 acquisition in functional morphology and syntax are persistent or not. If they are persistent, then which of them are more difficult to acquire. In fact, RQ3 asks whether morphological conditions are more problematic than narrow syntax or not.

3.1 Predictions

Following the BH, I hypothesize that the acquisition of functional morphology, including past tense -ed and third-person singular –s, will be more problematic than the acquisition of word order in subject initial clauses and non-subject initial clauses by L1 Persian, L2 English learners.

In other words, functional morphology for L1Persian speakers acquiring the English will be more difficult than syntax. As mentioned in section 2, past tense -ed and -s are representatives of functional morphology and word order (verb movement in subject initial clauses and non-subject initial clauses represent) represent the narrow syntax.

3.2 Study predictions

Prediction 1

According to the Bottleneck Hypothesis, functional morphology is more difficult than narrow syntax. It means it is predicted that -s and past tense -ed are more difficult to acquire for L1 Persian learners of English. Since the results of previous studies like Jensen (2016), Jensen (2017), and Slabakova and Gajdos (2008) have shown that functional morphology is more difficult than syntax, it is predicted that for L1 Persian speakers the results will be the same or similar. Therefore, L1 Persian learners of English may show difficulties in subject-verb agreement and past tense. I predict that the accuracy rates will be higher for syntax condition than for the morphological conditions.

Since previous studies include Jensen et al, found that participants were more successful to judge grammatical trials than ungrammatical trials of morphological conditions and in their study ungrammatical trials were more error-prone, I predict that the results can be similar and more correct judgment will occur in grammatical trials and more errors will be observed in ungrammatical sentences.

Prediction 2

Based on the previous studies like (Slabakova & Gajdos, 2008), Jensen (2016), and also claims of Bottleneck Hypothesis, both morphological constructions including the past tense and third- person singular which have been discussed in section 2.4, must be more difficult to acquire that both suggested syntactic conditions. Moreover, according to certain studies (Jara2015, Morales2014, Jensen2016, Jensen 2017, basnet 2017), third-person singular-s is a challenge for many L2 English learners. It is predicted that past tense -ed is not in the same level of difficulty as third-person singular -s.

Furthermore, based on previous studies like Morales (2014), the English verb inflection in the past tense is richer than the verb inflection of past tense in Persian which does not indicate any tense markers (see section 2.4), the acquisition of the past tense-ed for Persian speaker will not be challenging. Therefore, it is predicted that acquiring the past tense-ed will be easier for Persian L2 learners while acquiring the third person singulars-s will be more challenging.

In the case of the two syntactic constructions, based on the Full Transfer/Full access Hypothesis which suggested by (Schwatz & Sprouse, 1994), the transferable part of L1 to L2 makes the process of the acquiring that part easier. So, based on these hypotheses and the construction of the word order in Persian, I hypothesize that acquiring the subject initial sentences is easier than the non-subject initial since the subject initial sentences have less mismatch between Persian and English.

Prediction 3

According to the Bottleneck Hypothesis, the problems in acquiring the functional morphology of English for L1 Persian speakers are more permanent than syntactic conditions. Due to the results in previous studies like Jara (2015), Slabakova (2013), Jensen(2016), Jensen (2017), Basnet(2017) and Morales(2014) that third person singular-s is specifically problematic because of different reasons, I hypothesize that problems in the acquisition of third-person singular -s will be more persistent than other tested morphological condition and also two syntactic conditions.

4 METHODOLOGY

This chapter discusses the research methodology employed to conduct this research. In this thesis, the methodology is inspired by Jensen (2016), who has made a similar test. The participants in the current study participated in three tests 1) an English proficiency test, 2) a background questionnaire, and 3) a grammatical judgment test to collect data regarding the acquisition of the selected constructions presented in section 2. In this study, an off-line experimental method has been implemented in order to investigate the acquisition of English functional morphology and syntax by L1 Persian speakers.

A group of four participants was asked to answer the whole test as a pilot study. This is discussed in section 4.1, and the details about participants will be presented in section 4.2. The proficiency test used in the study will be presented in section 4.3, the background questionnaire is explained in section 4.4 and Grammaticality Judgment test (GJT) is discussed in section 4.5. The procedure of the experiment presented in section 4.6 and sentences used within the GJT test will also be discussed in section 4.7. In section 4.8 grammatical fillers used in the test are explained.

4.1 Pilot study

Four participants took the pilot study. They were asked to answer three tasks including proficiency test, a background questionnaire, and the GJT. Three participants of this group are in grade 10 who were 16 and one is twenty-two from the university group.

In order to test the participants and check whether the GJT test is too easy or too difficult; these three participants from the lowest grade and highest grade are selected. The results of the pilot group can be taken into account since they have a relatively average mean proficiency test. The details of the results of this group are presented in appendix 1.

At the end of the test, they were asked about the difficulty of the test. In their opinion, the test was not too easy, although they expected higher knowledge from themselves. They also believed that there were some vocabularies in the proficiency test that could be changed or replaced by the easier words. The 22-year-old participant also found the test average and believed that if they had more time for each slide, they would be able to judge correctly more often. All four participants found the instructions helpful, and they believed that the procedure of the test was reasonable. They also commented that they felt comfortable during the whole test.

4.2 Participants

Totally 44 participants in three groups participated in this test and answered the three kinds of tasks. Two groups from the 10th and 11th school grades and one group of university students. Among 44 participants of this study, 11 students are in the 10th grade and aged 16 years old, 20 participants are in the grade 11th and are 17 years of age, and 13 participants make up the university group and are between the ages of 21-23. Typically, learning the English language as a foreign language begins in the seventh grade, and students who start English at that level are at the age of 12-13. Some students start learning English or other languages in private elementary schools or private kindergartens.

Since there is a rigorous entrance exam for universities and knowledge of English is one of the main subjects of this exam, university students usually have adequate knowledge of English grammar. Some significant actions have been considered by the Ministry of Education to develop the role of English at a higher educational level. Therefore, some general and academic subjects in English have been offered for university students, and all students are supposed to pass general and academic English classes. The current university student group in this study are in their second year, one year after their entrance exam. All the participants, however, have a different background that will be discussed comprehensively in the results of the test.

It is easy to assume that the knowledge of the participants is different, and they have different backgrounds in terms of their familiarity with the English language. Another reason for choosing this university group was that they were in their second year of education, and it was predicted that they would have enough English classes in comparison to the high school group. The judgment test of this group is important because the errors within the results of their judgments will be more observable. It will then be easier to discuss the remaining problems in their grammatical judgment. It can be seen whether the tested language constructions are persistent or not.

4.3 The proficiency test

In order to have information about the background of English knowledge of the participants, the proficiency test as one of the important parts of this is utilized and participants were asked to take part in this test. Therefore, having the information about the relationship between the level of general English and their judgment in the main task is one of the vital parts of this study which necessitates having the proficiency test in the test. Since it was expected that Iranian students have different general English backgrounds and interests, and

also they are in different levels of general English, it was essential to take the proficiency test for having this data about them in order to investigate the correlation between their proficiency test and the Grammaticality Judgement Test.

The Standardized Oxford Proficiency test which has also been used in SLA studies and relevant previous studies of the Bottleneck hypothesis including Jensen (2016) , Basnet (2017) and Slabakova and Garcia Mayo (2015) is utilized. The complete test has 60 questions with grammar questions and some readings to divide the students into levels of elementary, intermediate, upper-intermediate, and advanced level. Because of the essence of this study, only the elementary, intermediate, and upper-intermediate levels are considered, and 40 questions out of the sixty questions of the Oxford Proficiency test are used. Moreover, it was easier for students to answer only 40 questions, and since they had the two tests in one day, they did not become tired and could answer the whole test. All questions are a multiple-choice task, and all students are supposed to fill in the blanks, writing their choice upon an answer sheet. The whole proficiency questions used in the test is presented in appendix 2. Certain samples of the test are mentioned here.

1- Water at a temperature of 100^0 C.

(a) is to boil (b)is boiling (c)boils

2-In some countries _____very hot all the time.

(a) there is (b)is (c) it is

3- In cold countries people wear thick clothes _____ warm.

(a) for keeping (b) to keep (c)- for to keep

This test was purely paper-based, and the participant was supposed to choose the answer and write the answer on the answer sheet provided.

4.4 Background questionnaire

After the proficiency test, the participants had 15 minutes to fill out the background questionnaire. This contained questions about their age and linguistic background. In order to avoid any confusion about their native language, the language they use to communicate with their parents and siblings, the language they use in school, the age of starting the English and the place they started it. The questions were prepared in Persian and English. All the questions

were explained to participants to avoid any problem or confusion. The completed questionnaire will be found in appendix 3.

4.5 The Grammaticality Judgement Test (GJT)

A Grammaticality Judgment test as a quantitative method in syntactic research has also been used in this study. The test includes a proficiency test, a questionnaire regarding the participants' languages and age, and the main test, which is based on the Grammaticality Judgment Test. Based on Rimmer's (2006, p. 242), the Grammaticality Judgment Test, also referred to as the Acceptability Judgment Test, "is a standard method for deciding if sentence construction is well-formed or not". Moreover, precisely, participants make an intuitive decision on the accuracy of the considered constructions in the test. In this thesis, the term of Grammatical Judgment Test is used because of the format of the test, which includes questions that must be answered by participants to recognize the right or wrong construction.

Gass and Selinker (2008) consider the Grammaticality judgments as one of the forms of "metalinguistic performance or language objectification". She explains that the learner firstly decodes the task in which two ways will be in front of the learner to select the sentence as wrong or right. In fact, the learner should try to recognize the sentence based on the internalized linguistic system. (Gass & Selinker, 2008, p. 272)

Numerous researches are done to test the reliability and validity of the Grammaticality Judgment test on L1 and L2. Based on Mandell (1999, p. 74), the Grammaticality Judgment Test tries to test L2 competence. That is why the reliability of this test has always been important and many kinds of research have been done for it. Mandell`s study results confirmed that the Grammatically Judgment Test is a "reliable measure "to test the verb movement; in other words, the Grammaticality Judgment Test can measure the competence of L2 learners. Furthermore, it concluded some previous experiments like Gass (1994) who tested the reliability of the L2 Grammaticality judgment test. The results of her study showed that the test was significantly reliable even though there were some variations in the performance of the two tests she implemented.

In this study, participants answered the test based on the wrong/right answer. In contrast to previous studies about the Bottleneck Hypothesis which Likert scale is used, there is no scale of judgment in the current thesis, and participants are supposed to specify whether the answer is right or wrong. On the Likert scale which is answered based on the scale of 1-4 with the exception that participants can answer the question "I do not know," here in this

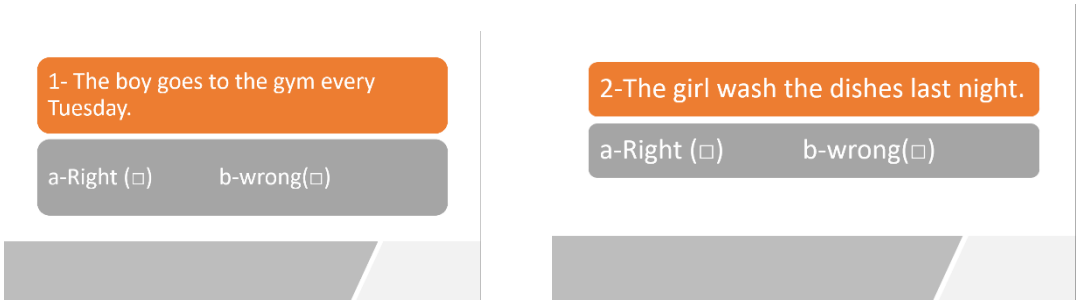
experiment participants must choose whether the answer is right or wrong. In other words, the participants are forced to judge the sentences as grammatical or ungrammatical.

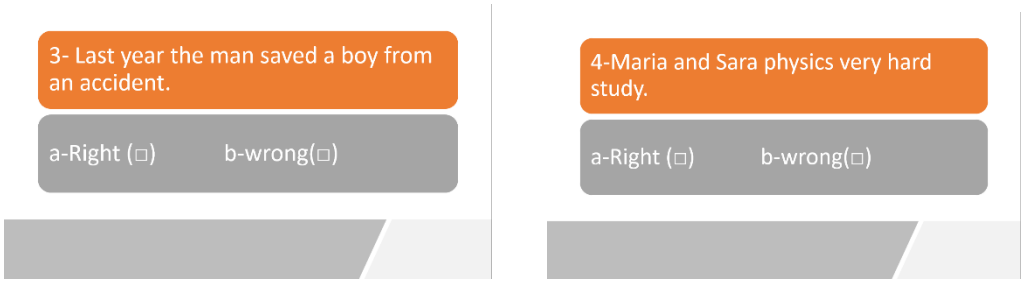
4.6 The Procedure of the main test

Since there were two groups of high school age and one group of university students, the main test was conducted on two different days. In high school, the main experiment was led in one classroom, and two high school groups including 10th grade and 11th grade attended the class separately. Due to insufficient computers for all students, the off-line method had to be used. Therefore, students had to fill out the answer sheet to answer the questions. All participants had 15 minutes to do the main test.

After the proficiency test and filling out of the background questionnaire form participants were supposed to do the main test which included 45 questions. The instructions for this part were explained to them entirely, and they were informed about the situation of the experiment. Only students who were interested in participating attended the experiment, and it was not obligatory for them to attend the test. In contrast to two previous question forms, i.e., proficiency and background questions, here the questions were shown on a screen via the projector. Each question was shown on one slide, and the students had 20 seconds for each slide to decide whether the sentence was wrong or right, and to put a checkmark on the answer sheet. Since this test, is going to investigate the judgment of participants, each slide was played only once and no more.

Participants could not go back to previous questions or compare the sentences. The items of the study were also pseudo-randomized to avoid repetition, and two constructions of the same sort do not follow each other. Eleven students from the 10th grade and 20 students from the 11th grade participated in the experiment. To indicate the procedure of the slides, some of them are shown below.





The mentioned procedure was the same for the university students as well. They were given the instruction completely, both in Persian and English languages, and also the test was not obligatory. Only subjects who were interested in participation attended the experiment. In order to replicate similarities in the test with the high school students, the test was taken off-line even though there were enough computers in the university. The GJT questions are presented in appendix 4.

4.7 Sentences

The main test includes 45 sentences; twenty sentence pairs and five ungrammatical fillers which are all available in appendix 5**.** Four types of sentences have been used here, which are mentioned in the following. Each type contains five grammatical and five ungrammatical sentences that are pseudo-randomized in the experiment:

1-subject initial declarative clauses with lexical verbs

(17) *a. Maria and Sara study physics very hard.*

b. Maria and Sara physics very hard study.*

2- non-subject-initial declarative with lexical verbs

(18) a. *Yesterday Maria bought the book.*

*b.*Yesterday Maria the book bought*

3- subject-initial declarative with singular subjects

(19) *a. The boy goes to the gym every Tuesday*

b. The boy go to the gym every Tuesday*

4- subject initial declarative with the past tense marking -ed

(20) a. *The girl washed the dishes last night.*

*b. * The girl wash the dishes last night.*

(21) a. **Maria her home work finish tomorrow*

4.8 Ungrammatical fillers

It is worthwhile to mention that five ungrammatical fillers are also included in the experiment in order to distract the participants from finding the tendency and the construction used in the experiment. These fillers improve the motivation of participants when answering the questions because they are so easy to spot and select, participants, will, therefore, identify them easily as an ungrammatical construction.

5 RESULTS

As discussed in chapter 4 (methodology), three kinds of questions have been distributed among participants. Participants answered Proficiency test, a background questionnaire, main test (Grammaticality Judgment Test) respectively. It is crucial to see how participants with different English proficiency levels and backgrounds will judge the grammatical and ungrammatical sentences in the main test i.e. GJT. In other words, this experiment is going to analyze the judgment ability of the participants with different language proficiency levels.

Since the data extracted from the offline test, all data transferred to an excel file. Then they are analyzed by the program "R" and finally the extracted file from “R” is used in tables, and figures. In this chapter, firstly, I discuss the results of the Proficiency and Grammaticality Judgment test in sections 5.1 and 5.2 respectively. Secondly, the relationship between proficiency test and Judgment Test will be analyzed in section 5.2.1. All the results of tested conditions will be discussed in sections 5.2.2 to 5.2.5 respectively. The result will answer the questions which were introduced before whether functional morphology is more difficult than the narrow syntax for L1 Persian speakers or not.

5.1 Proficiency test

The proficiency test used in this study is the Standard Oxford Proficiency test. Forty out of the fifty questions of this test have been selected because the details of the Advanced level were not in the priority of the current experiment. The test is multiple-choice, and the highest score is forty, which means 1 point for each question. In the current thesis, the relationship between proficiency and age, length of exposure, and also the Grammaticality Judgment test are investigated. As mentioned in chapter 4 the participants divided into 3 groups of grades 10, 11 from high school and one group of university students. Because of the distribution of the scores and number of people in each group the analysis is based on the mentioned division (grades 10, 11 and university students).

To explain the reason for using the grade groups, a related point to consider is that at the proficiency test results within each group in table 5-1, the group division could be quite different if the score of 32 or greater is considered as an advanced while less than 10 is a beginner. Furthermore; elementary level students who could have a score between 11-17, intermediate level with a score between 18-25 and upper intermediate student who could have a score between 26-32. However, as mentioned above, the classification is based on the groups

of participants because of the number of people at each level. The details of each grade and the level of proficiency are illustrated in table 5.1 below.

Table 5. 1: Results of the Proficiency test of all participants within each grade

Grade	Beginner	Elementary	Intermediate	Upper-Intermediate	Advanced
10th	1 person	4 people	5	1	0
11th	0	6	11	2	0
University	0	0	7	4	3

Table 5.1 indicates that only one person was at the beginner level while 10 participants were in elementary, 23 have been intermediate, 7 have been upper intermediate and 3 people scored on the proficiency test more than 32, classified as advanced level. Figure 5.1 below shows a representation of participants' language Proficiency test scores among each grade.

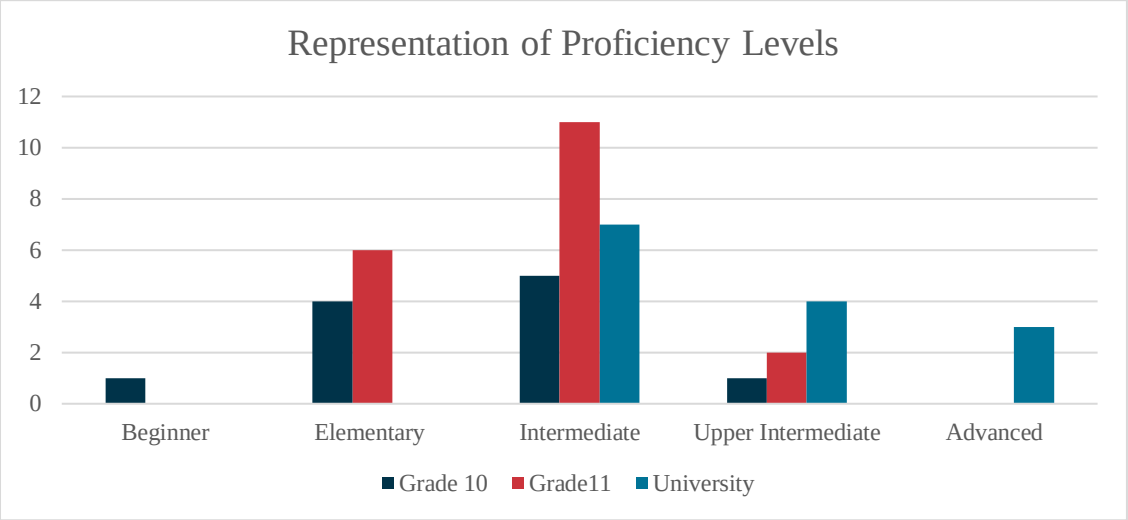


Figure 5.1: Bar Chart of the Proficiency Test Results within each grade.

Moreover, table 5.2 shows the proficiency mean scores and lengths of exposure for every 3 groups (Two groups include 10^{th}, and 11^{th} grades and one group of a university student).

Table 5. 2: Mean scores & lengths of exposure for all participants

Grade	Proficiency test mean score	Length of exposure
10th	18	7.272
11th	20.3	8.4
University students	26.61	11.615
Total mean score	21.59	9.096037

As shown in table 5.2, all three groups with the 7.272,8.4, and 11.615 lengths of exposure could obtain the mean score of 18, 20.3, and 26.61 respectively. The data from the Proficiency test and lengths of exposure show that there is a relationship between the Proficiency test and the length of exposure. In other words, the mean scores of the proficiency test show that the length of exposure influence the proficiency level. In Figure 5.2, the relation between proficiency scores and exposure length is illustrated. Although there are some participants with an exposure length higher than average who have low proficiency scores, the average scores (mean scores) of all participants' proficiency tests and length of exposure to the English language indicate that length of exposure is effective on language proficiency. The figure of 5.2 shows the relationship between the proficiency test mean scores of each group while 5.3 shows the distribution of proficiency test scores of all participants.

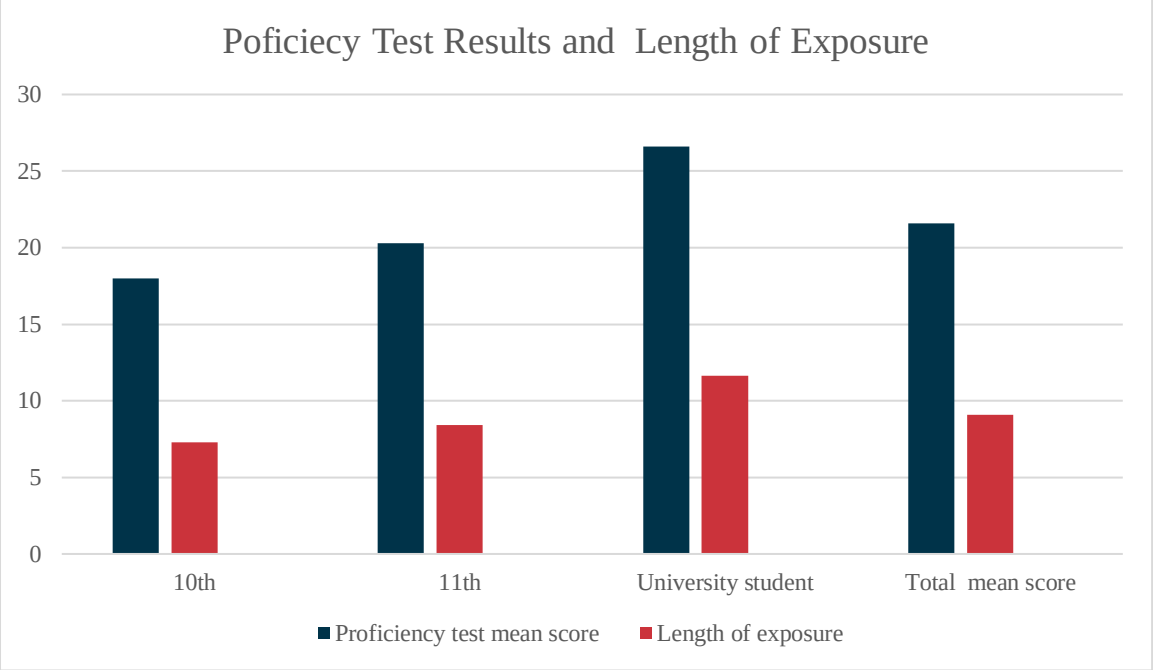


Figure 5-2: Bar chart of Proficiency test and Length of exposure

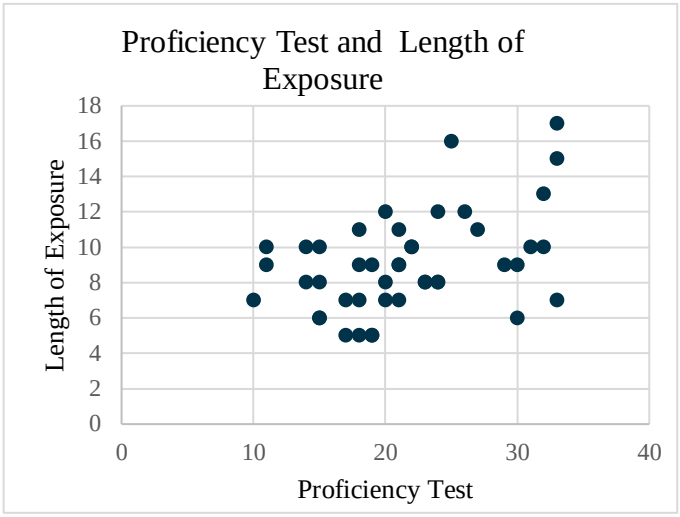


Figure 5.3: chart of proficiency test results and Length of Exposure within all participants.

Furthermore, as mentioned in section 4-2, the participants are different age groups. Grade 10 students are at the age of 16, grade 11 students are 17, and university students are between 20-23(mean= 22). It is noticeable that proficiency mean scores of participants with the age of 20 and more could get higher proficiency test mean scores than the other two groups. Figure 5.4 shows this relationship between age and Proficiency scores.

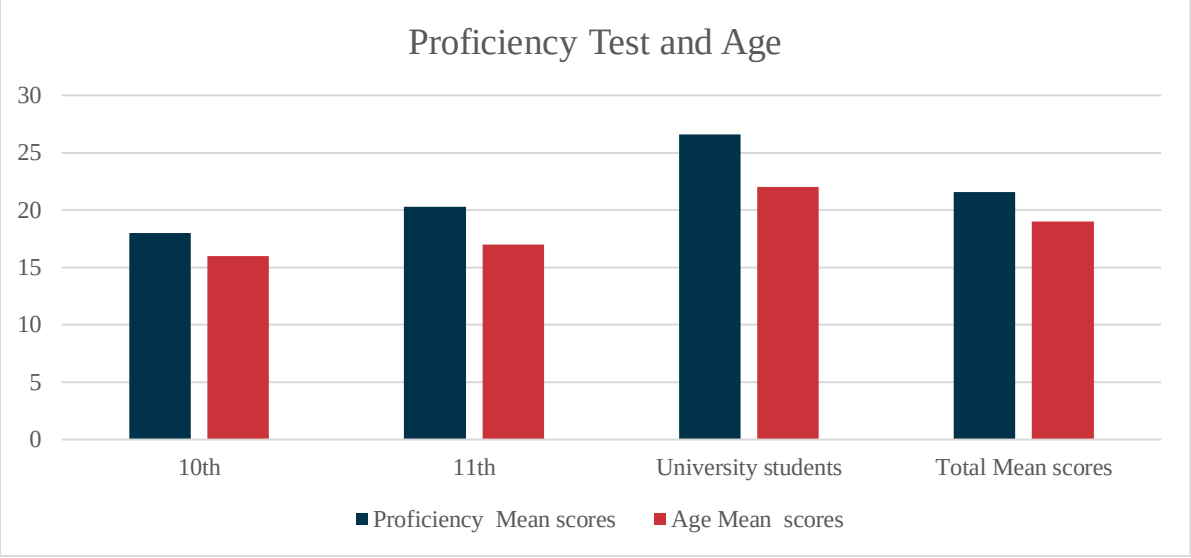


Figure 5.4: Bar chart of the relationship between Proficiency Test and Age of participants

In the following section, the results of the Grammaticality Judgment Test and their relationship with the Proficiency test are observed. Therefore, in the following sections, I mainly focus on the judgments of the participants and later compare them with their proficiency using the results of the respective Proficiency test.

5.2 The Grammaticality Judgment Test

Based on what has been discussed previously in the case of the Grammaticality Judgment Test (see section 4.5), the main test contains 45 questions including 20 sentence pairs (ungrammatical and grammatical) and five ungrammatical fillers which are excluded from the analysis. The sentences are distributed through the test pseudo-randomly. The participants were supposed to determine whether the sentences are grammatically "wrong" or "right". Therefore, the mean score is between 0 and 1 as a score of 0 is allocated if the participants' judgment is incorrect and a score of 1 allocated when correct.

As discussed in the previous section, there was a relationship between the results of the proficiency test and the participants' length of exposure. The data analysis shows that there is an insignificant relationship between participants' judgment and their length of exposure to the English language (shown in Figure 5.5). Below shows a weak correlation, approaching significance, between the length of exposure and the judgment task. The longer the participants' language exposure the better their results in sentence judgment. Although there are some cases with different scores, the mean scores of their judgments show that length of language exposure affects the proficiency and judgment - illustrated in figure 5.5.

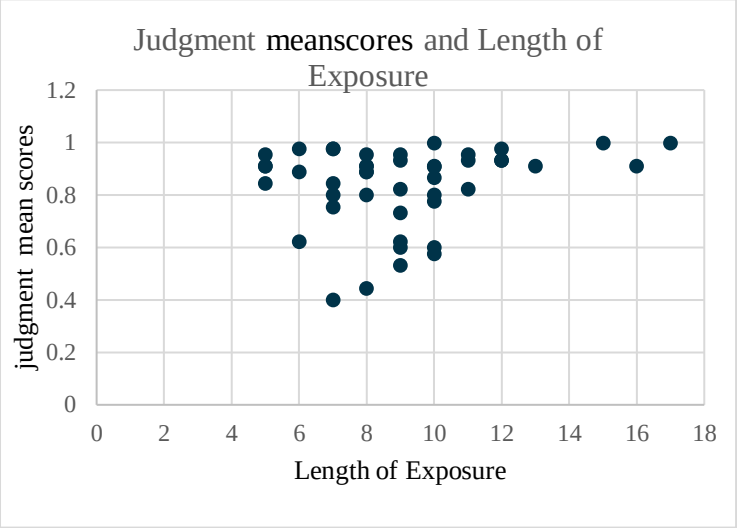


Figure 5. 5: Judgment task and the length of exposure

It should be mentioned that the results of the judgment task and the age of the participants, which is shown in figure 5.6, show that there is no correlation between the age and judgment scores. In other words, older participants were not necessarily more successful in the judgment of the conditions than the others and the factor of age was not effective by itself.

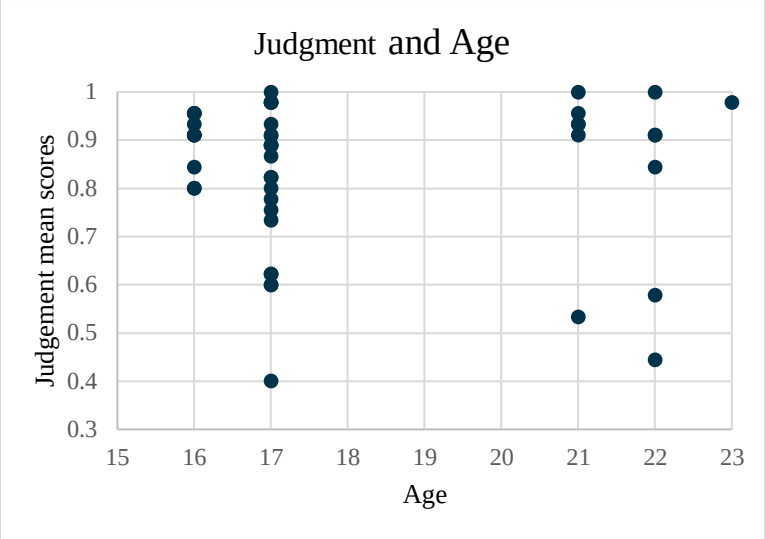


Figure 5. 6: Judgment task and Age

5.2.1 Judgment Task, & Language Proficiency Test Results

Before analyzing each condition separately, it is necessary to mention that each condition judgment task has been analyzed and the results of them compared to each other in figure 5.7 which is the most important part of this analysis. As is noticeable in the figure, all conditions are prepared here. The horizontal scale shows the language proficiency and the proportion of correct responses is presented on a vertical scale. All four conditions are also presented. The details of each condition will be illustrated in the section below.

Here in this figure, the significant improvement from low proficiency to the highest language proficiency score belongs to the subject-verb agreement, identified by the green color in the figure. By improving proficiency scores, the judgment task scores also improve. Observing the figure shows that the mean score of the judgment test in *agreement* condition is the lowest among the other conditions. By increasing the proficiency score, the mean score of subject-verb agreement increases.

Since the agreement was here to test the functional morphology, the following condition which will be discussed is *past tense*. In the case of the past tense, there is no significant improvement in the judgment mean score. Even participants who are beginners or intermediate could judge the condition correctly, but there is still a slight improvement in the judgment mean score for upper intermediate participants which indicates the effect of

proficiency level on the acquisition and comprehension of the condition. Two other conditions also illustrate the relative increase of the judgment task by improving the proficiency test.

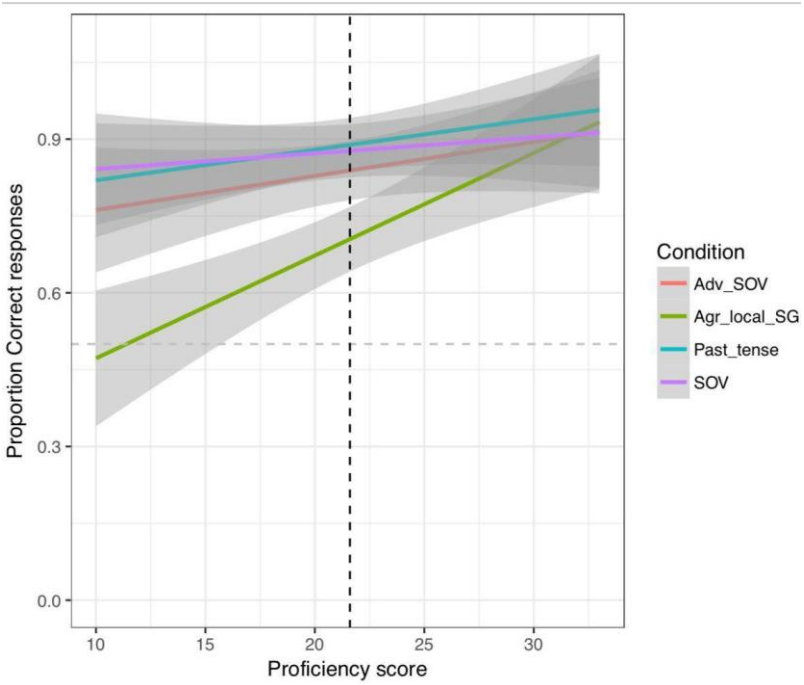


Figure 5.7: Graph of Proficiency test and judgment task results concerning the conditions

In the analysis of the following section, each condition is presented. First, the agreement and past tense, which are going to test the functional morphology, will be presented. Then the results of word order, which is going to test the narrow syntax, will be illustrated. Thus, the results of the Judgement task for each condition are discussed in the following sections.

5.2.2 Results for subject-verb agreement condition

Table 5.3 shows the mean scores of the grammatical and ungrammatical conditions of subject-verb agreement (judgment of the test sentences testing third-person singular-s).

Table 5. 3: Mean scores of judgments in subject-verb agreement

Grade	Grammatical	Ungrammatical
10th	0.8727273	0.5090909
11th	0.720000	0.540000
University Students	0.8000000	0.8615385
Mean scores for all participants	0.7818182	0.6272727

The mean scores of judgments for grammatical and ungrammatical sentences for each group are presented. 10thgrade participants got the mean scores of 0.8727273 when identifying grammatical sentences while they got 0.5090909 for ungrammatical sentences. Two other groups in the 11th grade and university students also followed similarly. The weighted mean scores of all the participants also show that they have been more successful in the correct identification and judgment of grammatical sentences than ungrammatical sentences.

As shown in figure 5.7, the judgment task results for all participants are not very high or at least are not as high as other condition; in other words, the lowest scores belong to this condition which shows that participants, particularly in the lower level, made more mistakes when judging the ungrammatical sentences than the other participants. The mean score of the grammatical sentences as shown in table 5.3 is 0.7818182 while the mean score of ungrammatical sentences is presented as 0.6272727 which again shows that all participants gave more wrong answers when judging ungrammatical sentences. Therefore, recognizing the ungrammatical sentences has been more difficult for all participants. These differences are presented in figure 5.8below:

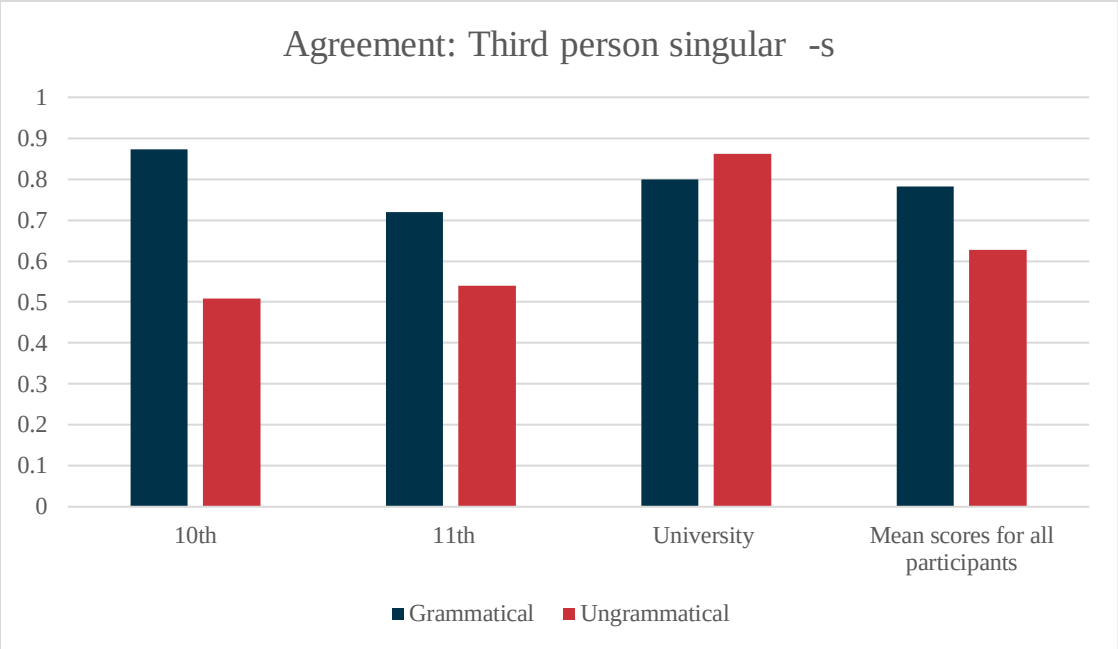


Figure 5.8: Bar chart of Judgment mean scores in the condition of Agreement (third Person singular -s)

5.2.3 Past tense -ed

The past tense *-ed* is one of the conditions selected to test functional morphology. The tendency of the judgment task, as shown in figure 5.7, shows that even beginners are able to

judge the sentences correctly. The successful judgments for this condition is surprisingly high. Although the mean scores for beginners and upper intermediates are insignificantly different, it is noteworthy that there is still a rising tendency in the past tense judgment task by increasing the proficiency level.

The mean scores of all participants' judgment tasks, which are presented in table 5.4 indicate that all participants from beginner proficiency level to upper-intermediate had acceptable results when judging past tense. A mean score of 0.9181818 for grammatical sentences shows that the participants were more successful in judging the grammatical sentences than ungrammatical sentences where the mean score was 0.8545455. On the other hand, only the 10th-grade participants, who were eleven people in total, could recognize the ungrammatical structure completely. Since the number of these participants was limited to just 11 people, it is assumed that they were successful by chance and this aspect of the experiment requires more rigorous testing with a larger research group within this demographic.

Table 5. 4 Mean scores of judgments in the past tense -ed

Past tense -ed	**Grammatical**	**Ungrammatical**
10th	0.9818182	1.0000000
11th	0.900000	0.810000
University Studens	0.8923077	0.8000000
Mean scores for all participants	0.9181818	0.8545455

Figure5.9 shows the differences between the judgment scores of the three groups precisely.

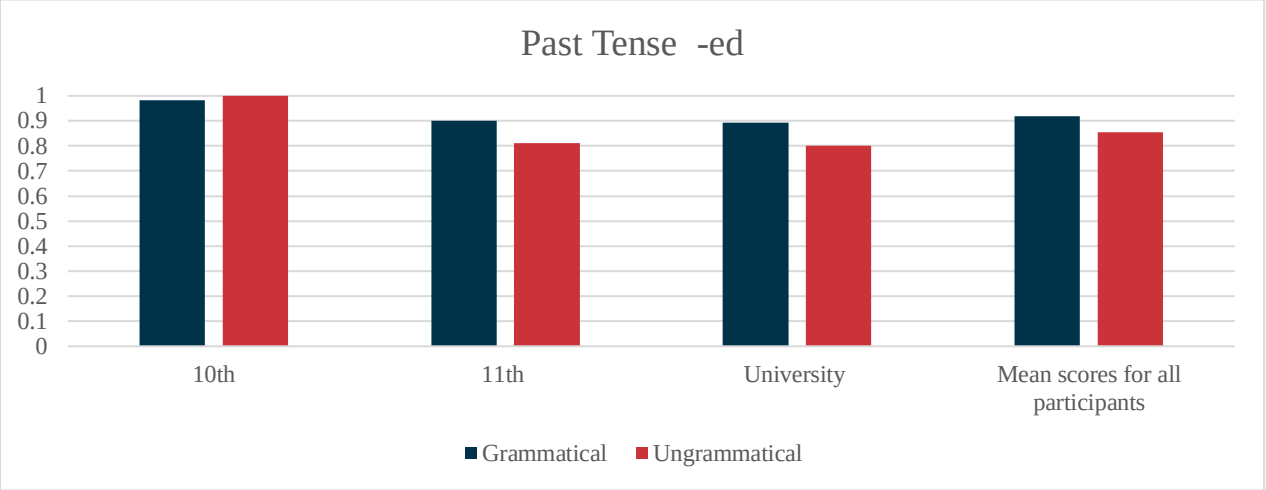


Figure 5. 9: *Judgment mean scores in the condition of Past tense (-ed)*

5.2.4 Narrow Syntax

In this section, the results of the *narrow syntax* condition will be presented. As discussed before, two constructions are used to test this condition: 1) non-subject-initial declarative clauses and 2) subject-initial declarative clauses. Tables 5.5 and 5.6 show the mean scores of the grammatical and ungrammatical judgments of these two conditions respectively. Also, figures 5.10 and 5.11 indicate the mean score differences of the non-subject initial clauses and subject initial clauses respectively.

Table 5. 5: Mean scores of judgments in *Non-subject initial clauses*

Non-subject initial	**Grammatical**	**Ungrammatical**
10th	0.9272727	0.9090909
11th	0.67	0.94
University Students	0.7692308	0.8769231
Mean scores for all participants	0.7636364	0.9136364

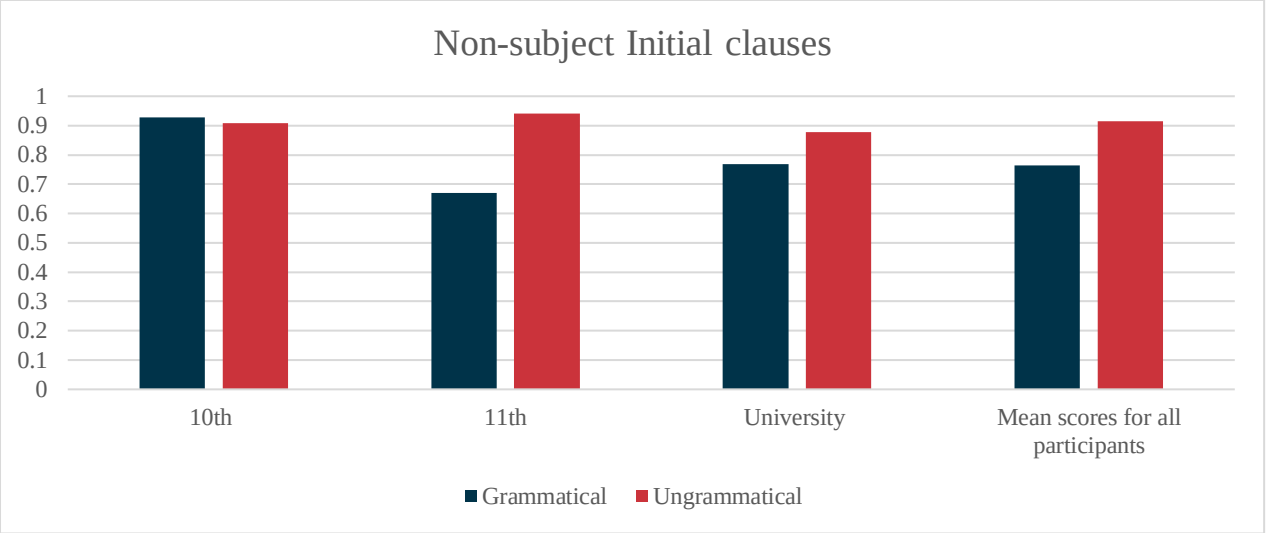


Figure 5. 10: Judgment mean scores in the condition of non-initial clauses

Table 5. 6: *Mean scores of judgments in subject initial clauses*

Subject initial	**Grammatical**	**Ungrammatical**
Grade 10	0.8727273	0.9636364
Grade 11	0.79	0.94
University Students	0.8461538	0.8769231
Mean scores for all participants	0.8272727	0.9272727

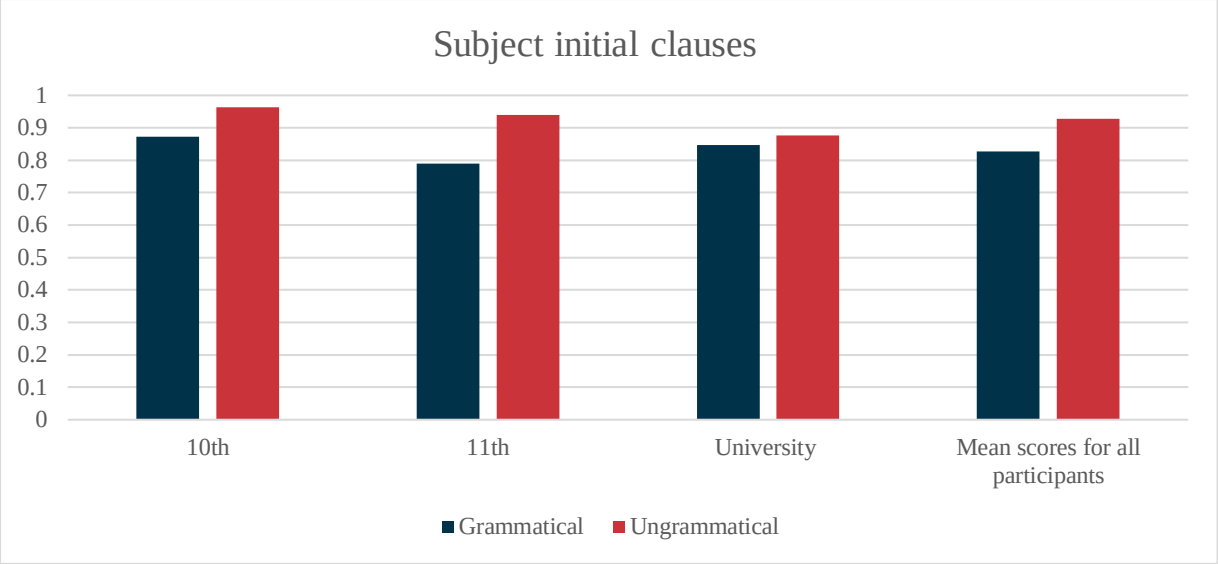


Figure 5. 11: Bar Chart of Judgment mean scores in the condition of subject initial clauses

What is obvious to see is that in table 5.5 the mean scores of both grammatical and ungrammatical judgments are so high: 0.8272727 and 0.9272727 respectively, and even close to the highest possible mean score, which is 1. In the first condition, which is non-subject initial sentences, the mean score of the judgment for grammatical sentences is 0.7636364. The mean score for ungrammatical sentences for the same condition is 0.9136364, which is very high and shows the impressive performance of participants. The total mean score in the initial subject sentences, which are the second condition tested in narrow syntax, is even higher than the first condition. The mean score for grammatical sentences is 0.8272727 while the mean score for ungrammatical sentences is 0.9272727, which is the highest among all conditions. Regarding these scores, two points are worth mentioning. Firstly, both mean scores of these two conditions are higher than the other conditions past-ed and subject-verb agreement. Secondly, in both conditions, the mean score of ungrammatical sentences is higher than their grammatical counterpart. It may illustrate that they were more successful in recognizing ungrammatical sentences.

As shown in figure 5.7, there is an insignificant improvement in the correct judgments when improving the level of proficiency, particularly for syntactic conditions. Based on this figure and the achieved mean scores of judgments for grammatical and ungrammatical sentences, all proficiency groups reached the acceptable judgment scores. Furthermore; both conditions (non-subject initial sentences and subject-initial sentences) tested in narrow syntax which have been indicated by red and purple respectively in figure 5.7, can illustrate that even beginners with low proficiency could judge almost all sentences correctly. A comparison of

mean scores of all participants' judgment for all conditions has been indicated in figure 5.12. In both narrow syntax conditions, which were subject-initial sentences and non-subject initial sentences, judgments in ungrammatical sentences are more successful than grammatical sentences while in functional morphology conditions, grammatical sentences are judged correctly at a higher frequency than ungrammatical sentences. The lowest mean scores belong to the ungrammatical sentences of the agreement condition whilst the highest mean scores related to the ungrammatical sentences of the subject-initial sentences.

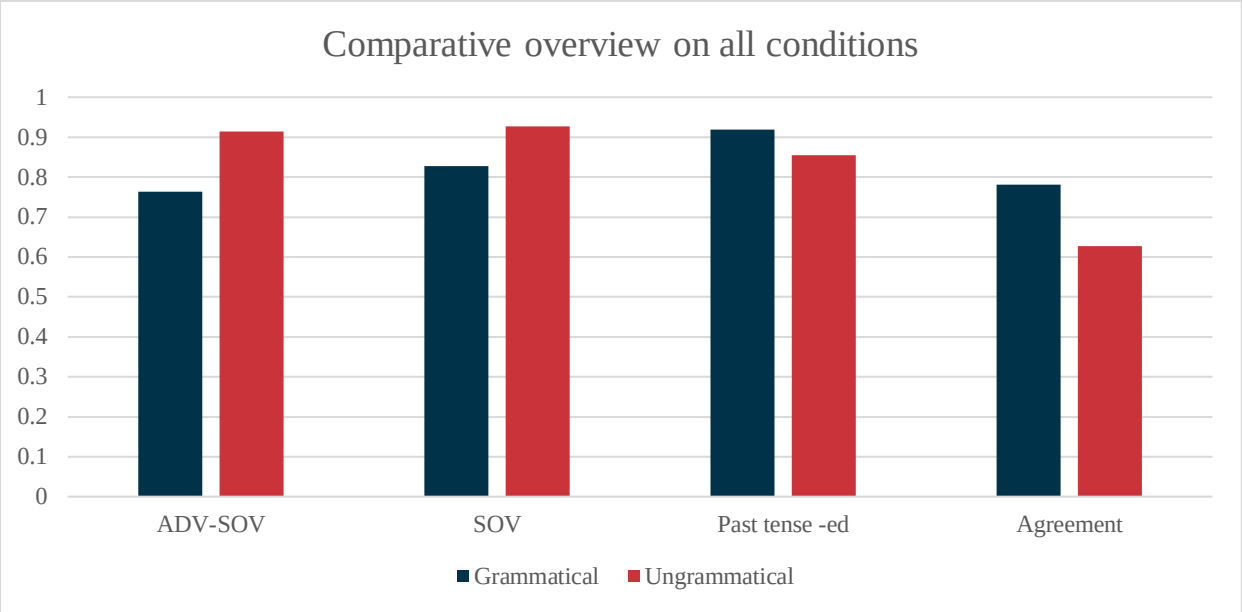


Figure 5. 12: Bar Chart of Comparative view on judgment mean scores within each condition.

On the other hand, the comparison between two functional morphology conditions, i.e. agreement and past tense -ed, shows that the judgment of past tense -ed has been answered with a higher success rate than the agreement. The mean scores in the agreement condition show that the ungrammatical sentences have been more difficult to judge than grammatical sentences. In other words; participants have been more able to recognize the grammatical sentences in both conditions of functional morphology, while in the narrow syntax condition they are more successful in recognizing the ungrammatical sentences.

5.2.5 Fillers

There are five ungrammatical fillers in the main test (see section 4.6). Since they are not part of the results, I will not discuss this aspect of the experiment and I will exclude fillers from the analysis of the whole test. However; it should be pointed out that although the level of proficiency in the University grade demographic was the highest, they also had the lowest success rate in identifying the ungrammatical fillers. This is an anomaly of sorts, as the

judgment mean scores across all 3 groups show that all groups have errors in judgment However one would expect that with a higher proficiency test the University grade participants would identify the ungrammatical fillers with adequate ease giving them a higher score in the test. This was not the case. Table 5.7 shows the details about Fillers.

Table 5. 7: Mean scores of the fillers

Fillers	**Ungrammatical**
Grade 10	0.9454545
Grade 11	0.890000
University Students	0.8461538
Mean scores for all participants	0.8909091

6 DISCUSSION

This section focuses on the discussion of the data illustrated in chapter 5. In order to discuss the questions and predictions proposed in chapter 3, I considered the results of the main test presented in chapter 5 along with the questions and predictions formulated in chapter 3. Since the current thesis aimed to investigate the Bottleneck Hypothesis, the principal discussion will be on the "Results and Predictions" in the Bottleneck Hypothesis based on which functional morphology is the bottleneck in L2 acquisition. The constructions used in this experiment are past tense -ed and third-person singular -s as representative of functional morphology while word order in subject-initial sentences and non-subject initial sentences was utilized to test the narrow syntax.

In order to review the research questions and predictions, they are repeated here for convenience.

RQ1: Is functional morphology more difficult to acquire than narrow syntax in L2 acquisition?

RQ2: Are the two morphological conditions equally difficult in L2 acquisition?

RQ3: Which of the morphological and syntactic conditions are more persistent problems in L2 acquisition?

Prediction 1

Based on the Bottleneck Hypothesis, functional morphology is more challenging to acquire than narrow syntax. It is predicted that third person singular-s and past tense -ed are more difficult to acquire than Narrow syntax for Persian L2 learners of English.

Prediction 2

Both morphological conditions which have been discussed in this study including past tense -d and third-person singular -s must be more difficult to acquire than the two suggested syntactic conditions.

It is also predicted that third person singular is more challenging to acquire than past tense -ed while in case of two syntactic conditions, non-subject initial sentences will be easier to acquire because of the positive transfer from Persian and having fewer mismatches in this construction between English and Persian.

Prediction 3

Functional morphology problems will be more persistent than those related to syntactic conditions because of the difficulties in acquiring morphological conditions. it is predicted that 3rd person singular-s is the most persistent problem among all constructions

All three predictions are based on the previous research studies either the Bottleneck Hypothesis or on the acquisition of syntax and functional morphology. To review the important points; in short, it must be reminded that functional morphology is a part of the language that should be learned consciously by the learners. As seen in section 2.3, some aspects of language like semantics, syntax, and phonology are parts of UG that can be transferred while parameters like functional categories cannot be transferred although they are still parts of UG. Slabakova (2013, p. 6) considers these parameter values as "potential sources of L2 acquisition".

In the current experiment, the Grammaticality Judgment Test was used in which the participants were supposed to determine whether a construction is well-formed or not. The mean scores indicated the accuracy of the judgments and revealed how participants marked each sentence "right" or "wrong". A detailed description of mean scores on grammaticality judgment is presented in section 5. The estimated mean score of each sentence is presented in appendix 6. Correct answers obtained score 1 and wrong answers got 0. In this section, high mean scores show that participants were successful to judge whether a sentence was grammatical or ungrammatical while low mean scores show the opposite. Since this thesis is based on Generative approach and focuses on the acquisition of functional morphology and syntax, it is predicted that Persian learners of English face the same problems as other English learners as a second language in those aspects that must be learned lexically like functional morphology. (see section 2.1). Here, I will discuss each proposed prediction and the results of the test are presented in chapter 5.

6.1. Is functional morphology more difficult to acquire than narrow syntax in L2 acquisition?

The proposed prediction for this research question is that functional morphology is more difficult to acquire than narrow syntax. Then, based on this prediction, acquisition of third-person singular-s and past tense -ed is more difficult than the narrow syntax. In order to discuss this prediction, it is necessary to observe the results of this study in chapter 5. The comparative view on results of Grammaticality Judgment test is given in figure 5.12 where all mean scores of judgments for grammatical and ungrammatical sentences are presented. In the case of functional morphology conditions, the mean scores of all participants for grammatical sentences are more than those for ungrammatical ones indicating that participants were more successful to judge the grammatical sentences. Moreover, the mean scores of the ungrammatical sentence for the condition of the agreement are the lowest in all conditions of the whole test. The results are the same in each group of participants; in other words, in each

group, the mean scores of grammatical sentences are higher than those of ungrammatical ones which particularly indicate the difficulty of the agreement for all participants. Figure 5.7 illustrates the results according to the level of proficiency suggesting clearly that the participants with lower knowledge of the language had more difficulty in judging the sentences correctly. Besides, previous studies as mentioned in section 2.4, have represented similar results in terms of the agreement. Two studies conducted by Jensen (2016) , Jensen (2017), and Basnet (2017) relatively show the same results. In all relevant studies, ungrammatical sentences with subject-verb agreement problems were more challenging to be judged for Norwegian and Nepali learners of English.

Morales (2014) claimed that learning languages with richer inflection is easier than the language with poor inflection like English. Based on his study and suggestions the languages which have richer inflection system than English are easier to be learned while for these languages with rich inflection, learning the language like English will be more challenging, and since the Persian verb inflection system normally is richer and stronger than the English inflectional system, it is predicted that learning the functional morphology of English is difficult for Persian learners of English. In other words, learning the agreement is difficult for Persian speakers because of the verb inflection system in Persian and English. I believe that it can also be because of the partially negative transfer in English and Persian.

On the other hand, as functional morphology is a part of the language that is learned lexically, it must be the most difficult part of the language to acquire. Based on figure 5.12, the subject-verb agreement had the lowest mean score among other conditions confirming that it was the most problematic feature to be learned among 3 other conditions. The results are consistent with those of previous studies on the Bottleneck Hypothesis as the research work carried out by Jensen (2016) , Jensen (2017), and Basent (2017). The current results suggest that acquiring the third-person singular-s is problematic for Persian learners of English, despite the fact that Persian verbs have a rich inflectional system. To put it another way, the mean scores of judgments for grammatical and ungrammatical sentences are higher than 0.5 despite the fact that this condition remains the most difficult among other conditions.

However, to answer the research question 1, some information on the second morphological condition, i.e., the past tense -ed, is also required, the results of which are presented in table 5.4 and figure 5.9 in which the high mean scores in all groups reveal that this condition is not very problematic for Persian Learners of English. Each group indicated high mean scores in grammatical and ungrammatical sentences. The total mean scores of grammatical and ungrammatical sentences for all participants are 0.9181818 and 0.8545455

respectively which is around 1 and high enough to claim that this condition is easy for Persian learners to acquire. To explain in details, the judgment scores of grammatical sentences are higher in two groups of grade 11and university students than the mean scores of ungrammatical ones; in other words, the judgment of ungrammatical sentences was more difficult for both of these groups and both groups had the same tendency in their judgment. Only students of grade 10 (11 people) gave better results in ungrammatical sentences. They could recognize the ungrammatical sentences completely. Since the number of people is limited in this group, it is possible to record such a score. However, the total mean scores of the grammatical sentences are still higher than ungrammatical sentences.

According to the Bottleneck Hypothesis, acquisition of past tense -ed as a category of functional morphology must be more difficult than the syntax condition. The results show that this condition is not challenging for the participants of all groups. Figure 5.7 also supports this statement indicating that even participants with low proficiency levels could judge both grammatical and ungrammatical sentences almost successfully. However, the comparison between this condition and syntactic conditions indicates that past tense -ed is still a more challenging condition than two other syntactic conditions.

On the other hand, the results in two syntactic conditions including subject initial and non-subject initial sentences revealed high mean scores in both conditions. Due to the mismatches between Persian and English and differences in the structure of their sentences, it was predicted that Persian participants made errors in judgment about the syntactic conditions. The results also demonstrated that all participants made certain errors in judgment about the sentences despite the fact that the mean scores of all groups for all conditions were relatively high. The results of syntactic conditions for both non-subject initial and subject initial sentences are shown in table 5.5 and5.6, respectively. Surprisingly, all participants judged ungrammatical sentences more successfully than the grammatical ones. Therefore, although it was assumed that mismatches would create problems for Persian learners of English, they were relatively successful in judging the sentences correctly even though they still made some errors in their judgments. All three groups of the participants got relatively the same mean scores in syntactic conditions.

A comparison of all these conditions may answer the first research question of this study which asked whether the functional morphology is more difficult to acquire than the narrow syntax or not. The results shown in figure 5.12 revealed that the most difficult condition for Persian learners of English was subject-verb agreement while the easiest one was subject initial sentences. The high rate of correct judgment suggests that Persian learners

made a few errors in syntactic conditions. Observing the mean scores of all these conditions also demonstrated that the results are in agreement with those presented by Slabakova and Gajdos (2008), Jensen (2016), and Basnet (2017).

Based on Morales (2014), who suggests that acquiring the poor inflection system of a language is more difficult for L1 speakers of the richer inflection system, in general, Persian present tense inflection is richer than English, it is challenging to learn third-person singular of English verbs while the acquisition of past tense ed is easy because past tense inflection in Persian is not complicated and the English verb inflection of English is richer than Persian. Since the tense marker of the Persian simple past tense verb is 'ø ', acquisition of ed from English can be easy. Therefore, because of the mismatches, there are somehow difficulties in the acquisition of the past tense and agreement even though the agreement is more complicated than the syntax.

Based on the Bottleneck Hypothesis the functional morphology is the most difficult part of L2 learning. All these results support the predictions and show that the results of these tested conditions support the Hypothesis and previous researches which tested the Hypothesis and functional morphology is more difficult than the narrow syntax.

6.2 Are the two morphological conditions equally difficult in L2 acquisition?

The prediction proposed for this question was for both morphological conditions including the past tense -ed and third-person singular -s. based on previous studies on the Bottleneck Hypothesis agreement must be more challenging to acquire than past tense. Based on what discussed in section 6.1 and the results of this experiment, it is clear that agreement is the most difficult condition to acquire for the Persian learners. As mentioned in 6.1, the verb inflection of Persian in the present tense is richer than English, and it makes the learning of the agreement problematic. Thus, the results which support previous studies in the Bottleneck Hypothesis confirm that agreement is more challenging for L2 learners of language than past tense -ed.

In order to answer the research question and surveying the prediction, it is necessary to compare the results of the judgment, which shows that all mean scores of both syntactic conditions are higher than both morphological conditions. Figure 5.12 also shows that syntactic condition is easier for participants that they have fewer errors in these two conditions.

These results are in support of the "*Full Transfer/Full access Hypothesis*" which suggests that L1 is the "initial state" of the L2 grammar and there will be full access to UG

during the whole process of the transfer; in addition, as Slabakiva (2013, p. 6)mentions, based on Generative theory, competence is a grammar that allows to a language to have perception and production. Therefore, syntax, semantics, phonology, and UG Principles (Universal properties) are "transferable" from L1. Since syntax is a transferable feature, it might be easier for learners of the target language to learn although certain mismatches exist in the grammar of the two languages.

In sum, both syntactic conditions are easier for participants to learn than two morphological conditions. The agreement is more complicated than the past tense -ed; in other words, the agreement is the most difficult condition to acquire for Persian learners. Between the two syntactic conditions, non-subject initial sentences are more difficult than subject initial sentences. The subject initial sentence is the easiest construction to learn.

6.3 Which of the morphological and syntactic conditions are a more persistent problem in L2 acquisition?

The prediction for this question is that functional morphology is problematic during the acquisition of the L2, and since it is not transferable and must be acquired lexically, it will be the more persistent problem than syntactic conditions. In order to survey this prediction, the data from the study results need to be observed. To have a precise answer to this question, the results of the judgment and level of proficiency are considered. What has been shown in figure 5.7 can explain the tendency of each condition. Based on the information from this figure, it is visible that syntactic constructions could have high mean scores in judgment even in low proficiency level. Among two morphological constructions past tense -ed is also could achieve high mean scores even in low proficiency level. Besides, as shown in figure 5.7, by improving the level of proficiency there will be an improvement in grammatical judgment as well.

In order to test the effects of proficiency scores and conditions, a mixed-effects logistic regression has been done. It is found that participants who scored higher in proficiency test also got more correct scores in the judgment task. ([3]beta=0.077,[4]st. err=0.036, $p < 0.05$). Moreover, the findings show an effect of condition, located in the agreement condition: all in all, the correct scores were lower for the agreement condition than the other conditions (beta = -0.914, st. err= 0.368, [5]$p < 0.05$). Finally, an interaction between proficiency and condition is found, again localized to the agreement condition: there is a stronger positive correlation

[3] "*Beta is used to model variables that assume values in the standard unit interval (0, 1)*" (Cribari-Neto & Zeileis, 2010, p. 2).

[4] "*A standard error of a statistic (or estimator) is the (estimated) standard deviation of the statistic. Standard errors mean the statistical fluctuation of estimators, and they are important particularly when one compares two estimates*" (Ahn & Fessler, 2003).

[5]"*The P-value is defined as the probability under the assumption of no effect or no difference (null hypothesis), of obtaining a result equal to or more extreme than what was observed."* (Dahiru, 2008, p. 4)

between agreement and proficiency than between the other conditions and proficiency(beta = 0.067, st. err = 0.032, $p < 0.05$).It shows that this condition needs more practice and exposure to be acquired because as mentioned by Slabakova (2013) is not transferable and must be learned lexically.

Figure 5.7 also shows this tendency which participants with low proficiency level has problems with agreement while the other two syntactic constructions are much easier for them, and mean scores also are high. Other morphological condition, past tense -ed; however, shows high mean scores in judgment for both grammatical and ungrammatical sentences. So based on this information and also the results of Slavakova and Gajdos(2008), Jensen (2016)and Basnet (2017), the agreement is the most persistent problem since even participants with high proficiency scores still have errors in judgment of the agreement. Therefore, the prediction about this research question can be correct that functional morphology problems are more persistent than syntactic problems and agreement is more persistent than past tense -ed.

Thus, the results of this study and previous studies are in support of the Bottleneck Hypothesis, which claims that functional morphology is the bottleneck of L2 acquisition. Although testing the past tense-ed showed that this functional category feature is not as difficult as the other features tested in this thesis and the other thesis, the result of the current thesis still supports the Bottleneck Hypothesis, and this feature is slightly more complicated than two other constructions. More research is required in the Bottleneck Hypothesis to clarify some other aspects of the Hypothesis.

7 CONCLUSIONS

The current thesis tried to test the Bottleneck Hypothesis which claims that functional morphology is the bottleneck of the second language acquisition (Slabakova, 2006; 2008; 2013). The Bottleneck Hypothesis's theoretical framework is based on Generative linguistics and asserts that the acquisition of functional morphology is more challenging than the other linguistic domains like syntax, semantics, pragmatics, and so on. Not so many studies have been done by 2016 when Jensen (2016) based on (Slabakova & Gajdos, 2008) studied the sole Bottleneck Hypothesis. Basnet (2017) and Jensen (2017) have also done studies on Bottleneck Hypothesis. This given study focuses on testing the Bottleneck Hypothesis with a concentration on syntax and functional morphology.

Besides, the methodology inspired by Jensen (2016). 44 participants between the ages of 16 -23 in the 3 groups of grades 10, 11, and university students answered three kinds of questions including proficiency test, a background questionnaire, and Grammaticality Judgment Test. The analysis of the participants' results has been done based on these three groups and the effect of proficiency level, age, and length of exposure also included in the analysis. The proficiency test was an off-line test and participants answered the questions on the answer sheets. The Grammaticality Judgment Test was also an off-line test and each group used checkmarks to judge whether the sentences were right or wrong. Each sentence has been shown only once in the PowerPoint slideshow and participants had only 20 seconds to judge the sentence. Grammaticality Judgment Test has been selected as the main test because as Mandell (1999) considers the test reliable measure to test the L2 competence. Since the aim of the study is to test the cognitive process of L2 acquisition, it was the most reliable method to be used here.

The results of the test fully support the Hypothesis according to the judgment mean scores of all groups which show the hierarchy of difficulties in the tested construction including the subject-verb agreement third-person singulars-s, past tense -ed which tested the functional morphology and subject initial and non-subject initial sentences used to test syntax. The results confirm the prediction which claimed that functional morphology is a challenging part of the L2 acquisition. Also, the results admit all the previous studies in the Bottleneck Hypothesis that the subject-verb agreement is the most difficult condition among all tested conditions; therefore, both morphological conditions are more difficult than two syntactic conditions even though the results of the past tense -ed indicate that this condition is not as challenging as

agreement and the mean scores of correct judgments are relatively high. As predicted, between the two morphological conditions of past tense-ed and subject-verb agreement, the past tense -ed is significantly easier than the subject-verb agreement. In the case of the two syntactic conditions, subject initial sentences have been easier to judge since the judgment mean scores of them are higher even though both conditions have higher mean scores and the difference between these two conditions is insignificant.

Moreover, the correlation between the conditions and level of Proficiency is investigated. As discussed in sections 5 and 6, there is a correlation between the level of proficiency and correct judgment mean scores which shows that the participants made more mistakes at a low level of proficiency; on the other hand, when language proficiency improves, the correct judgment mean scores also increase. This correlation is more obvious in the case of the subject-verb agreement. Participants with a low level of proficiency have low mean scores and the number of correct judgments is low (see figure 5.7). However, this number increases with improving the level of proficiency. Although this correlation is observed and participants with higher proficiency scores were more successful, the results indicate that participants with a higher level of proficiency still made many mistakes in agreement condition.

Based on Slabakova (2013), these confirm that since syntax is a part of the language that is transferable, it will be easier to acquire while functional morphology is a part of the language which should be acquired lexically. That is why acquiring functional morphology is problematic. Also, based on Morales (2014), who argues that languages with rich inflection face problems during the acquisition of the poor inflection system, it is difficult for Persian speakers to acquire the subject-verb agreement of English since Persian verb inflection is richer than English. Also, since the past tense marker in English is richer than Persian, according to Morales's claim, the acquisition of the past tense -ed is easier than the subject-verb agreement. Furthermore, there has not observed any correlation between the age and correct judgments while the insignificant correlation has been recorded between the length of exposure and correct judgments.

All in all, certain questions have been answered in the current thesis while many questions remained unanswered in the case of the Bottleneck Hypothesis and cognitive process of L2 acquisition which needs more research in this field. The results of the current study do support the Bottleneck Hypothesis that suggests functional morphology is the most difficult part of the L2 acquisition. The comparison has been done here between functional morphology

and syntax. The results support all previous studies conducted in Norwegian and Nepali languages. Also, they support the Slabakova and Gajdos (2008) that found that the acquisition of the subject-verb agreement are more complicated than syntax in German learners. Furthermore, the correlation between language proficiency and correct judgment mean scores recorded the improvement of the correct judgment by improving the level of proficiency even though participants with a high level of proficiency still have errors in the case of subject-verb agreement. This reveals that L2 learners of English probably are not able to acquire functional morphology as best as the syntax or other linguistic domains. Another aspect of this study is that these results can help the English teaching methodology. The differences in the details of this study and previous studies can reveal the effect of L1 transfer and difficulties of the acquisition of English as L2 for Persian speakers and can help the pedagogy of English for Persian speakers.

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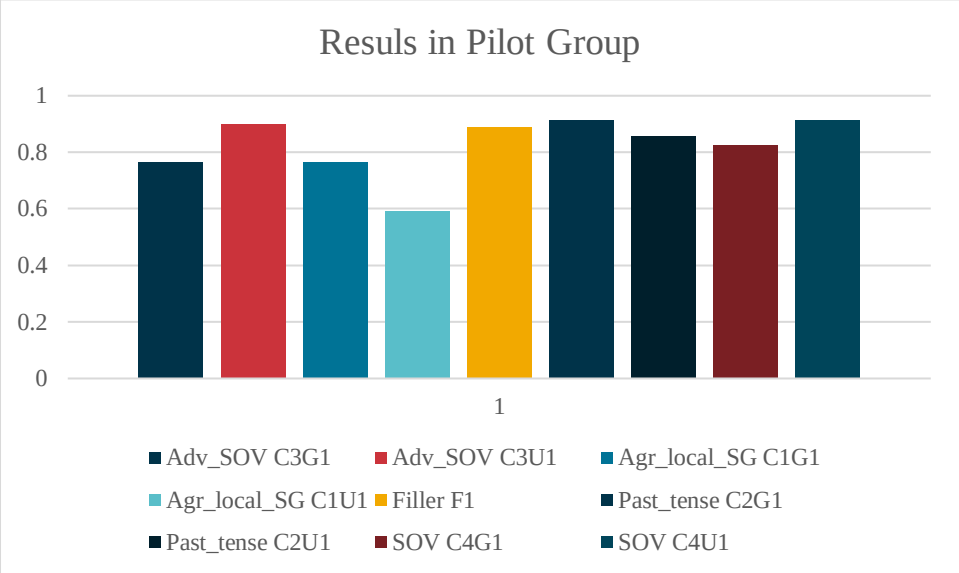
9 APPENDICES

Appendix 1: Pilot study

Mean scores of the Pilot group in each condition

Condition	Item	Mean scores
Adv_SOV	C3G1	0.766667
Adv_SOV	C3U1	0.9
Agr_local_SG	C1G1	0.766667
Agr_local_SG	C1U1	0.591667
Filler	F1	0.891667
Past_tense	C2G1	0.916667
Past_tense	C2U1	0.858333
SOV	C4G1	0.825



Results in the Pilot group.

Appendix 2: Oxford Proficiency Test

Grammar test-30 minutes

Instructions: Please complete the sentences by selecting the best answer from the available answers below.

1- Water_____at a temperature of 100^0 C.

(a) is to boil (b) is boiling (c) boils

2- In some countries _____very hot all the time.

(a) there is (b) is (c) it is

3- In cold countries people wear thick clothes _____ warm.

(a) for keeping (b) to keep (c) for to keep

4- In England people are always talking about _____ .

(a) a weather (b) the weather (c) weather

5- In some places _____almost every day.

(a) it rains (b) there rains (c) it raining

6- In deserts there isn't _____grass.

(a) the (b) some (c) any

7- Places near the Equator have _____weather even in the cold season.

(a) a warm (b) the warm (c) warm

8- In England _____time of year is usually from December to February.

(a) coldest (b) the coldest (c) colder

9- _____people don't know what it's like in other countries.

(a) The most (b) Most of (c)Most

10- Very _____people can travel abroad.

(a) less (b) little (c) few

11- Mohammed Ali _____his first world title fight in 1960.
(a) has won (b) won (c) is winning

12- After he _____an Olympic gold medal he became a professional boxer.
(a) had won (b) have won (c) was winning

13- His religious beliefs _____change his name when he became champion.
(a) have made him (b) made him to (c) made him

14- If he _____lost his first fight with Sonny Liston, no one would have been surprised.
(a) has (b) would have (c) had

15- He has travelled a lot _____as a boxer and as a world famous personality.
(a) both (b) and (c) or

16- He is very well known _____the world.
(a) all in (b) all over (c) in all

17- Many people _____he was the greatest boxer of all time.
(a) is believing (b) are believing (c) believe

18- To be the best _____the world is not easy.
(a) from (b) in (c) of

19- Like any top sportsman Ali _____train very hard.
(a) had to (b) must (c) should

20- Even though he has now lost his title, people _____always remember him as a champion.
(a) would (b) did (c) will

21- The history of _____ is

(a) aeroplane (b) the aeroplane (c) an aeroplane

22- _____ short one. For many centuries men

(a) quite a (b) a quite (c) quite

23- _____ to fly, but with

(a) are trying (b) try (c) had tried

24- _____ success. In the 19th century a few people

(a) little (b) few (c) a little

25- succeeded _____ in balloons. But it wasn't until

(a) to fly (b) in flying (c) into flying

26- the beginning of _____ century that anybody

(a) last (b) next (c) that

27- _____ able to fly in a machine

(a) were (b) is (c) was

28- _____ was heavier than air, in other words, in

(a) who (b) which (c) what

29- _____ we now call a 'plane'. The first people to achieve

(a) who (b) what (c) which

30- 'powered flight' were the Wright brothers. _____ was the machine which was the forerunner of the Jumbo Jets

(a) His (b) Their (c) Theirs

31- and supersonic airliners that are _____ common

(a) such (b) such a (c) so

32- sight today. They _____ hardly have imagined that in 1969,
(a) could (b) should (c) couldn`t

33- _____ more than half a century later,
(a) not much (b) not many (c) no much

34- a man_____ landed on the moon.
(a) will be (b) had been (c) would be

35- Already _____ is taking the first steps towards the stars.
(a) a man (b) man (c) the man

36- Although space satellites have existed _____ less
(a) since (b) during (c) for

37- than forty years, we are now dependent _____ them for all
(a) from (b) of (c) on

38- kinds of _____ . Not only
(a) informations (b) information (c) an information

39- _____ being used for scientific research in
(a) are they (b) they are (c) there are

40- space, but also to see what kind of weather _____.
(a) is coming (b) comes (c) wil come

Appendix 3: Background Questionnaire

1. How old are you? (date of birth) 1.تاریخ تولد

2. In which grade do you study? ۲.مقطع تحصیلی

3. Which language do you speak at home 3.درخانه به چه زبانی صحبت میکنید؟

4. Which language do you speak to your friends? ۴. با چه زبانی با دوستان خود صحبت میکنید؟

5. When did you start learning English? Age and grade? ۵. ازچه سنی یادگیری زبان انگلیسی را اغازکرده اید.

6.Where did you start learning English? ۶.در کجا یادگیری زبان انگلیسی را اغاز کرده اید؟

School مدرسه

English institute (private teacher) موسسه زبان(معلم خصوصی)

Home(parents) خانه(والدین)

Thank you!

Appendix 4: Sample of the main test (GJT) and the answer sheet

8-The man shows his car to everyone.

a-Right (□) b-wrong(□)

9-Yesterday the teacher a book to Sara gave.

a-Right (□) b-wrong(□)

10-Jane cooked a lot of food last night.

a-Right (□) b-wrong(□)

11-Ate my cat a fish yesterday.

a-Right (□) b-wrong(□)

12-The man clean his old car yesterday.

a-Right (□) b-wrong(□)

13-Last year Martin his house painted.

a-Right (□) b-wrong(□)

14-The student sends a letter to her teacher.

a-Right (□) b-wrong(□)

15-John sent a message to his mother.

a-Right (□) b-wrong(□)

	right	wrong	Code		
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Appendix 5: Sentences

Condition	Grammatical		Ungrammatical	
Agr_local_SG: Main clauses with agreement, singular subjects	The boy goes to the gym every Tuesday	1	* The boy go to the gym every Tuesday	28
	The man writes a letter to his family.	29	*The man write a letter to his family.	6
	The student sends a letter to her teacher.	14	* The student send a letter to her teacher.	35
	The girl plays with her friends .	38	* The girl play with her friends .	20
	The mother buys a pen for her son .	22	*The mother buy a pen for her son.	43
Past_tense: Subject initial declarative main clauses, past tense	The girl washed the dishes last night.	34	* The girl wash the dishes last night.	2
	Jane cooked a lot of food last night.	10	*Jane cook a lot of food last night.	27
	The man cleaned his old car yesterday.	37	* The man clean his old car yesterday.	12
	The police killed the thief last year.	44	* The police kill the thief last year.	23
	Jack watched football last night.	7	* Jack watch football last night.	32
Adv_SOV: Non-subject-initial declarative sentence : object placement.	Last year the man saved a boy from an accident.	3	* Last year the man a boy from an accident saved.	18
	Yesterday the teacher gave a book to Sara.	26	*Yesterday the teacher a book to Sara gave.	9
	Yesterday Maria bought the book.	45	*Yesterday Maria the book bought.	33
	Last year Martin painted his house.	39	* Last year Martin his house painted.	13
	Last month the children baked some bread .	21	Last month the children some bread baked	41

SOV: Subject-initial declarative main clauses, lexicality	Maria and Sara study physics very hard. John sent a message to his mother The man shows his car to everyone. The girls want to dance in the party. Jane opened the door last night.	30 15 8 31 24	* Maria and Sara physics very hard study. * John a message to his mother sent. * The man his car to everyone shows. * The girls to dance in the party want. *The door last night Jane opened	4 36 25 16 42
Filers, ungrammatical			*Maria her home work finish tomorrow. *went to gym yesterday Maria. *Ate my cat a fish yesterday. *The exam John this semester passed *Lap top the teacher lost in the bus.	5 17 11 19 40

The numbers in column 3 and 5 are the placement for the sentences in the actual test

Appendix 6: Language Proficiency scores

Participant	Proficiency Test	length of exposure
P10	10	7
P2	11	10
P25	11	9
P16	14	10
P8	14	8
P11	15	8
P18	15	6
P22	15	10
P30	15	6
P15	17	7
P4	17	5
P19	18	7
P20	18	11
P3	18	5
P43	18	9
P17	19	9
P6	19	5
P7	19	5
P21	20	12
P23	20	7
P26	20	8
P27	21	9
P31	21	9
P35	21	7
P36	21	11
P1	22	10
P24	22	10
P14	23	8
P42	23	8
P28	24	8
P44	24	12
P5	24	8
P39	25	16
P37	26	12
P38	27	11
P9	29	9
P12	30	9
P13	30	6
P41	31	10
P32	32	13
P33	32	10
P29	33	7
P34	33	17
P40	33	15

Appendix 7: Order of Language Proficiency based on the Length of Exposure

Participants	Proficiency Test	Length of exposure
p3	18	5
p4	17	5
p6	19	5
p7	19	5
p30	15	6
p13	30	6
p18	15	6
p10	10	7
p15	17	7
p19	18	7
p23	20	7
p29	33	7
p35	21	7
p42	23	8
p28	24	8
p26	20	8
p14	23	8
p11	15	8
p8	14	8
p5	24	8
p9	29	9
p12	30	9
p17	19	9
p25	11	9
p27	21	9
p31	21	9
p43	18	9
p1	22	10
p2	11	10
p16	14	10
p22	15	10
p24	22	10
p33	32	10
p41	31	10
p20	18	11
p36	21	11
p38	27	11
p21	20	12
p37	26	12
p44	24	12
p32	32	13
p40	33	15
p39	25	16
p34	33	17