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Crosslinguistic Influence in Third Language Acquisition

CLI in L3 English acquisition of Persian-Mazandarani Bilinguals

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Master's thesis in English Linguistics, ENG-3991, May 2024

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Dedication

To my wonderful partner and my adorable twin brother for their endless love and support

Acknowledgment

Primarily, I sincerely appreciate my supervisor, Prof. Marit Westergaard, for her patience, support, precious comments, and constructive feedback throughout all the steps of my writing process. This thesis has been made possible with her guidance.

Similarly, I would like to thank Dr. Sergey Minor, who patiently helped me with the data analyses.

Many thanks to all the participants in my data collection and to all the Iranian families and teachers who contributed to this thesis.

I am so grateful to my parents and my family for their boundless love and support and for believing in me throughout my most challenging moments.

Finally, I would like to express my enormous gratitude to my husband, Mahyar, and my brother, Milad, for all their love.

For my departed friend Mina, who remains eternally in my heart and thoughts.

Abstract

Aims and Objectives: This thesis aims to find the influence of previously acquired languages, specifically Mazandarani and Persian, on the early stages of English acquisition. The primary objective is to test word order patterns in noun modifiers and Of-genitive usage across Mazandarani, Persian, and English. The study includes three groups: bilinguals of Mazandarani and Persian and native speakers of Mazandarani and Persian.

Methodology: The research methodology is a forced-choice task through Google Forms appropriate for 6-7-year-old children in the beginning of English acquisition. The participant selection involved a non-random approach complemented by background questionnaires and assessments of English, Mazandarani, and Persian proficiency.

Data and Analysis: The collected data was analyzed in RStudio, R version 4.2.2 (R CoreTeam, 2023). The lme4 R (Bates et al., 2015) and emmeans (Searle et al., 1980) packages were used to fit the logistic mixed effects regression model.

Findings and conclusion: According to the Cumulative Enhancement Model (CEM) (Flynn et al., 2004), the performance of Group 2L1 is not only facilitated by Persian and Mazandarani languages. Instead, it shows a combination of facilitative and non-facilitative influences from both languages. This suggests that the CEM model does not fit the results. The Typological Primacy Model (TPM) (Rothman, 2010, 2011, 2015; Rothman et al., 2019) posits that 2L1 uses a previously acquired language with higher typological similarity. However, results showed that Group 2L1 struggled with noun modifier properties despite Mazandarani's typological similarity to English. The Linguistic Proximity Model (LPM) (Westergaard et al., 2017) is the only model that supports some aspects of the findings. It indicates that only the Attributive adjective condition has a non-facilitative influence from Persian and a facilitative influence from Mazandarani. Generally, there is no significant cross-linguistic influence in English.

Significance: This study adds to the existing data on CLI in L3 acquisition and contributes to the ongoing discussions on the role of previously acquired languages in L3A.

Keywords: CLI, Mazandarani, Persian, English acquisition, word order of noun modifiers, Of-genitive, CEM, LPM, TPM.

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List of Abbreviation

Group 2L1 Mazandarani and Persian simultaneous bilinguals

2L1 Mazandarani and Persian simultaneous bilinguals

L2 second language

L2A second language acquisition

L1 first language

L3A third language acquisition

L3 third language

REZP reverse ezafe phrase

CEM cumulative enhancement model

CLI cross-linguistic influence

EPT English proficiency Test

Group P native Persian speakers

Group M native Mazandarani speakers

PT Persian Test

MT Mazandarani Test

Eng English

EZ ezafe particle

1 Introduction

There is a growing interest in investigating the acquisition of third or more languages (e.g., Bardel & Falk, 2007; Flynn et al., 2004; Hermas, 2014; Rothman, 2011; Rothman & Cabrelli Amaro, 2010; Westergaard et al., 2017). However, questions remain regarding the impact of Cross-linguistic Influence (CLI) on language acquisition. It is crucial to investigate how bilingualism helps or hinders the process of acquiring a third language and how this impacts the initial phases of third language acquisition.

Unlike second language (L2) acquisition, identifying the source of cross-linguistic influence (CLI) in L3 is challenging as it can stem from the L1, L2, or both existing grammars. L3 models do not yet agree on whether learners prefer first or second source of influence, which involves temporarily inhibiting one of their pre-existing grammars, or if they can use both previously acquired languages as sources of influence throughout the acquisition process.

In the field of third language acquisition (L3A) research, there are two models for identifying the source of influence: In the first model, CLI source selection is a property-by-property process when both previously learned languages impact L3A, which is suggested by (Westergaard, 2021a; Westergaard et al., 2019; Westergaard et al., 2017) and (Slabakova, 2017). The second model assumes that if the CLI is only from a language that is typologically similar to the target language, then the CLI occurs all at once proposed by Rothman (2011, 2015). The CLI in the source selection is influenced by factors such as order of acquisition (Bardel & Falk, 2007; Hermas, 2010, 2015; Jin, 2009), language dominance (Fallah et al., 2016), typological similarity (Rothman & Cabrelli Amaro, 2010), and structural proximity (Westergaard et al., 2017). There are contradictory results regarding the source and nature of CLI that have been found, which lead to ongoing discussions.

In light of this, in this thesis, I will analyze the role of previously acquired linguistic systems, Mazandarani and Persian, on learning English at the earliest stages of acquisition. The linguistic properties under investigation relate to the word order of noun modifiers Of-genitive usage.

The study addresses two primary research questions: First, the source of Cross-Linguistic Influence and whether it comes from one or both of the previously acquired languages. Second, it examines whether CLI is facilitative or non-facilitative.

Mazandarani and Persian simultaneous bilinguals (Group 2L1), native speakers of Persian (Group P) and Mazandarani (Group M), were chosen as the target participants who are at the beginning of learning English. The groups were matched in English proficiency and all of the participants were tested through a forced-choice task. In addition, the L3 group and native Mazandarani group were tested in the background test of Mazandarani and Persian.

Mazandarani and Persian are very similar languages. However, Mazandarani has a word order of noun modifiers that is similar to English. At the same time, it is different from Persian, and Persian and English are similar in Of-genitive usage. In Persian, the Possessive 'S and the Of-genitive have the same meaning as the structure of the Of-genitive in English. Similarly, in Mazandarani, the Possessive 'S and the Of-genitive have the same meaning as the structure of the Possessive's in English.

The Main Test results demonstrated that the performance of Group 2L1 reflects facilitative and non-facilitative influences from both languages. This suggests that the Cumulative Enhancement Model (CEM) (Flynn et al., 2004) does not adequately address the finding. The Typological Primacy Model (TPM) (Rothman, 2010, 2011, 2015; Rothman et al., 2019) posits that language learners use a previously acquired language with higher typological similarity. Based on TPM, my study predicted that Group 2L1 would replicate the structure of Mazandarani in learning English. However, results showed that Group 2L1 struggled with noun modifier properties despite typological similarity between Mazandarani and English. The Linguistic Proximity Model (LPM) (Westergaard et al., 2017) is the only model that supports some aspects of the findings. It indicates that only the Attributive adjective condition has a non-facilitative influence from Persian and a facilitative influence from Mazandarani. Generally, there is no significant cross-linguistic influence in English. In general, there was not a significant amount of cross-linguistic influence among simultaneous Mazandarani-Persian bilinguals who are learning English as a third language.

This thesis is structured as follows: Chapter 2 provides theoretical background, models of L3A, and empirical evidence. It discusses cross-linguistic influence (CLI) between Mazandarani, Persian, and English, syntactic structure in the word order of noun modifiers and of-genitive in three languages, as well as research questions and predictions. Chapter 3 presents comprehensive details of the experiment, including results from a pilot study conducted before the main study. The results and statistical analysis are presented in Chapter 4, while the findings are discussed in Chapter 5. Future research recommendations and limitations will be addressed

in Chapter 6. The final chapter (Chapter 7) summarizes and concludes this thesis. The appendices provide additional information about the tasks, including a comprehensive list of data collection items.

2   Background

In this section, I present the core definitions of this study briefly. These concepts include the definition of multilingualism, the phenomenon of cross-linguistic influence, literature and the most common models in third language acquisition, and an exploration of the syntactic structures in Mazandarani and Persian. Furthermore, I will provide an overview of the study conducted by Fallah et al. (2016) which was done in the same languages as my thesis— Mazandarani, Persian, and English—as well as some shared properties, in the final section, I provide my research questions and possible predictions for this study.

2.1   Multilingualism

As Puig Mayenco (2019) explains, definitions of multilingualism vary; some emphasize communication skills, while others refer to language usage without providing clear explanations. The complexity of this issue becomes more obvious when we question conventional language concepts. For instance, a Spanish-Arabic-English trilingual is undoubtedly multilingual because they speak three distinct languages. However, it is blurred when considering people who speak various "dialects," like Cantonese, Mandarin, and Hebei. Whether they qualify as multilingual depends on our interpretation of "language" versus "dialect."

Chomsky (2000) provides a clear answer:

> Everyone grows up hearing many different languages. Sometimes they are called 'dialects' or 'stylistic variants' or whatever, but they are really different languages. It is just that they are [sometimes] so close to each other that we don't bother calling them different languages. So, everyone grows up in a multilingual environment. Sometimes the multilingual environment involves systems that are so unlike that you call them different languages. But that is just a question of degree; it is not a question of yes or no. (Chomsky, 2000)

To summarize, multilingualism refers to at least three linguistic systems, per Chomsky's quote. However, it is important to clarify that these systems do not necessarily have to be three distinct systems.

2.2   Cross-Linguistic Influence

Bi- or multilingual people possess multiple linguistic frameworks within their cognitive repertoire. This intricate linguistic coexistence leads to the phenomenon known as Cross-Linguistic Influence when one language system exerts an impact on another language system within the mind or brain. As introduced by Kellerman and Smith (1986), the concept of CLI enables the study of language contact phenomena in L2 and L3A. It considers the multidimensional, multidirectional nature and significant complexity of learning languages. A significant part of language contact is in grammar, which includes syntax, morphology, phonology, and semantics. Grammar is employed to analyze linguistic input, helping to comprehend or produce a specific language.

Jessner (2008) highlights the significance of CLI in L3A and the influence of previously acquired languages on the acquisition, use, and learning of a third language.

In this study, the term CLI will be consistently employed rather than *transfer* because it offers a broader scope than transfer, including various forms of interference or interactions at both the "product and process" levels, as described by Smith and Truscott (2014, p. 194). This study exclusively utilizes the term "transfer" when focusing on earlier models and research that specifically used this concept.

In Third Language Acquisition, CLI pertains to how previously acquired languages, such as L1 and L2, can impact the acquisition, processing, and usage of a third language (L3), affecting both the ultimate proficiency of the L3 learner and the underlying cognitive processes involved in L3 acquisition.

According to (Westergaard, 2021b), there are two types of Cross-Language Influence (CLI): facilitative and non-facilitative. Facilitative CLI occurs when a feature in one or both of the learner's background languages closely resembles a corresponding structure in the target language. This enables the learner to accurately process input and construct grammatically correct sentences in the target language. On the other hand, non-facilitative CLI occurs when a

structure in one or both previously acquired languages differs from the corresponding structure in the target language. In such cases, the learner may struggle to process input correctly, leading to difficulties in comprehension and production. It is important to note that non-facilitative CLI often becomes apparent during production, as the learner may inappropriately draw upon one of their previously acquired languages.

2.3   Third Language Acquisition

Third language acquisition is an emerging field of study, and much of the existing research in this domain builds upon insights from second language acquisition (L2A), particularly concerning Cross-Linguistic Influence. It is essential to note that L3A represents a significantly more intricate process than L2A. In L2A, the learner's first language is the sole source of influence, whereas in L3A, the learner has the flexibility to choose from two distinct language systems.

Cal and Sypiańska (2020) explain that L3A is marked by a significant degree of complexity. This complexity is exacerbated by various influencing factors, including the learner's proficiency in their L2, their proficiency in their L1, the structural similarities between the languages, the sequence and context in which the languages are acquired, how recently the languages have been used, and the learner's level of proficiency in the third language. These factors collectively play a role in shaping the impact and interaction with the third language.

Westergaard et al. (2022) explain that a crucial difference between investigations in the L2A and L3A fields lies in the necessity of L1 transfer, which is essential in L2A but not always applicable in L3A.

In addition, according to (Rothman & Cabrelli Amaro, 2010), the study of L3A is not only about L1 and L2, it includes various linguistic perspectives, including sociolinguistics, psycholinguistics, and generative approaches.

To sum up, studying the process of acquiring multiple languages can help us understand whether (a) the first language serves as the main influence on all subsequent languages learned, (b) the most recently acquired language becomes the primary source for learning future languages or (c) if the acquisition of a multilingual third language (L3) happens while both the first (L1) and second (L2) languages are equally active (Rothman & Cabrelli Amaro, 2010). As Otwinowska et al. (2020); Westergaard et al. (2017) state, the primary focus of research in the

field of L3A pertains to determining the source of CLI, i.e., whether all previously acquired languages influence the L3 or if only one is selected as the predominant or sole source of influence.

2.4   L3 Models and Relevant Previous Research

In the last ten years, numerous L3A models have been developed, primarily focusing on essential aspects of Cross-Linguistic Influence in L3A research. These inquiries revolve around pointing to the source of CLI, such as whether it stems from the L1, L2, or both, as well as the characteristics of CLI, containing whether it is all-encompassing or limited to specific linguistic features, along with the effects of various factors. Multiple theories and models exist within L3A, and the forthcoming sections will spotlight only a few.

2.4.1   The Default L1 Effect

The "L1 Factor" theory proposed by Hermas (2010, 2014), contends that the L1 should play a prominent role in the process of L3A transfer. According to Hermas (2010, 2014), while the L1 is typically considered the primary source of transfer, surpassing factors like linguistic proximity and psychotypology, both facilitative and non-facilitative transfer can occur. While no definitive model of L1 involvement in L3A has been developed at this time, certain studies, including those by Hermas (2010), and (Jin, 2009), have observed significant L1 influence. They argue that because learners may possess greater proficiency in their L1, it becomes more accessible for transfer, potentially making L1 the primary source of impact in L3A.

Hermas (2010) investigated, the L3 verb movement acquisition of adult Arabic-French bilinguals, who were initiating their L3 English learning, was investigated. The study employed an acceptability judgment task and a preference test to assess the proficiency of participants in these components. French and Arabic share the feature of verb movement, unlike English, which lacks it. In French, adverbs only appear after verbs, while in English, they are inserted before verbs. In Arabic, adverbs can occur both before and after verbs. The results of the two tests showed that the L3 group varied significantly from the native French and English speakers and L1 Arabic only had a negative impact on the accuracy of L3 English. The findings supported the important role of L1 as the primary source of influence in early L3 English.

Also, in a study conducted by Jin (2009), which provided empirical support for the influence of L1, the investigation aimed to understand how advanced L2 English learners from China, who were pursuing graduate studies in Norway, acquired Norwegian objects in their L3.

Notably, Chinese is a topic-prominent language, while both Norwegian and English are subject-prominent languages. This distinction results in Chinese allowing null objects, whereas Norwegian and English require a referential pronoun or noun phrase. The results from a grammaticality judgment task and a sentence correction task revealed variations in the acceptance of null objects in L2 and L3 of learners. Overall, the Chinese learners exhibited a high degree of accuracy in rejecting null objects in English (70%), more than half of the participants were able to evaluate and correct English null object sentences at a native-like proficiency level. However, the same learners encountered difficulties in rejecting null object sentences in Norwegian, indicating a lack of facilitation from their L1 (Chinese). Consequently, the researchers concluded that the L1 Chinese, had a significant adverse impact on the L3 acquisition of Norwegian properties, while L2 English, did not exert any influence.

2.4.2 The L2 Status Factor

The L2 Status Factor (L2SF) hypothesis posits that the second language holds an advantageous and privileged role as the primary source of influence in the acquisition of a third language (Bardel & Falk, 2007, 2012; Falk & Bardel, 2011). The Declarative/Procedural model proposed by Paradis (2009), the foundation of the L2SF hypothesis, suggests that native and non-native grammars are stored in separate areas within the mind/brain—native grammars in procedural memory and non-native ones in declarative memory. Only when L3A follows a similar pattern to L2A, both the L2 and L3 are stored in declarative memory, making transfer from L2 to L3 a more straightforward process compared to L1 to L3.

Bardel and Falk (2007) examined the V2 linguistic phenomenon, focusing on the languages involved. Among the languages involved in their research, German, Dutch, and Swedish exhibited V2 characteristics, while English, Italian, and Albanian did not. The researchers ensured that each participant had one V2 language and one non-V2 language as either their L1 or their L2. They recorded Swedish language classes through both video and audio recordings over ten sessions. The analysis of the spoken data revealed that individuals with a V2 language as their L2 performed notably better in learning either Dutch or Swedish compared to those with a V2 language as their L1. These findings suggest that the L2 functions as a filter, avoiding the influence of the L1 on L3 acquisition.

Falk and Bardel (2011) further substantiated the L2SF model by examining the placement of object pronouns in L3 German. In this experiment, intermediate-level L3 learners were divided into two groups: one comprised of L1 English - L2 French speakers, and the other

group consisted of L1 French - L2 English speakers, with the goal of making a performance comparison. English and German share a similar structure in main clauses, placing object pronouns after the verb. In contrast, German and French exhibit structural similarity in subordinate clauses, positioning object pronouns before the verb in both languages. The results indicated that the performance of both groups was influenced by their L2. Specifically, participants with L2 French tended to accept object pronouns in pre-verbal positions in both main and subordinate clauses, while participants with L2 English displayed a preference for accepting post-verbal object pronouns.

2.4.3 The Cumulative Enhancement Model

The Cumulative Enhancement Model (CEM), as proposed by (Flynn et al., 2004), signifies a perspective concerning the impact of prior language acquisitions in L3A. In contrast to the L2 Status Factor (L2SF), the CEM argues that the influence exerted during L3A is selective and can emerge from any source, provided that it serves as a facilitative factor. This implies that the source of influence can be L1, L2, or a combination of both, and the impact of previously learned languages on L3A can either be positive or have no effect. As a result, a learner systematically examines specific linguistic features present in their background languages. If a similar feature exists in any of these languages, it is then chosen to be transferred into the L3. If there is no equivalent feature, the learner acquires the new feature.

The CEM is proposed on research by Flynn et al. (2004) who employed an elicited imitation task to investigate the influence of L1 and L2 languages on the acquisition of English restricted relative clauses among three participant groups: L1 Spanish and L1 Japanese learners of L2 English, and L1 Kazakh-L2 Russian learners of L3 English. Kazakh and Japanese are head-final languages, whereas English, Spanish, and Russian are all head-initial. The results revealed that, while the L1 Japanese group responded differently, the bilingual group (L1 Kazakh-L2 Russian) and L1 Spanish group performed similarly. From this, the researchers concluded that the bilingual and L1 Spanish groups outperformed the L1 Japanese group in relation to the head-final parameter because they had already acquired a language (L1 or L2) with the head-initial parameter. Generally, the data indicated that all previously acquired languages can have a positive impact on the acquisition of a third language, leading to the formulation of the Cumulative Enhancement Model (CEM).

2.4.4 The Typological Primacy Model

The Typological Primacy Model (TPM), as proposed by Rothman in several publications (Rothman, 2010, 2011, 2015; Rothman et al., 2019) represents one of the developments in the field of L3A. According to TPM, learners initially construct the grammar of their third language by replicating the entire linguistic structure of a language that shares greater typological similarity with the target language. This model is closely connected to the Full Transfer/Full Access (FT/FA)[1] model in L2A, as indicated by (Schwartz & Sprouse, 1996).

Both of these models aim to explain how prior languages impact the acquisition of subsequent ones. The FT/FA model suggests that learners have access to all linguistic knowledge obtained from the previous language, while the TPM argues that language transfer depends on the typological similarities between languages. According to the FT/FA model, the knowledge from L1 is fully accessible and transferable to L2. On the other hand, the TPM predicts that transferability depends on the typological similarity among L1, L2, and L3.

The TPM claims that the source of the influence is dictated by the overall typological similarity between the target language and one of the previously acquired languages. Unlike the default L1 effect and L2SF, where the order of acquisition is important, the TPM considers total typological similarity as the source of influence, irrespective of whether the impact serves as a facilitator or not.

Rothman (2015, p. 184) argues that wholesale transfer offers cognitive efficiency by eliminating the need to compare each feature with two highly active languages simultaneously. Moreover, a bilingual mind requires inhibition, among other executive control functions, to limit the activation of multiple languages. Consequently, it appears more effective to transfer entire grammatical structures based on general typological similarities between the target language and other grammatical systems. However, these studies on TPM including Rothman (2015); Rothman et al. (2019) demonstrate that transferring property-by-property is feasible, both before and after wholesale transfer. This is particularly applicable in L4 acquisition, as "L3 experiences of non-facilitation might very well mean that full transfer will be disregarded as a viable option when the mind is an experienced multilingual one" (Rothman et al., 2019, p.

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[1] The Transfer/Full Access Model proposed by Schwartz and Sprouse (1996, p. 40) in L2A is elaborated in the TPM. In this model, they explain that "the initial state of L2 acquisition is the final state of L1 acquisition (Full Transfer) and the failure to assign a representation to input data will force subsequent restructurings, drawing from options of UG (Full Access)."

157). Therefore, the assessment of typological similarity includes structural similarity as a decisive factor.

Rothman (2013, p. 238) proposed an outline through a property hierarchy by evaluating typological similarities, listed in order of importance as follows:

1. Lexicon
2. Phonology/Phonotactics
3. Functional Morphology
4. Syntactic Structure

This hierarchy serves as a framework for the parser to assess which linguistic attribute closely resembles one of the previously acquired languages in order to choose a source of influence. If a similarity at one level is inadequate for CLI, the parser proceeds to the next level in the hierarchy and continues this process until a suitable match is found.

2.4.5   The Linguistic Proximity Model

The Linguistic Proximity Model (LPM) (Westergaard, 2021a, 2021b; Westergaard et al., 2017), shares certain similarities with the TPM. However, the LPM distinguishes itself through variations in certain aspects. In the LPM, transfer is perceived as a phenomenon that takes place on a property-by-property basis. In this model, the source of influence can originate from either one of the previously acquired languages or even from a combination of them. Moreover, the LPM operates under the assumption that CLI occurs when an abstract structural similarity between a linguistic property in the target language and properties found in the background languages exists. Based on Slabakova (2017), the LPM can be described as a structural model, similar to the TPM. Nevertheless, it deviates from the TPM and other previously discussed models in one crucial aspect—it does not endorse the notion of complete transfer. This perspective is also in alignment with the Scalpel Model.[2]

Westergaard (2021b) explains a perspective that emphasizes the influence of overall typological/lexical similarity over structural similarity during the early stages of L3A. While the LPM argues that all previous grammars remain active and accessible to the L3A learner, it

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[2] Both the LPM and the Scalpel Model, as proposed by Slabakova (2017), make the assumption that property-by-property transfers take place and that L3A is a cumulative process. In both models, structural similarity serves as an important factor for CLI. These similarities lead to no discussion of the Scalpel Model in this study.

acknowledges that when there is a significant typological and lexical similarity between the L3 and one of the previously acquired languages, it can lead to a stronger activation of the syntactic structure of that specific language, the result of this activation is a facilitative influence. On the other hand, non-facilitative influence arises from a misanalysis of L3 input, which prompts the learner to construct structures that deviate from the target language. Moreover, Westergaard et al. (2017) present that the process of transferring linguistic properties on a property-by-property basis is a more efficient cognitive mechanism. They argue that this approach reduces the effort required to unlearn incorrectly transferred properties. Expanding on this, Westergaard et al. (2017) clarify that it remains uncertain whether transferring an entire grammar is cognitively more efficient than transferring smaller amounts of information repeatedly.

For the first time, the LPM was introduced in a study (Mykhaylyk et al., 2015; Westergaard et al., 2017) comparing 2L1 Russian-Norwegian bilingual L3 English learners to two groups of L2 English speakers, aged 11-14. The study assessed the acceptability of two English syntactic structures: Adverb-Verb (Adv-V) word order in subject-initial declarative clauses and Subject-Auxiliary (Aux-S) inversion in interrogative clauses. The former structure aligns with Russian, while the latter corresponds with Norwegian. Results showed that Russian-Norwegian speakers displayed higher accuracy in the Adv-V word order, although they were less accurate than Russian speakers. This pattern was attributed to the simultaneous presence of both facilitative and non-facilitative CLI from Russian and Norwegian in L3 English, activated by structural matches or mismatches between English and previously learned grammars.

A recent study in the LPM (Westergaard, 2021a, 2021b) has shown CLI as the outcome of the simultaneous activation of previously acquired grammars to varying degrees, influenced by their structural similarity, for the purpose of parsing L3 input. During this process, the parser has access to all the earlier grammars. In this framework, the parser assesses the L3 input by utilizing features from the previously learned languages, which are engaged simultaneously. This initial representation is initially unstable and weak but strengthens over time with more input and parsing.

2.4.6 The Language of Communication

The concept of "the language of communication" is a central focus of the study by Fallah et al. (2016). This term refers to the primary spoken language used by individuals in various aspects of their daily lives, including interactions with family, friends, teachers, and other people. It is the language that is employed most frequently by the learners in different social settings such as at home, in school, and social contexts. It examines how this "language of communication" plays a crucial role in the acquisition of an L3. The researchers investigate whether the language predominantly used by individuals in their everyday interactions has an influence on the syntax and linguistic patterns they employ when learning an L3, particularly at the initial stages of acquisition. The significance of the "language of communication" becomes apparent in multilingual societies where different languages are spoken, and it may vary depending on the region or setting. The choice of language for daily communication can be influenced by factors such as location, culture, and social dynamics.

Fallah et al. (2016) explain the study of attributive possessives in three different languages, with a focus on three groups of learners. The first and second groups have L1 Mazandarani and L2 Persian, differing in their "language of communication," either Mazandarani or Persian, respectively. The third group, with Persian as their L1 and Mazandarani as their L2, uses Persian as the language of communication.

2.5 A brief overview of the study by Fallah, Jabbari and Fazilatfar 2016

This study examines the influence of previously acquired linguistic systems, specifically Mazandarani and Persian, on the early stages of acquiring a third language (L3), English. The research assessed the ability of participants to correctly position attributive possessives in English sentences. Notably, English and Mazandarani share similar grammatical patterns for the target possessive structures, where possessors came before possessed nouns and possessive adjectives preceded nouns (1). In contrast, in Persian possessives are positioned after nouns (2).

(1) Me kelas (Mazandarani)

possessor possessed noun

My   class

(2) *Kelas-e mæn* (Persian)

⬇ ⬇ ⬇

possessed   EZ   possessor

Class -EZ my

(3) My class (English)

⬇ ⬇

possessor   possessed noun

The study involved 31 junior high school students from Mahmoudabad and Tehran in Iran. Participants were all male, aged 13-14, since all participants of this study are in grade 7, they are in the initial stages of learning L3 English, that is, during the onset of language learning after a minimum of 22 hours and a maximum of 26 hours of formal instruction in the schools.

The participants were divided into three groups: the first two groups had Mazandarani as their first language (L1) and Persian as their second language (L2), but they differed in terms of their primary language of communication, either Mazandarani or Persian. The third group had Persian as their L1 and Mazandarani as their L2, with Persian as their primary language of communication.

Fallah et al. (2016) employed three tasks to assess language proficiency and target structures comprehension and production. The tasks included a Grammaticality Judgment Task (GJT), an Element Rearrangement Task (ERT), and an Elicited Oral Imitation Task (EOIT).

a. Grammaticality Judgment Task (GJT): This task comprised 40 items, with 20 focusing on possessive structures (both '-s' and Possessive determiner) and 20 serving as distractors to divert attention. The 20 possessive items were evenly split into 10 grammatical and 10 ungrammatical sentences. The participants, who were beginners in learning English, assessed sentence correctness without a time limit. They could choose from three options: 'acceptable,' 'unacceptable,' or 'I don't know.' Correct judgments received a score of one, while incorrect judgments scored zero, with a maximum possible score of 20. 'I don't know' answers did not earn any points. Two raters scored the answers, and there were no disagreements between them.

b. Element Rearrangement Task (ERT): This task consisted of 40 scrambled sentences, with 20 containing the target possessive structures and 20 featuring other structures as distractors. Participants were tasked with reorganizing words to form correct sentences. Scoring focused solely on the positioning of the possessor and possessed, with a score

of 1 awarded for each correct arrangement. The maximum total score for this task was 20.

   c. Elicited Oral Imitation Task (EOIT): This task comprised 20 sentences, including 10 grammatical and 10 ungrammatical ones with the target structures. Test-takers were first required to determine whether each sentence was true or false, serving as a delay to prevent direct imitation. Subsequently, they had to orally produce the sentences in correct English. The first part, regarding truth or falsity, did not yield any points. Scoring was based on the accurate repetition of sentences to the target structures, awarding a score of 1 for correct repetition and 0 for incorrect repetition or avoidance.

Additionally, the tasks were administered to five native English speakers to validate their effectiveness and the acceptability of the test sentences. The native speakers achieved 100% accuracy in the target structures across all tasks, affirming the tasks' validity.

The group which used Mazandarani as the language of communication, exhibited the highest mean scores in all tasks, with approximately 80% accuracy in comprehending and producing target structures in English, aligning with an English-like order. In contrast, the second Mazandarani and the Persian groups, using Persian as their language of communication, predominantly placed possessors after possessed nouns, reflecting a Persian-like order. Their performance in comprehending and generating grammatical English sentences was lower, ranging from about 12% to 18% accuracy, with the majority conforming to the Persian order, in around 85% of cases.

Fallah et al. (2016, p. 234) point out that the participants have not previously studied English in any language institutes and have not received any formal instruction on possessives. However, in today's world, with the influence of social media and online games, it is nearly impossible to prevent children from being exposed to English. Without an English Proficiency Test, we cannot accurately evaluate the English level of participants individually. Consequently, the final data is based on an assumption about their English proficiency. Therefore, it is necessary to have a proficiency test in English, which was not included in the study. I attempted to fix the issue by taking an English proficiency test.

2.6   Syntactic Structures

This thesis investigates the word order of different nouns modifiers, including Possessive determiner, Possessive 'S, and Attributive adjective. These modifiers share the same structure in both English and Mazandarani but differ in Persian. Additionally, this study examines the Of-genitive structure, which has the same structure in English and Persian but it is different in Mazandarani. For clarity, there is a table with a summary list of each property in each language and their functions in the final part of this section.

Mazandarani and Persian belong to the same language group. They are similar in many ways but diverge when it comes to nominal modification. In the following, these properties will be described in detail and some syntactic trees will be drawn to explain the structures in Persian and Mazandarani:

As Mahootian (2002, p. 66) explains, the ezafe phrase plays a crucial role in modifying nouns and connecting various nonverbal elements in Persian. The ezafe particle serves as a link between a head noun and various elements such as adjectives (phrases), nouns (phrases), adverbs (phrases), prepositional phrases, or infinitives. Moreover, it has the capacity to connect adjective and quantifier heads to their corresponding complements. The ezafe particle is represented by an unstressed [e] (or [ye] after a vowel) positioned between the head of a phrase and the modifying elements that come after it. The sequence in **Persian**, in simple terms, is as follows:

MODIFIED + EZAFE + MODIFIER

(1)   *Asb*   -e-   *Peter* (English: Peter's horse)

(2)   *Asb*   -e-   *mæn* (English: My horse)

(3)   *Asb*   -e-   *siyah* (English: Black horse)

A. ***Possessive determiner:*** In Persian, the Possessive determiner is positioned after nouns, with the ezafe particle in between (5). Possessive determiner come before nouns in Mazandarani and English without the ezafe particle (4).

(4) *Me*   *asp* (Mazandarani) (English: My horse)

Possessive determiner   noun

(5) *Asbe*   *-e*   *man* (Persian) (English: My horse)

   ⬇   ⬇   ⬇

noun   **Ezafe Particle**   **Possessive determiner**

B. ***Possessive 'S:*** In Mazandarani, there is a head-initial phrasal category called the "reverse Ezafe Phrase," where the main element is the morpheme (-e). It is structured with the possessor on the right and the possessum on the left. This differs from Persian, where the "Ezafe phrase" positions the possessum on the right and the possessor on the left (12). (Dabir-Moghaddam, 2006; Fallah et al., 2016)

As Fallah et al. (2016) explain, in Persian, there is no structure for the reverse Ezafe phrase (REZP), whereas, in Mazandarani, it is a common and frequently used linguistic structure. In Mazandarani, the REZP is characterized by the morpheme (-e) serving as its head, with the possessum positioned on the right side and the possessor on the left side. It stands in contrast to Persian (7). The meaning and structure of Possessive 'S and Of-genitive in Persian are similar (7) and (12), and they behave similarly to Of-genitive in English.

(6) *Peter*   *-e*   *asp* (Mazandarani) (English: Peter's horse)

   ⬇   ⬇   ⬇

possessor   **reverse Ezafe Particle**   **possessum**

(7) *Asb*   *-e*   *Peter* (Persian) (English: Peter's horse)

   ⬇   ⬇   ⬇

possessum   **Ezafe Particle**   **possessor**

(8) Peter's horse

   ⬇   ⬇

possessor   **possessum**
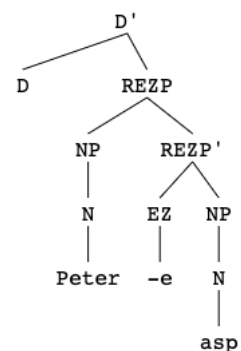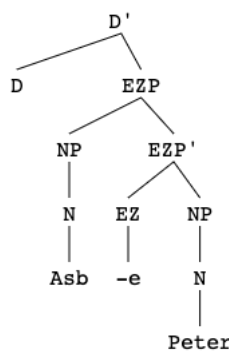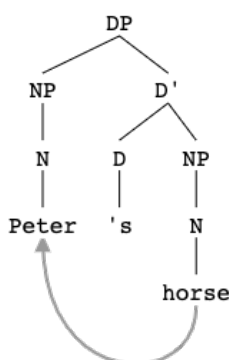
C. ***Attributive adjective:*** According to Dabir-Moghaddam (2006); Fallah and Jabbari (2018), in Mazandarani, Attributive adjectives are positioned before nouns and are linked to nouns by using the reverse Ezafe particle (REZ). In contrast, Persian has Attributive adjective on the right side of nouns with ezafe particle in between.

(9) Gat   -e   asp (Mazandarani) (English: Big horse)

   ⬇   ⬇   ⬇

  adjective   reverse Ezafe Particle   noun

(10)   Asb   -e   bozorg (Persian) (English: Big horse)

      ⬇   ⬇   ⬇

    noun   Ezafe Particle   adjective

(11)   Big   horse

      ⬇   ⬇

    adjective   noun
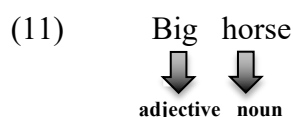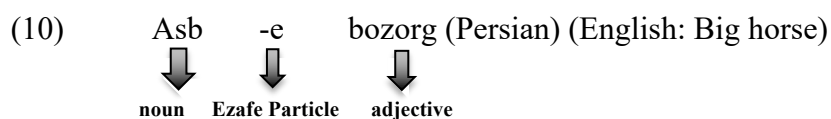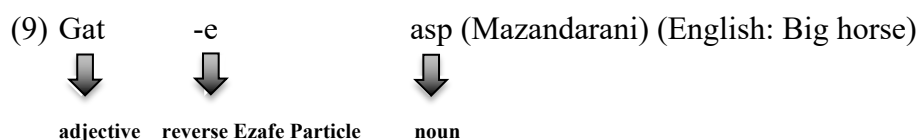
D. ***Of-genitive:*** The structure of the Of-genitive property is the same in both Persian and English. However, the structure and meaning of the Possessive 'S and the Of-genitive in Mazandarani are similar (6) and (13), they behave like the Possessive 'S in English. In English, as Leech (2006, p. 47) mentions, the 'of-phrase,' sometimes referred to as the 'Of-genitive,' and both constructions ('s and Of-genitive) cannot be used interchangeably. For instance, "the arrival of the bride" and "the bride's arrival," demonstrate the same meaning in two different structures. In Persian, possessum is positioned after possessor, with the ezafe particle in between.

(12)   *Xaneh*   *-ye*   *Peter* (Persian) (English: House of Peter)

      ⬇   ⬇   ⬇

    noun   Ezafe Particle   noun

(13)   *Peter*   *-e*   *sere* (Mazandarani) (English: Peter's house)

      ⬇   ⬇   ⬇

    noun   reverse Ezafe Particle   noun
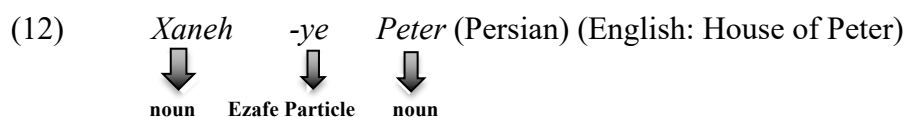
(14)　　　House　　　-of　　　Peter (English)

⬇　　　⬇　　　⬇

noun　　**Of-genitive**　　**noun**

LANGUAGE PROPERTIES

A. POSSESSIVE DETERMINER	**M=E≠P**
B. POSSESSIVE 'S	**M=E≠P**
C. ATTRIBUTIVE ADJECTIVE	**M=E≠P**
D. OF- GENITIVE	**P=E≠M**

Table 1. Summary of Properties

It is essential to emphasize that in Persian, the Possessive 'S and Of-genitive have the same meaning and structure but they behave like the Of-genitive in English. Similarly, in Mazandarani, the Possessive 'S and Of-genitive have the same meaning and structure but they behave like the Possessive 'S in English.

2.7 Research Questions and Predictions

The current study aims to explore how the acquisition of English as a third and second language differs between individuals who are simultaneous bilingual speakers of both Mazandarani and Persian (Group 2L1) and those who are monolingual in either Mazandarani (Group M) or Persian (Group P). Both Mazandarani and Persian are Indo-Iranian languages that share similarities in some structures.

The linguistic properties that I consider are the word order of noun modifiers and the Of-genitive. The word order of noun modifiers will include three components: Possessive determiner, utilization of 'S, and Attributive adjective. In the word order of these noun modifiers, Mazandarani and English have similar word order. Also, English and Persian have similar structures regarding the Of-genitive. I will respond to the research questions that are listed below:

RQ 1. Where does CLI come from? Is it from both of the previously acquired languages or just one of them?

RQ 2. Is CLI facilitative or can it be non-facilitative too?

According to the Cumulative Enhancement Model (CEM) (Flynn et al., 2004), CLI comes from two acquired languages, and 2L1 should benefit from both languages. This means that non-facilitative influence should not occur. In simpler terms, simultaneous Mazandarani-Persian bilinguals are anticipated to perform similar to native Mazandarani speakers in terms of the word order of noun modifiers and akin to native Persian speakers when it comes to the use of the Of-genitive structure.

As Rothman (2010, 2011, 2015); Rothman et al. (2019) represents in the Typological Primacy Model (TPM), learners create the grammar of the third language by duplicating the complete linguistic structure of a language with a higher typological similarity to the target language. In other words, in my study this model would predict that participants in Group 2L1 due to more typological similarity (syntactic structure) of Mazandarani and English, and at the early stage of learning English, there would be only influence from one language which is Mazandarani, participants in Group 2L1 would duplicate complete linguistic structure of the

Mazandarani language (transferring wholesale from Mazandarani), and they have no issue in the word order of noun modifier properties.

Based on the Linguistic Proximity Model (LPM) (Westergaard et al., 2017), I predict CLI to occur from both previously acquired languages. More specifically, the model makes the following predictions (1)-(2):

(1) the word order of noun modifiers

- Monolingual Mazandarani speakers are predicted to perform better than Group 2L1 and Group P, due to word order similarity between their L1 and L2.
- Monolingual Persians are expected to perform lower than Group 2L1 and Group M, due to influence from the L1 Persian.
- Simultaneous bilinguals (2L1) are predicted to outperform L1 Persian, due to access to Mazandarani. However, they may score lower than L1 Mazandarani due to non-facilitative influence from Persian.

(2) Of-genitive

- L1 Persian speakers are predicted to perform at ceiling, due to facilitative transfer from Persian.
- L1 Mazandarani speakers are expected to have difficulties, due to non-facilitative influence from Mazandarani.
- 2L1 learners are predicted to outperform L1 Mazandarani, due to access to Persian. However, they may score lower than L1 Persian, due to the non-facilitative influence from Mazandarani.
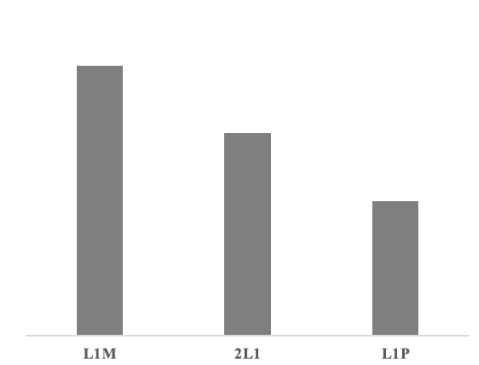

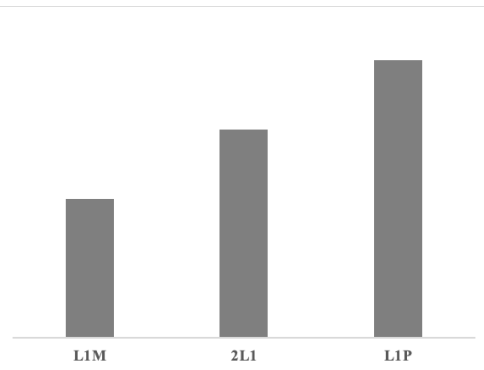*Figure 1. word order of Noun Modifiers prediction*

Figure 2. Of-genitive prediction

These graphs are like perfect predictions, but the actual result depends on many factors, including time. They show an ideal situation, but how things turn out is influenced by when they happen, and the results may vary.

2.8   Chapter Summary

This section provides an overview of critical concepts such as multilingualism, cross-linguistic influence (CLI), and key models in third language acquisition. I referred to Fallah et al. (2016) findings in Mazandarani, Persian, and English, highlighting similarities with my thesis. Additionally, I delved into the grammatical structures of Mazandarani and Persian and discussed the structural similarity of Mazandarani and English in the word order of noun modifiers. Moreover, I discussed the structural similarity of Persian and English in the use of Of-genitives and mentioned that the Possessive 'S and the Of-genitive have equivalent structure and meaning in Mazandarani and Persian. However, in Persian, it functions like the Of-genitive in English, while in Mazandarani, it functions like the Possessive 'S in English. I outlined my research questions and potential predictions based on three models in L3A (CEM, TPM, and LPM) for my study. My research question and predictions in summary are:

1. Where does CLI come from? Is it from both of the previously acquired languages or just one of them? **2**. Is CLI facilitative or can it be non-facilitative too?

According to the Cumulative Enhancement Model (CEM) (Flynn et al., 2004), CLI derives from two previously acquired languages. Therefore, bilinguals will benefit from both, and there is no non-facilitative influence. This model would predict in my study, simultaneous Mazandarani-Persian bilinguals (2L1) should utilize the Of-genitive structure like Persian speakers and noun modifier word order like native Mazandarani speakers.

The Linguistic Proximity Model (LPM) (Westergaard et al., 2017) explains CLI from both languages and predicts both a non-facilitative and a facilitative influence due to the co-activation of languages. The LPM suggests that L1 Mazandarani should perform better in the word order of noun modifiers. However, L1 Persians may struggle due to the influence of their L1. 2L1 should outperform L1 Persian due to the influence of Mazandarani. However, non-facilitative Persian influence may lower their score. Regarding the usage of the Of-genitive, L1 Persian speakers may perform well due to the facilitative transfer from Persian. However, non-facilitative influences may hinder the performance of L1 Mazandarani. 2L1 learners should outperform L1 Mazandarani, with Persian helping them perform better than L1 Persian.

According to Rothman (2010, 2011, 2015); Rothman et al. (2019), in the Typological Primacy Model (TPM), learners develop the grammar of the third language by copying the whole linguistic structure of a language with a higher typological similarity. In my study, this

model would predict that Group 2L1 due to the typological similarity (syntactic structure) of Mazandarani and English, and at the early stage of learning English would replicate Mazandarani.

The following chapter will discuss the method I used to conduct my experiment and procedure, the tasks I designed, the pilot research, and the results.

3 Methodology

3.1 Method

This study assessed the word order in noun modifiers and Of-genitive usage by a forced-choice task among 6-7-year-old children at the beginning phase of English language learning. Participants were evaluated through the main task, an English proficiency test, a Persian Test, and a Mazandarani Test. The general method for designing tests was a forced-choice task that was created in a digital format, featuring items with pictures and recorded voices.

I used *Google Forms*, the test maker tool, to do this online test. This platform offers a user-friendly interface for designing and administering online tests. I used images from the legal image sharing and social media service *Pinterest* to enhance the visual design and engagement of the test materials. For recording voices in the Mazandarani, Persian and English Proficiency tests, I used *Mote*, a suitable and practical platform for recording content. In recording for the Persian and Mazandarani Tests, it is important to mention that the selections for voice recordings were made with an emphasis on *native male speakers* of both Persian and Mazandarani to ensure consistency across the audio samples.

The forced-choice task is less complex and aligns well with the cognitive and linguistic development of 6-7-year-old participants. There are some reasons for selecting this particular task. The age of the participants is critical, children in the early stages of education and language learning require age-appropriate tasks to ensure they understand and maintain their interest and engagement. Due to their limited attention span, it is necessary to limit the number of tasks to avoid boredom and keep them engaged. In addition, it is crucial to design tests that are appropriate for their proficiency level.

To design the test, I utilized words and structures (Appendix 4) of the *Family and Friends Starter* (2019*)*, a resource widely used in institutions teaching English across Iran to children aged 6 to 8 years. *Family and Friends Starter* (2019), part of the Family and Friends series books, is written for students at the beginner to elementary language level.

The tasks will cover four main properties: 1. Possessive determiner, 2. the Possessive 'S, 3. Attributive adjective, and 4. Of-genitive. The equal number of items assigned to each of these properties (5 items in each condition) ensures that none are overemphasized or overlooked. This leads to a more accurate evaluation of the participant's proficiency in these structures. In

addition, 20 filler items are included in the main task to prevent students from copying answers or memorizing the format. The fillers include the following properties: pronouns he/she, articles the/Ø and a/an, and the inclusion of -s in the third person singular. These structures are covered in the book, and it is expected that students understand them. In the test item section, I provide some examples to illustrate the tasks, and the full version of Main Test is available in the appendix section.

3.2   The Participants

I used a subtractive language group design based on Westergaard et al. (2023) to select appropriate participants for assessing qualities in Mazandarani, Persian and English. Westergaard et al. (2023, pp. 227-228) explain that the subtractive language group design is a methodology that isolates the impact of individual languages in the acquisition of a third language. In this study, L3 performance is compared to L2 controls. Consequently, by analyzing significant differences between L3 and L2 groups, it is possible to determine if a subtracted language exerts influence on the L3, providing insights into the individual effects of previously acquired languages on learners' grammatical behavior in the third language. The participants in my research will be divided based on their first and second languages, all of them are in the process of learning English. The three groups of participants will be:

A. Simultaneous bilinguals of Mazandarani and Persian (Group 2L1)
B. Mazandarani as a first language and English as a second language (Group M)
C. Persian as a first language and English as a second language (Group P)

I have chosen group A to investigate bilinguals who have been exposed to both Mazandarani and Persian from birth. By comparing their performance in the L3 (English) to B and C, where only one native language is present, it is possible to isolate the impact of having two native languages on L3 development.

In all three groups, the subtractive language group design makes a systematic evaluation of the individual effects of previously acquired languages on the acquisition of the L3 (English). If everything else is equal, significant differences emerge between the L3 group and the L2 control groups, I can conclude that the subtracted language plays a role in CLI.

Also, these groups can address my research questions; based on my first and second RQs, Group 2L1 is chosen to investigate whether CLI in the target language (English) is influenced

by both of their native languages. Moreover, in Group M and Group P, where either Mazandarani or Persian is the main language and English is the second language, we can closely look at how each first language influences the development of English as a second language. By comparing these groups to Group 2L1, we can understand CLI, especially whether CLI is facilitative or non-facilitative in the language learning process.

The experiment was conducted at three different institutions that teach English. Two institutions are located in the northern region of Iran in Saari district, where the dominant language is Mazandarani, and the third one is in Tehran, the capital of Iran, where Persian is the primary language.

The total 45 participants (each group includes 15 people) were children between 6 and 7 who had recently started primary school. In Iran, 7-year-old children officially begin school, a crucial stage in their language development. The selection of participants is not random, and as mentioned, they were assessed with a background questionnaire and their English language proficiency, as they should be at a similar level of proficiency.

3.3 Procedure

This research study includes a background questionnaire and proficiency tests in English, Mazandarani, and Persian to select the right participants. An informational letter (appendix 1) was sent to parents or instructors with essential details about the study, including information about the researcher and supervisor and their contact information. Then, the parents signed a consent letter (appendix 2). The Persian version of each information and consent letter was provided for parents to prevent any misunderstandings or potential issues. They completed a background questionnaire (appendix 3), including essential details about their children, such as their age, duration of exposure to English, language spoken at home, and preferred language for social interactions.

First, the participants completed the English proficiency test, then they took the Main Test. In the final part, to prevent the activation of specific languages in their mind, the Group 2L1 Group M, were assessed in both Mazandarani and Persian. Participants in Group P completed the Persian Test. The Mazandarani and Persian tests aim to ensure that the proficiency of participants in the different languages are thoroughly evaluated.

In the beginning, the teacher explained the test instructions, and the participants understood what to do. The process took 10 to 25 minutes and was conducted on tablets for convenience. The tests were conducted in two small groups to ensure students could concentrate independently and complete them at their own pace.

In the following parts, I will describe comprehensively how I designed the English proficiency, Main, Mazandarani, and Persian Tests.

3.4   Test Items

3.4.1   English Proficiency Test

To assess English proficiency, I designed an short version of the *Peabody Picture Vocabulary Test (Dunn, 2007),* including 15 items. Similar to the *Peabody Picture Vocabulary Test*, this test evaluates receptive vocabulary skills without reading or writing. The vocabulary utilized is sourced from the *Family and Friends Starter* (2019) (Appendix 4).

The Peabody Picture Vocabulary Test follows a standardized format where participants are presented with a single word and four pictures, typically belonging to the same category. Similarly, the English Proficiency test features a set of 15 questions that gradually increase in difficulty. To begin, participants should press the "play" button to listen to recorded pronunciations of the vocabulary. They must then select one option from the four provided (1, 2, 3, or 4) and the participants have the option to replay the audio and. Scrolling down reveals the next item, and answering all items is mandatory.
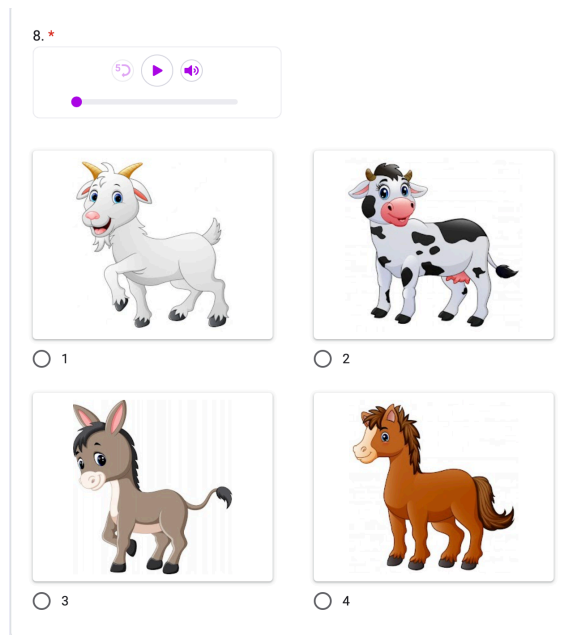
Figure 3.Sample of an item in English Proficiency Test

As shown in Figure 3, items in the English Proficiency test begin with an audio recording of a vocabulary word followed by four pictures, with one option being the correct answer.
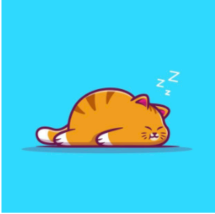
3.4.2 Main Task

I have provided two visual examples of the task items that participants will encounter during the test. Each test item consists of a single picture and two options (A, B). Participants must select either A or B for each item and press "next" to proceed to the next question. Answering the item before moving on to the next one is mandatory.

The Main Test will assess four properties, each with an equal number of items (5 each). After each main item, the participant will face a filler item. The non-randomized order of the filler items among the leading test items was designed to control for fatigue, maintain participant engagement throughout the test, and avoid potential imitation of responses. This approach ensures a balanced distribution of attention and effort, enhancing the reliability of the test results.

Figure 4. Sample of a prominent item in Main Test

Figure 5. Sample of a filler item in Main Test

Figure 4 illustrates *the main item*, and Figure 5 shows *the filler item*. Both begin with the question, "A or B?" which is the same in all items. They are followed by a photo and two options, A or B. There are two options to consider: one is grammatically correct in English, while the other is incorrect in English. Main Test item in figure 4 is for assessing the Possessive determiner property and, the filler item in figure 5 is the indefinite article a/an.

The table below shows a list of all main items and fillers used in the task. Some items include one of the filler conditions, for example (a/an), *A. This is a blue hat*, B. *This is a hat blue* or *A. She is a girl, B. He is a girl*. In designing the items, I tried to closely align with the *Family and Friends Starter* (2019) book content, utilizing sentences that are either the same or very similar to those students encounter in the textbook. I am aware of the potential issues caused by this overlap, such as simple and uninteresting questions, as well as a lack of variety. However, the effect of this overlap is minimized since it occurs in both grammatical and ungrammatical choices.

Test Items	Syntactic Condition	Filler Items	Syntactic Condition
A or B? A. This is a blue hat B. This is a hat blue	Attributive adjective	A or B? A. This is an apple B. This is a apple	Filler (a/an)
A or B? A. This is a balloon pink B. This is a pink balloon		A or B? A. This is an umbrella B. This is a umbrella	
A or B? A. This is a chair red B. This is a red chair		A or B? A. This is an sofa B. This is a sofa	
A or B? A. This is a green car B. This is a car green		A or B? A. This is an elephant B. This is a elephant	
A or B? A. This is a fox red B. This is a red fox		A or B? A. This is a octopus B. This is an octopus	
A or B? A. The dog of Rosy B. The Rosy of dog	Of- genitive	A or B? A. This is duck B. This is the duck	Filler (definite article)
A or B? A. The house of grandma B. The grandma of house		A or B? A. This is the robot. B. This is robot.	
A or B? A. The car of dad B. The dad of car		A or B? A. Girls are happy B. The girls are happy	
A or B? A. The farm of grandpa B. The grandpa of farm		A or B? A. This is rainbow B. This is the rainbow	
A or B? A. The Nilla of horse B. The horse of Nilla		A or B? A. This is the panda B. This is panda	
A or B? A. This is guitar's Ali B. This is Ali's guitar	Possessive 'S	A or B? A. He is Billy B. She is Billy	Filler (He/ She)
A or B? A. This is teddy bear's Kate B. This is Kate's teddy bear		A or B? A. She is grandma B. He is grandma	
A or B? A. This is yo-yo's Ellie B. This is Ellie's yo-yo		A or B? A. She is grandpa B. He is grandpa	
A or B? A. This is desk's dad B. This is dad's desk		A or B? A. She is a girl B. He is a girl	
A or B? A. This is the cat's Nilla B. This is Nilla's cat		A or B? A. He is Tom B. She is Tom	
A or B? A. This is my cat B. This is cat my	Possessive determiner	A or B? A. Rosa likes egg B. Rosa like egg	Filler (S in the third singular)
A or B? A. This is his pencil B. This is pencil his		A or B? A. The cat likes cake B. The cat like cake	
A or B? A. This is violin your B. This is your violin		A or B? A. The lion sleep B. The lion sleeps	
A or B? A. This is my notebook B.This is notebook my		A or B? A. Billy like milk B. Billy likes milk	

A or B? A. This is my lollipop B. This is lollipop my		A or B? A. Nilla dislike the dog B. Nila dislikes the dog	

Table 2. List of Test Items and Fillers in Main Test

3.4.3   Mazandarani Test

In the following section, I describe the layout and content of the items on the Mazandarani test. Specifically, I discuss the process of designing Of-genitive items in the Mazandarani that exhibit possessive 'S behavior. For the Mazandarani Test, a native speaker translated 12 items from the main task, with 3 items for each of the 4 properties as table 3 shows. In the following,

PROPERTIES	COUNT
ATTRIBUTIVE ADJECTIVE	3
POSSESSIVE DETERMINER	3
OF- GENITIVE	3
POSSESSIVE 'S	3

Table 3. Total number of each property in Mazandarani Test

Initially, I designed an *Acceptability Judgment task* for the Mazandarani test where participants listened to a sentence and had to label it as either "good" for grammatically correct or "not good" for ungrammatical item. However, during the pilot study, I found this approach unsuitable. Firstly, the different test format makes the lack of same measurements for the further analysis. Secondly, participants struggled with understanding the instructions to choose "good" or "not good".

In the revised design, participants viewed a picture along with two recorded voices from a male local Mazandarani speaker—one with a grammatically correct choice and the other with an ungrammatical one. Participants select the correct option and could proceed to the next item by scrolling down. It is possible for participants to listen to the recorded voices multiple times, and they were required to answer all questions.
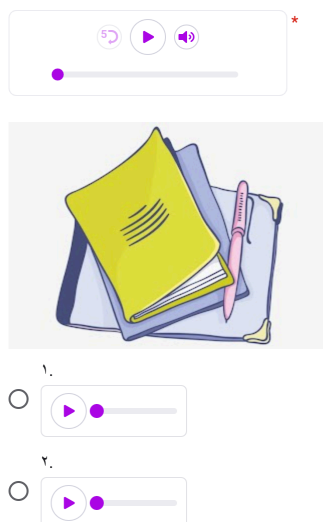
Figure 6. Sample of an item in Mazandarani Test

Figure 6 shows an item from the Mazandarani Test, starting with an audio indicating whether option ١ or option ٢ is right answer (١ , ٢ are Mazandarani and Persian of 1 and 2)_ this format is consistent across all questions_, subsequently, an image is displayed, followed by two choices that are recorded by a native male Mazandarani speaker, where one of the choices is grammatical, and the other is not.

3.4.3.1 Of-genitive in Mazandarani Test

In Mazandarani Test, the Of-genitive items have been designed with two options: one option that indicates the grammatically correct form of this property in Persian and English, with the Mazandarani lexicon in the Mazandarani accent (1). The other option refers to the ungrammatical form of this property in Persian and English with the Mazandarani lexicon, as recorded by the speaker with a Mazandarani accent (2). For the Mazandarani group, option (2) may seem more valid option and for the 2L1 group, both options seem correct, but we consider option (1) the most accurate option to find the influence of Persian among 2L1 learners.

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(1) Sere   -e   gæbnæne   grammatical
      house   Of   grandma

Persian: *Xaneh -(y)e   mamanbozorg*

English: The house of grandma

*(2) *Gæbnæne -e sere **ungrammatical***
   grandma   *Of* *house*

Persian: Mamanbozorge -e xaneh

English: The grandma of house

3.4.4 Persian Test

The Persian Test consists of 12 items translated and recorded by a native male Persian speaker. Each of the four properties is represented by three items, as shown in Table 4. My goal in conducting the Mazandarani and Persian Test is to assess the participants' performance and determine whether it meets my expectations as a native speaker or not.

During the test, participants were presented with an image and two audio recordings from a male Persian speaker. One recording contained a grammatically correct sentence, while the other was ungrammatical. The participant should choose the grammatically correct option. They could listen to the recordings as many times as needed and were required to respond to all the items before proceeding to the next ones by scrolling down.

PROPERTIES	COUNT
ATTRIBUTIVE ADJECTIVE	3
POSSESSIVE DETERMINER	3
OF- GENITIVE	3
POSSESSIVE 'S	3

Table 4.Total number of each property in Persian Test
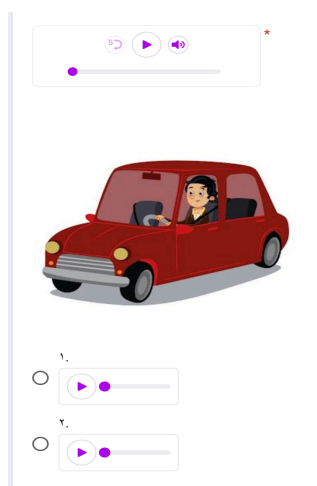
Figure 7. Sample of an item in Persian Test

The Persian Test item illustrated in Figure 7 begins with an audio recorded by a male native speaker of Persian asking the user to select option ١ or option ٢ (١ , ٢ are Mazandarani and Persian of 1 and 2),_ The question remains the same for all items_, next, an image is shown, and then two choices which are recorded by a male native speaker of Persian, one of which is grammatically correct and the other not.

3.4.4.1 Possessive 'S in Persian Test

In designing the Possessive 'S questions for the Persian Test, I frequently used the structure of *proper noun + 'S + possessor,* which is the most common usage of 'S in English. For example, "Kate's teddy bear" and "Ellie's yo-yo" and these sentences are translations from the Main Test that was conducted before the PT. In designing the Of-genitive in PT, I primarily started the Of-phrases with objects, which is common in English. These were the only methods that seemed appropriate for designing this property in Persian. However, I made an oversight by failing to notice that the correct answers for both are similar in Persian, which is an essential issue that I should have considered and may have overshadowed the result.

3.5 The Pilot Study

The pilot study was a crucial step in my research, as it allowed me to identify and address potential challenges in the study design and analysis procedures. By conducting a pilot study, I aimed to refine the methodology, enhance the reliability of data collection, and ensure the smooth execution of the main experiment study. This would, generally, contribute to the overall validity of my findings.

For the pilot study, I selected a sample size of 18 participants (6 in each group) based on their background questionnaire. The first group under consideration comprised individuals who are simultaneously bilingual in Persian and Mazandarani while also acquiring English. In the initial step, participants took the Main Test, which consisted of 40 test items and took 7 to 10 minutes to complete. Subsequently, without any pause, they engaged in an English proficiency test with a 15-picture vocabulary assessment that took 3 to 8 minutes to complete. The next stage involved a proficiency test in Persian and Mazandarani.

As mentioned in the last section, the Mazandarani test was initially structured with the format of the *Acceptability Judgement Task*, as participants were supposed to determine whether the heard Mazandarani sentences were good or not good. However, the participants experienced significant confusion in understanding the instructions of the Mazandarani proficiency test during the test. Consequently, I decided to revise the Mazandarani test format, aligning it with the structures of the main and Persian tests.

The second group, Group M, Like Group 2L1, they started the experiment with the Main Test, which lasted slightly longer, ranging from 3 to 10 minutes. Subsequently, without interruption, participants underwent an English proficiency test, with a completion time ranging from 3 to 8 minutes. In the third step, they engaged in a proficiency test in Mazandarani, followed by a final proficiency test in Persian. These tests lasted 10 minutes, and participants encountered no difficulties responding. I avoided engaging in conversation with them to avoid any potential influence on their responses as a Persian speaker. Instead, I asked a Mazandarani teacher to facilitate clear instructions and explanations.

The third group, Group P, like the other two groups, the pilot experiment started with the Main Test, lasting 8 to 10 minutes. Subsequently, without interruption, participants progressed to the English proficiency test, which took 3 to 8 minutes to complete. In the third

phase, participants exclusively underwent a proficiency test in Persian and it had a total duration of less than 5 minutes.

After completing the entire experiment, I analyzed the results of the 18 participants (6 participants per group). I selected and excluded individuals who achieved 7 or more correct answers from 15 items in the English proficiency test because it is important to have participants at a consistent level of English proficiency for data validity (Table 5). Finally, I had 3 participants in each group who met the requirements for data analysis.

GROUP	SELECTED PARTICIPANT	SUM OF CORRECT ANSWERS
GROUP 2L1	1	9
	2	11
	3	7
GROUP M	4	13
	5	7
	6	9
GROUP P	7	10
	8	9
	9	10

Table 5. Sum of Correct Answers of selected Participants in EPT in Pilot Study

The number of participants who provided valid data varied across the groups, as shown in Table 6. In Groups M and 2L1, multiple participants achieved a score of 7. To avoid any possible issues, I selected only one participant from each group who had achieved a score of 7. This ensured that the number of participants in each group remained balanced and that any unexpected variables, such as an unbalanced number of participants in each group, did not affect or distort my analysis.

GROUP	EXCLUDED PARTICIPANT	SUM OF CORRECT ANSWERS
GROUP 2L1	4	6
	5	7
	6	3
GROUP M	10	7

	11	6
	12	5
GROUP P	16	5
	17	4
	18	6

Table 6. Sum of Correct Answers of excluded Participants in EPT in Pilot Study

It is important to address an issue that has been concerning me; during the pilot analysis, I realized that I could not use the Persian Test (PT) and Mazandarani Test (MT) results because of a mistake I made in their first design. In PT, I only used the Of-genitive property and filler while ignoring the other properties. This was a mistake as I should have assessed the performance of participants in all properties in Persian. If I had analyzed the data now, the result would not have been accurate. As for MT, I initially excluded the Of-genitive property and used only three other properties. However, in the final version, I decided to put all properties in MT, and I realized that it was a mistake.

The pilot study results showed different performance patterns across three groups (Table 7). Group 2L1, in particular, attained the highest average score and displayed good consistency in their performance. They exhibited better performance in the area of Attributive adjective but showed less proficiency in the 'S property.

PARAMETERS	2L1	M	P
AVERAGE SCORES	11	10	8
STANDARD DEVIATION	1.58	2.12	2.12

Table 7. Parameters in Groups 2L1, M and P of Piloting

Group M displayed a moderate level of consistency in their results. They achieved the same high score as Group 2L1 in the Possessive determiner property, the performance of Group P was marked by a lower average score. Although their scores varied, they showed relative strength in the Of-genitive property. However, they exhibited a noticeable problem in the 'S and Possessive determiner properties (Figure 8).

Scores by Group and Property

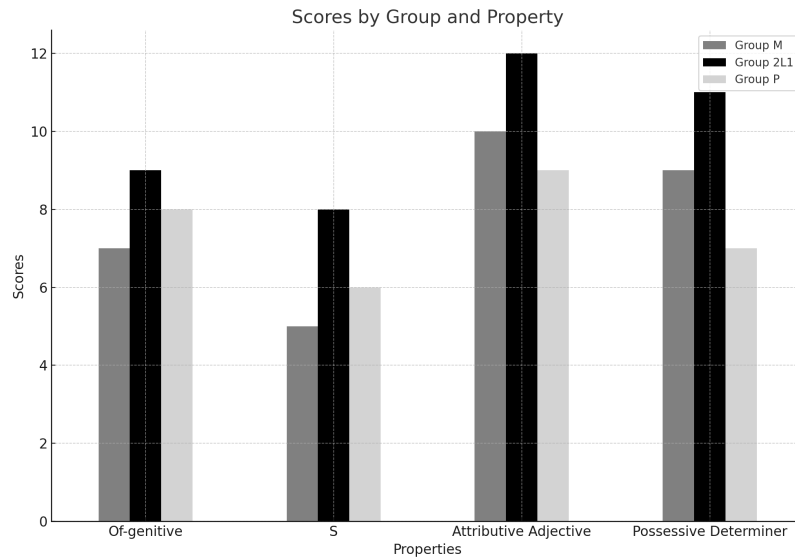***Figure 8. Comparative Analysis of Main Test in Pilot Study***

The Figure 8 shows that Group 2L1 outperforms in all properties, with considerable proficiency in the Attributive adjective and Possessive determiner components and less performance in the 'S property. To sum up, the insights and processes in the pilot study have helped me to adjust the data collection process in the following main experiment.

3.6 Chapter Summary

I discussed my research methodology and explained why I chose it. The research methodology involves a forced-choice task conducted through *Google Forms*. To select participants, a non-random approach was used. I also explained different tests, including the English proficiency test, the Persian test, the Mazandarani test, and the Main Test, and explained the reasons for conducting them.

I moved on to the next step, which was selecting participants. I used the *subtractive language group* (Westergaard et al., 2023, pp. 227-228) approach to determine and select participants suitable for this experiment. My participants in this study are: Mazandarani and Persian simultaneous bilinguals (Group 2L1), native speakers of Persian (Group P) and Mazandarani (Group M).

In the pilot study section, I explained that, based on the data and results analyzed in the pilot study, the 2L1 Group outperformed both Group M and Group P in all properties.

The three main issues with the pilot study were: first, my inability to utilize the data from PT and MT in the data analysis. This was due to my mistake in their initial design, where I only used the Of-genitive items in PT and noun modifiers items in MT. Second, the use of the Acceptability Judgment Task method for MT caused confusion and misunderstanding of structures by the participants. Finally, the change in the order of tests began with EPT in the actual experiment, whereas it started with the primary test in the pilot study.

One challenging point worth emphasizing is questions related to the Possessive 'S and Of-genitive properties in MT and PT, which I only discovered issues later in data analysis. This issue is that the meaning and structure of these properties are the same in Persian and Mazandarani. Therefore, the items in these tests are very tricky and nearly similar. These issues may have overshadowed the results.

4 Results

The main results were collected by *Google Form* and subsequently analyzed using *RStudio*, R version 4.2.2 (R Core Team, 2023). The following sections will present the data visualization, including the performance of the participants in the English Proficiency Test, Persian Test, Mazandarani Test, and the Main Test. Finally, the statistical analysis will be presented in detail, focusing specifically on the logistic mixed effects regression model.

4.1 English Proficiency Test

To select Participants who are appropriate for my experiment, I asked 128 people, including mothers, fathers, and teachers, to complete a background questionnaire. After receiving these forms, I analyzed the information by applying filters based on age, age of learning English, and the language spoken at home. Ultimately, I had to disqualify 19 participants due to their age, 9 participants due to their early start in learning English, and 11 participants who claimed to be native speakers of Mazandarani but mainly communicated in Persian. The remaining 89 selected participants took an English proficiency test as a quick fun test in the classroom environment.

To take the Main Test, participants needed a minimum test score of 7 out of 15 to continue, ensuring participants had sufficient English proficiency. I excluded 44 participants from the study as they scored below 7 on the English Proficiency test. However, I need to highlight two participants from Group M and one participant from Group 2L1 scored exactly seven, which resulted in more than 15 participants in each group that I excluded them too. This is because I wanted to avoid any unexpected factor, such as an unequal number of participants in each group, that could potentially impact and influence my analysis.

Finally, the number of participants who qualified for the Mazandarani, Persian and Main Tests are 45, including 15 participants in each group.
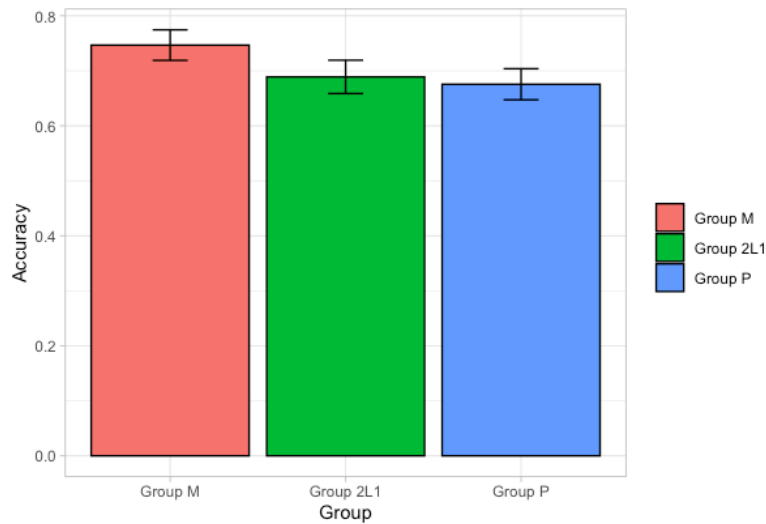
Figure 9. Distribution of Correct Answers per Group in English Proficiency Test

Group	Mean Score	Standard Deviation
2L1	10.93	1.85
M	11.20	1.84
P	10.13	1.65

Table 8. Mean Score and Standard Deviation per Group in English Proficiency Test

Table 8 shows that Group M has the highest mean score, followed closely by Group 2L1, and finally, Group P with the lowest mean score. Although Group M has a slightly higher mean score than the other two groups, there is no significant difference between them. This is helpful because it indicates that these three groups have English proficiency qualifications to be compared together. Moreover, Group P has the lowest standard deviation, which implies that there is less variation in individual scores when compared to the other two groups, 2L1 and M.

Figure 9 presents the performance distribution of 45 participants on English proficiency, the accuracy in the vertical axis means dividing the total sum of correct answers for each group by 15 (the total number of questions answered by that group). As it is shown, Group M has the highest accuracy among the three groups. Group 2L1 has the second-highest accuracy. Group P has the lowest accuracy among the three groups. However, as I mentioned, there is no significant difference between them. The English Proficiency Test result was used as a

covariate in the data analysis of the Main Test, and its correlation with the Main Test per participants will be explained in the Main Test section.

In the following section, I explore the performances of participants specifically Group 2LI on the Persian and Mazandarani Tests, to compare and understand their proficiency and prepare the data for the Main Test.

4.2   Statistical Analysis of Persian and Mazandarani Tests

In this section, I will look at the performance of Group 2L1 in Persian and Mazandarani tests to evaluate their proficiency in both languages. Subsequently, I will do comprehensive analysis of both the Persian and Mazandarani tests.

There are two purposes for conducting PT and MT; 1. To assess the participants' performance and determine whether it meets my expectations as a native speaker or not, 2. To provide a reference point and assessment tool for comparing participants across different groups, particularly the 2L1 Group, helping me evaluate each participant's proficiency in Persian and Mazandarani. It was crucial to recruit participants in Group M with different proficiency levels in both Persian and Mazandarani. For instance, if a native Mazandarani speaker who was supposed not to know Persian achieves the same results in Persian and Mazandarani, it indicates they know Persian, which is unexpected. As a result, they should not be analyzed as Group M but should be defined in Group 2L1. Therefore, such participants should be excluded from the final analysis of Group M. However, after analyzing the data, I discovered that each participant in Group M in Persian and Mazandarani tests had different level of knowledge.

In the subsequent sections, I will investigate the results of the Persian and Mazandarani tests.

4.2.1   Persian Test
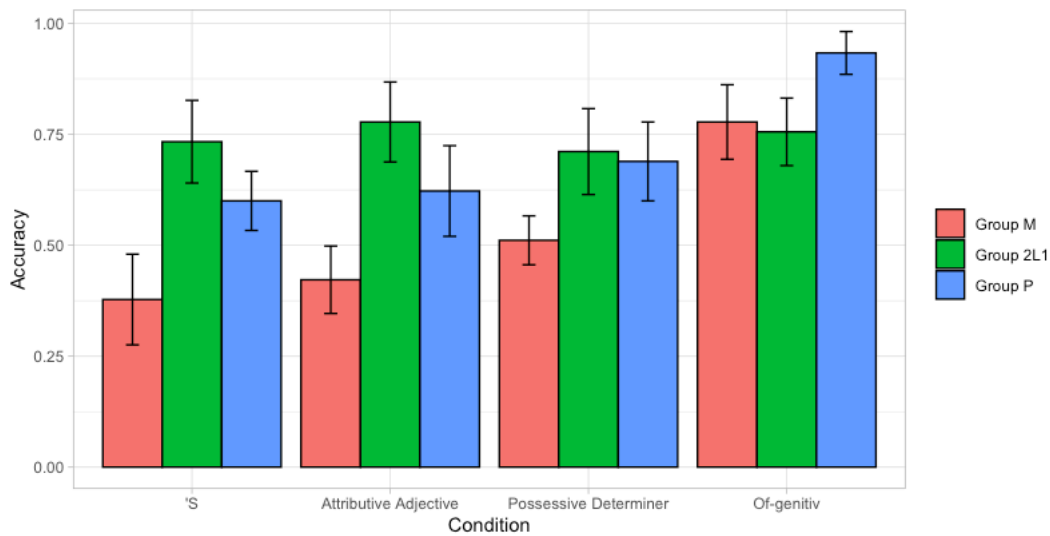
Figure 10. Performance per Property in Persian Test

In Figure 10, we can see that the Persian test examined four conditions in three groups. The results showed that in the 'S condition, Group 2L1 outperforms Groups M and P, with a significant difference between Group M. Similarly, in the Attributive adjective condition, Group 2L1 demonstrates better results than the other groups, with a significant difference with Group M. Under the Possessive determiner condition, again Group 2L1 has better performance, but there are no significant differences between Group 2L1 and Group P.

Finally, in the Of-genitive condition, Group P achieves the highest result, followed by Group M and Group 2L1, with significant differences between Group 2L1 and Group P, but there is slight difference between Group M and Group 2L1. The table of means and standard errors for three groups in Persian test is provided in the Appendix section.

To summarize, I anticipated that Group P would outperform Group 2L1 and Group M in all aspects of the Persian test, and Group M demonstrate a lower level of proficiency among others as they are native speakers. Contrary to my expectations, Group 2L1 outperforms the predicted results in the Persian test, including the aspects related to the word order of noun modifiers. In addition, Group M exhibited better scores than Group 2L1 regarding the Of-genitive property, which is also surprising. I cannot identify a valid and appropriate justification for this better performance.

I want to emphasize once again that I made a mistake while designing the questions for 'S and Of-genitive. I have not noticed that the correct answers to these questions are the same in Persian. I tried to incorporate some information from the English language and the main test to help the participants. However, this result may be invalid and can be analyzed and interpreted differently.

4.2.2   Mazandarani Test
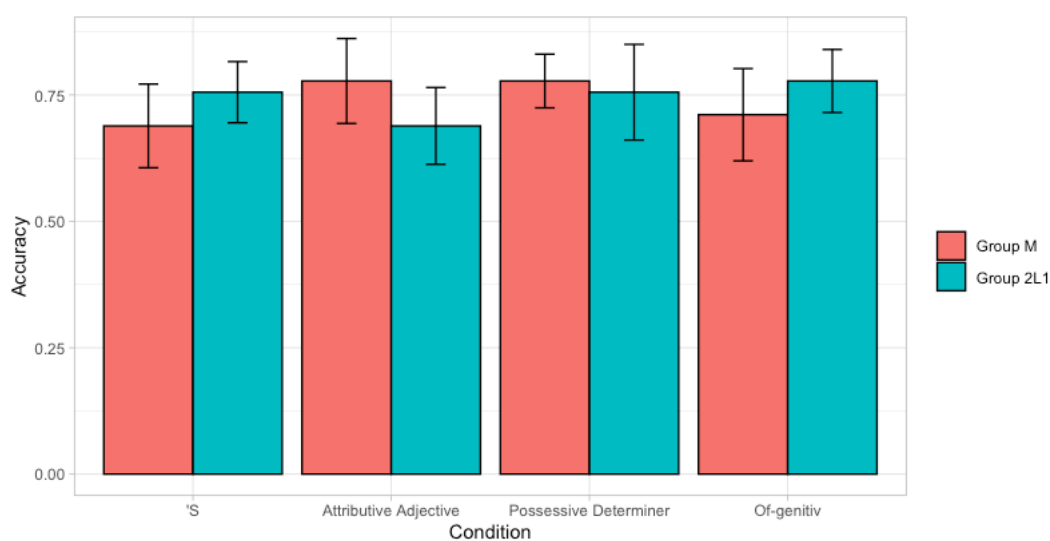
Figure 11.Performance per Property in Mazandarani Test

Figure 11 illustrates that the Mazandarani Test is exclusively designed for two groups, Group M and Group 2L1. Group M in the 'S property has the lowest performance, while they have performed in the Attributive adjective and Possessive determiner conditions equally, and they performed well in the Of-genitive condition. The Group 2L1 exhibits different scores across different properties. The conditions of 'S and Possessive determiner demonstrate the same performance, while the Attributive adjective condition displays a lower performance. Remarkably, the score reaches its highest point in the Of-genitive condition, demonstrating the best performance compared to all other conditions in the Group 2L1. For additional details, I include the table of means and standard errors for Group M and Group 2L1 in the Appendix section.

During the Mazandarani test, Group M was predicted 100% performance as they are native speakers of Mazandarani; as Figure 11 shows, it is not a native-like performance; in terms of 'S and possessive determiner, Group M outperformed Group 2L1, but the difference was not significant. Group M and Group 2L1 scored well (more than 70%) in the Of-genitive property. However, it is surprising that Group M is expected to provide ungrammatical and incorrect answers because the behavior of the Of-genitive in Mazandarani is similar to Possessive 'S.

4.2.3 2L1 Participants in Persian and Mazandarani Tests

As we can see in Figure 12, Group 2L1 have better results regarding Attributive adjectives property in the Persian test. Additionally, they scored more in 'S and Possessive determiner properties in the Mazandarani tests. These results demonstrate the preference and understanding of Group 2L1 in Mazandarani and Persian.
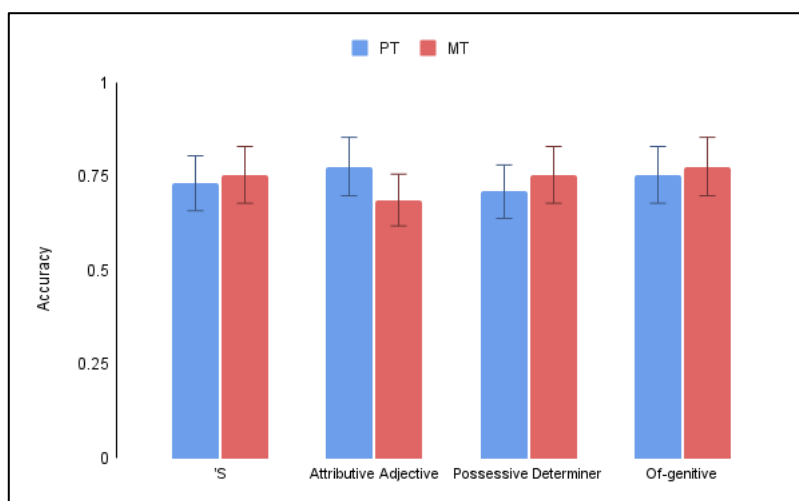
Figure 12. Performance per Property of 2LI Group in MT and PT

As previously discussed, the performance of Group 2L1 surpassed predictions and performed better than native speakers of Persian and Mazandarani. I will provide a comprehensive overview in the discussion section.

The following section will focus on the statistical analysis of the Main Test. I divided it into two categories: 1) word order of noun modifiers and 2) Of-genitive. The section will start

with the relationship between English proficiency and higher performance on the Main Test for each participant.

4.3   Statistical Analysis of Main Test

In this section, I will explain the result of the Main Test conducted on three different groups, Group M, Group 2L1, and Group P, under four different properties in detail.
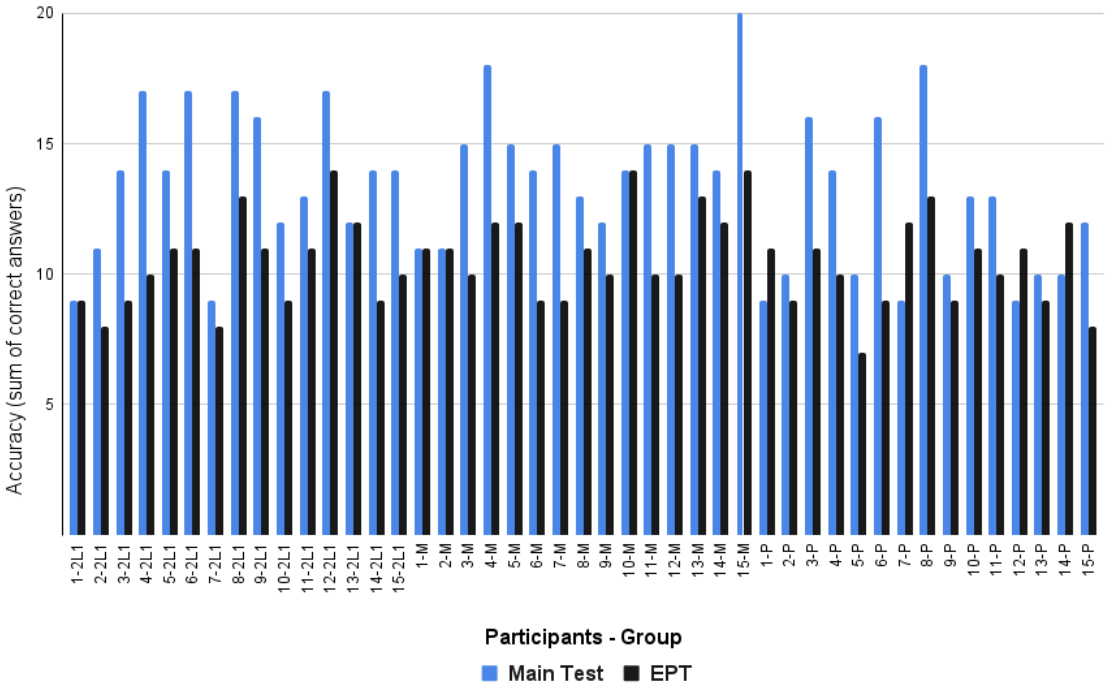
Figure 13. Comparing Performance of Participants in EPT and Main Test

According to the results illustrated in the figure 13, there is a positive correlation between the performance of participants on the Main Test and their English proficiency level, as shown by the black and blue bars, respectively. The higher the score on the EPT, the greater possibility of achieving a higher level of performance on the Main Test. One of the co-variants analyzed in this Main Test is the English proficiency test.
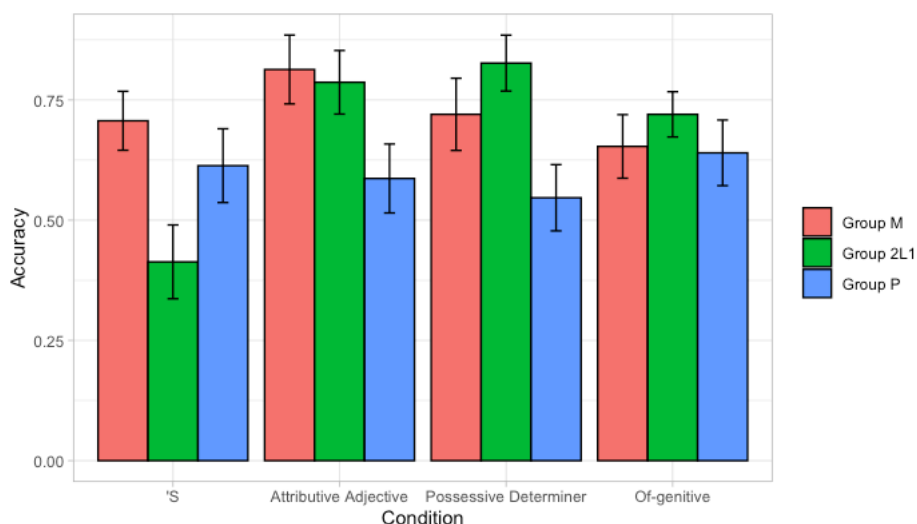
Figure 14. Accuracy per Property in Main Test

PROPERTY	GROUPS
'S	M>P>2L1
ATTRIBUTIVE ADJECTIVE	M>2L1>P
POSSESSIVE DETERMINER	2L1>M>P
OF- GENETIVE	2L1>M>P

Table 9. Table of Performance of groups in Main Test

4.3.1 The word order of modifiers

In Figure 14, it is evident that Group M performs better than Group P in all properties related to the word order of modifiers.

According to the prediction in the 'S property, native Mazandarani speakers perform better than L1 Persian speakers (M > P). However, it is surprising that Group P outperforms Group 2L1 (M > P > 2L1). In the discussion section, I will delve deeper into some factors that shed light on the performance differences among bilingual and multilingual people who speak Persian. In the Attributive adjective property, the participants perform as expected (M > 2L1 > P). Native Mazandarani speakers perform better, and this is likely due to their noun modifier word order similarity to English. In the Possessive determiner condition, Mazandarani native speakers perform better than Group P (M > P). However, Group 2L1 outperforms Group M,

which is unexpected. In the discussion section, I will explore this issue and provide a potential explanation that might answer this unexpected result.

4.3.2 Of-genitive

Based on the data presented in Figure 14 regarding the Of-genitive property, it can be observed that Group 2L1 outperforms Group M and P (2L1>M>P). Surprisingly, Group M performs slightly better than Group P (65%>64%), despite the similarity between the Of-genitive structure in Persian and English, and the difference in Mazandarani. Similar to previous properties, this unexpected result will also be addressed in the discussion section.

4.3.3 The Logistic Regression Model in the Main Test

The logistic mixed effects regression model is used in RStudio (R CoreTeam, 2023) to analyze my data and investigate variables with two possible results (True or False). It models the log odds of each outcome as a linear combination of the risk factors when there are both fixed and random effects. For modeling the data, two different libraries are used library (lme4) (Bates et al., 2015) and library (emmeans) (Searle et al., 1980).

The glmer gives an efficient linear algebra methods and reference classes to avoid copying big objects too often. Through the glmer tool, lme4 can use the generalized linear mixed model (GLMM). The emmeans function calculates Estimated Marginal Means based on a fitted model, utilizing a specified specification to determine which elements to include.

The logistic mixed effects regression model (Appendix 11) shows that the intercept is insignificant, meaning there is no substantial change from a baseline log-odds of zero for the responsible variable. The variables being analyzed are *Group*, *Condition*, and *AccEn* and the *intercept*, *interaction terms*, and *main effects* are predictors in the analysis.

4.4   Chapter Summary

I discussed analyzing the English Proficiency, Persian, Mazandarani, and Main test results. In the Persian test, it was expected that Group P would perform better than Group 2L1 and Group M in all areas, while Group M would perform weakly. In the Persian test, the results showed that Group M scored less than Group P, which confirms this part of the prediction. However, it was surprising that Group 2L1 performed better than Group P in the word order of the noun modifiers. In the Of-genitive property, Group P outperformed as expected, but Group M performed slightly better than Group 2L1, which was not expected. In addition, I mentioned that the correct answers to 'S and Of-genitive questions are the same in PT. However, there are some hints for participants, which may overshadow the findings.

In the Mazandarani Test, it was expected that Group M would perform native-like. However, Group M performed better than 2L1only in the Possessive determiner. In 'S, Attributive adjectives and Of-genitive, Group 2L1 performed better.

The positive correlation between Proficiency in English and better performance in the Main Test by each participant was presented. The results of the Main Test were intriguing. Group M outperformed Group P in all word order of noun modifier conditions, which aligned with expectations. In the 'S property, Group M outperformed Group P (M>P), but surprisingly, Group P outperformed Group 2L1. In the Attributive adjective property, participants performed as prediction. In the Possessive determiner condition, Mazandarani native speakers outperformed Persian native speakers, but unexpectedly, Group 2L1 outperformed Group M, contradicting the prediction. The Of-genitive results shows that Group 2L1 outperforms Groups M and P; despite the similarity between Persian and English in Of-genitive structures and the difference in Mazandarani, Group M performs slightly better than Group P. These unexpected findings will be discussed and investigated in the next chapter.

I will analyze the findings in the subsequent chapter and address the research questions. I will also discuss whether the results support the predictions made in Chapter 2.

5   Discussion

This part involves discussing the data presented in Chapter 4. I will review the research questions and predictions in each property and elucidate the extent to which the results have addressed them. Additionally, I will look through the literature in each part to determine whether there is a reason for the unexpected result I have obtained.

This study aimed to explore the differences and CLI in the acquisition of English among participants who are simultaneously bilingual in Mazandarani and Persian (Group 2L1) and monolingual of Persian (Group P) and Mazandarani (Group M).

The linguistic properties under investigation are the word order of noun modifiers and the Of-genitive component. The word order of noun modifiers includes three components: a Possessive determiner, Possessive 'S, and an Attributive adjective. It should be noted that Mazandarani and English share a similar word order of modifiers. Additionally, both English and Persian are similar in the use of the Of-genitive. The research questions explored in this study are as follows:

RQ 1. Where does CLI come from? Is it from both of the previously acquired languages or just one of them?

RQ 2. Is CLI facilitative, or can it be non-facilitative, too?

5.1   CLI in the word order of noun modifiers

- From both or one of the previously acquired languages? Is influence facilitative or non-facilitative?

The Cumulative Enhancement Model (CEM) (Flynn et al., 2004) states that bilinguals should benefit from both languages because CLI derives from two acquired languages, and non-facilitative influence should not occur. This model would predict in my study that simultaneous Mazandarani-Persian bilinguals should utilize the Of-genitive structure like Persian speakers and noun modifier word order like native Mazandarani speakers. The model does not fit my findings; Group 2L1 performs differently from Group M and Group P regarding noun modifier word order and the Of-genitive. In addition, in the context of Attributive adjective property, Group 2L1 is affected by a non-facilitative influence from Persian.

As Rothman (2010, 2011, 2015); Rothman et al. (2019) explain in the **Typological Primacy Model (TPM)**, language learners construct the grammar of a third language by coping the entire linguistic structure from a previously acquired language with a higher typological similarity. In my study, I predicted that participants in Group 2L1 would replicate the complete linguistic structure of Mazandarani in their English learning due to the more typological similarity (syntactic structure) of Mazandarani and English. This means that at the early stages of learning English, only Mazandarani would influence them, and Group 2L1 would not have issues with the word order of noun modifier properties. However, my results did not support this prediction since the 2L1 Group in the 'S property performed poorly compared to Groups M and P, indicating that they faced difficulties with this property despite the more typological similarity between Mazandarani and English.

According to my predictions and **the Linguistic Proximity Model (LPM)** (Westergaard et al., 2017), first-language Mazandarani speakers are predicted to outperform due to the similarity in the word order of modifiers between Mazandarani and English. Native Persian participants are expected to perform lower due to the influence of L1 Persian. Group 2L1 are predicted to outperform L1 Persian due to access to Mazandarani. However, they may score lower than L1 Mazandarani due to the non-facilitative influence of Persian. Since the LPM is the only model that aligns with certain aspects of my findings, I will only discuss the result based on this model in the following sections.

In 'S property, we observe that Group M performed better than Group P. (M>P), but strangely, Group P outperformed Group 2L1 (M>P>2L1), indicating that it has no facilitative influence from Mazandarani and this result does not follow the LPM (Westergaard et al., 2017). Some factors that may clear this issue among bi- or multilingual people who speak Persian are as follows:

In the study by (Biderooni et al., 2022) claimed that Guilaki did not affect learning English genitive cases (Guilaki is similar to Mazandarani in 'S), focusing on Guilaki genitive cases among Guilaki and Persian speakers (L2 and L3). The research explored how English beginner learners recognize and produce English genitive cases with similar structures in Guilaki (possessive determiners and possessive relations) and Persian (non-possessive relations). The study recruited the most proficient Guilaki and Persian speakers with a comparable understanding of the structures under scrutiny to form L3 and L2 groups. According to the statistical analyses of the Grammatical Judgement Task and Translation tests

of the L3 group, different levels of cross-linguistic influence were identified. One of the key findings related was that the knowledge of Guilaki did not play a significant role in learning English genitive cases that correspond to the related structures of this language. However, if the students possess Guilaki, their awareness of the structural similarity between Guilaki and English can be increased through visual stimulus, which can reduce the negative effect of Persian differing structures or facilitate the translation of items such as possessive determiners. Otherwise, raising awareness may lead to confusion and poor production of possessive and non-possessive relationships.

Furthermore, the research by Valizadeh and Baghchesaraei (2017) on bilingual groups (L1 Turkey, L2 Persian, and L3 English, L1 Persian and L2 English, and L1 Turkey and L2 English) reached the conclusion that bilingualism (especially when Persian is L2) complicates the learning of the 'S category in English. Valizadeh and Baghchesaraei (2017, p. 83) states precisely:

> In the possessive S category, the effect of the first language on this kind of errors has been the same for both monolinguals and bilinguals. Bilinguals committed 154 and monolinguals committed 152 errors due to the effect of first language. However, bilinguals committed another 154 errors in this category which was due to the effect of second language (Persian). Again, it seems that the presence of a second language has complicated the learning of this category of genitive case for bilinguals.

The unexpected performance of Group 2L1 in 'S property could be due to various factors, including lack of facilitation from their Mazandarani language, and challenges of bilingualism among Persian speakers.

In the Attributive Adjectives property, the result is as anticipated (M>2L1>P). According to LPM (Westergaard et al., 2017), the 2L1 Group is facilitated by the Mazandarani language, and the cross-linguistic influence happens for them. In the Possessive determiner property, Group M performed better than Group P; however, Group 2L1 outperforms Group M, and it was not predicted.

The better performance of simultaneous bilinguals in different parts of this experiment may refer to their cognitive ability to comprehend and perform effectively on the test. Kousaie et al. (2017) point out in their research, " Learning two languages simultaneously from birth, as

compared to learning an L2 after a native language, appears to have positive implications for brain organization in terms of intrinsic functional connectivity and cognitive control."

The recent study by Azad (2023) shows that the correlation between the control aspect of intelligence and the status of monolingualism or bilingualism in Mazandarani and Persian bilinguals has always been controversial. "Control" refers to an individual's ability to filter out provoking stimuli or to ignore outside stimuli in favor of an intended language or non-linguistic element. In particular, they were interested in whether bilingual children could do better than monolingual ones on tasks that require control. To sum up, Azad (2023) study demonstrated that bilingual Mazandarani-Persian children outperformed monolingual children in activities involving their actions and thoughts. It is essential to mention that there is a large amount of literature on whether executive function (cognitive control) outperforms in bilingual children, and drawing a conclusion from a single article is insufficient. It is possible that the higher performance of Group 2L1 in my tests is due to their cognitive abilities in filtering options during the test-taking process. However, this cannot explain why they received lower scores on the 'S property.

5.2 CLI in the Of-genitive

- From both or one of the previously acquired languages? Is influence facilitative or non-facilitative?

The Possessive 'S and Of-genitive in Persian have the same meaning and structure but they behave similar to the Of-genitive in English. This gives Group P and Group 2L1 an advantage in the Of-genitive property. However, Group M may have been at a disadvantage because the Possessive 'S and Of-genitive in Mazandarani have the same meaning and structure but they perform like the Possessive 'S in English, but it was not occurred. Group M scored well (more than 70%) in the Of-genitive property, it is surprising that Group M scored well, which is expected to provide ungrammatical and incorrect answers due to more similarity of Mazandarani to 'S property.

Participants in Group M might experience mutual intelligibility since Persian and Mazandarani have similar linguistic structures. As Gooskens et al. (2018, p. 54) explain in their book about mutual intelligibility,

"Even if the interactants have never been exposed to the other language, we may still find considerable cross-language intelligibility, depending on how much the two languages are alike. This part of the cross-language intelligibility would then be based entirely on the degree of linguistic similarity between the two languages. Linguistic similarity is multidimensional and subsumes differences in any of the linguistic subdomains, such as lexicon (shared cognates with shared meanings), phonology (same or similar sound systems, transparent correspondences between the sound systems), morphology (same or similar word structure), and syntax (same or similar word order)."

For example, a study by Tang and Van Heuven (2009) tested mutual intelligibility for evaluating the linguistic distinctions between two languages or language varieties. Their overall finding, with a specific emphasis on 15 Chinese dialects, is that the two subjective measurements (word and sentence intelligibility) exhibit a strong correlation from objective measures such as lexical similarity and phonological correspondence.

So, participants may exhibit mutual intelligibility, and they may guess Of-genitive property due to the linguistic similarity of Mazandarani and Persian.

5.3   General Discussion

A few points about my study are essential to mention. As I explained in the results of the Persian and Mazandarani tests, Group P and Group M did not score 100%. This point suggests that these participants, who are children, may not have sufficient proficiency in Mazandarani and Persian, which might result in improper CLI in English.

There is a positive correlation between English proficiency and performance on the Main Test. Group M performs slightly better on the English Proficiency Test (EPT) than Group 2L1. This could explain the better performance of Group M on 'S and Attributional adjective properties. However, this is not the case for Possessive Determiners and Of-genitive, so I cannot make a definitive conclusion here since the data cannot be generalized.

According to a study by Khosroshahi (2013), there is a positive relationship between language proficiency and the ability to acquire prenominal and postnominal genitives in Persian native speakers who are learning English. Khosroshahi (2013) assessed the language proficiency levels of the participants and categorized them into low and high-proficiency

groups. Both groups were then given a multiple-choice test on prenominal and postnominal genitives to determine if their proficiency level affected their test results. The study included 120 participants (age range 23-28), of which 58 were classified as high and 62 as low. The results indicated that there was indeed a positive correlation between language proficiency and the ability to acquire prenominal and postnominal genitives.

Another point is that there is a significant difference between the 'S-genitive and the Of-genitive in English. This difference may be due to differences in their frequency of use and morphology. As (Rosenbach, 2002, p. 277) shows in her book, the s-genitive has been becoming more frequently used along the preference structure in Modern English. It could be argued that the complexity of these two characteristics in English may be the reason for my weird results in 'S-genitive and the Of-genitive. However, neither in Mazandarani nor in Persian is this property as complex as in English.

6   Limitations and Future Direction

During the study, I encountered an issue with the selection of the Of-genitive and 'S properties. It was challenging and nearly impossible to find properties that were both similar in Persian and English but different from Mazandarani. This issue made it difficult to accurately measure CLI, facilitative and non-facilitative influences between Persian and English. Unfortunately, I discovered that this issue was truly complicated while I was analyzing the final data, and I did not have enough time to find a substitute and redo the experiment.

Another challenge to note is that, while creating questions related to the properties 'S and Of-genitive in the Persian and Mazandarani tests, which are similar in both languages, I attempted to create some differences in the format of items. However, they were similar, which may have overshadowed the results of the MT and PT.

Another challenge was finding participants who spoke both Mazandarani and English and were between 6 and 7 years old. Due to the small sample size, the analysis and results are highly prone to error and not very reliable.

For future studies, I recommend carefully selecting a similar property between Persian and English and thoroughly examining all aspects of this similarity. There is limited information available on the Mazandarani language in books and resources, so it is essential to verify the possibility of the existence of such a property in this language.

I suggest either selecting an older age group for participants or allocating sufficient time to find the desired participants. Based on the regression model results, we would need larger samples of participants to measure the proper influence of the languages and to understand why participants did not behave as expected in the items.

Additionally, it is crucial to thoroughly assess proficiency in each language and examine other factors, such as dominant language, with greater accuracy.

7   Conclusion

In conclusion, this study investigated the influence of previously acquired languages, Mazandarani and Persian, on the beginning of English acquisition among simultaneous bilinguals. Through a forced-choice task tailored for 6- and 7-years old children and subsequent analysis using logistic mixed effects regression models, it was found that the performance of participants did not exhibit significant cross-linguistic influence. Contrary to expectations based on the Cumulative Enhancement Model (CEM) (Flynn et al., 2004), which predicts only facilitative influences from prior languages, the observed results in some aspects showed a lack of facilitative influence from Mazandarani and Persian on English acquisition. Typological Primacy Model (TPM) (Rothman, 2010, 2011, 2015; Rothman et al., 2019) posits that language learners use a previously acquired language with higher typological similarity. My study, based on TPM, predicted that Group 2L1 would replicate Mazandarani's structure in learning English. However, results showed that Group 2L1 struggled with noun modifier properties despite Mazandarani's typological similarity to English. Notably, the only supported prediction aligns with the Linguistic Proximity Model (LPM) (Westergaard et al., 2017), particularly in the Attributive adjective property.

To find the cause of the discrepancy between my predictions and the actual results, I discussed about various factors, including a low level of English proficiency, a lack of facilitative effect from their Mazandarani language, mutual intelligibility, the challenges of bilingualism among Persian speakers, and frequency and morphology differences between 'S and Of-genitive properties in English.

Overall, this study adds to the discussion on cross-linguistic influence in acquiring a third language and highlights the significance of considering the effect of previously acquired languages, especially among Mazandarani-Persian speakers who are at the beginning of learning English.

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Appendices

Appendix 1: Information Letter in English and Persian

To whom it may concern

This is to confirm that Marjan Asghari is a second-year student enrolled in the English Language Acquisition and Multilingualism Master program at the UiT – The Arctic University of Norway.

Marjan Asghari's MA thesis Cross-Linguistic Influence in English (L3) acquisition of Mazandarani- Persian speakers. Three groups of students (7 and 8 years) will be recruited for participation in this study. The students attend Persian primary schools, and they go to English language institutions.

This study includes a forced-choice task, a background questionnaire, and a proficiency test. The background questionnaire asks about the student's age, in which language they speak to their family and friends, and duration of exposure to English. The last test is a proficiency test which is a simple version of the Peabody Vocabulary test. It will take approx. 15 minutes to complete all the tasks. The participation in the study is voluntary, the students' responses will be anonymous and confidential, and at no stage in the project will personal information about the students be made public. The tasks will not have any effect on the students' grades at school or institutions.

If you have questions about the project or want to exercise your rights, please send an email to: mas125@uit.no (student) or marit.westergaard@uit.no (supervisor)

به افراد و مسئولین مربوطه

بدینوسیله گواهی میشود که خانم مرجان اصغری دانشجوی سال دوم مقطع کارشناسی ارشد یادگیری در رشته زبان انگلیسی و چند زبانگی است و در دانشگاه ترومسو(دانشگاه آرکتیک) نروژ در حال تحصیل است. پایان نامه مقطع ارشد ایشان در مورد تاثیر زبان های مادری مازندرانی ـ فارسی‌زبانان در یادگیری زبان سوم انگلیسی است. سه گروه دانش‌آموز (7 و 8 سال) برای شرکت در این مطالعه جذب خواهند شد. دانش‌آموزان به مدرسه ابتدایی فارسی می‌روند و به مؤسسات آموزش زبان انگلیسی نیز مراجعه می‌کنند.

این مطالعه شامل یک امتحان دو گزینه ای (Forced Choice Task)، یک پرسشنامه زمینه ای و یک آزمون تعیین سطح است. پرسشنامه زمینه ای اطلاعاتی درباره سن دانش‌آموزان، زبانی که با خانواده و دوستانشان صحبت می‌کنند، و مدت تماس با زبان انگلیسی را می‌پرسد. آزمون توانمندی آخر هم یک نسخه ساده از آزمون واژگان Peabody است. زمان انجام تمام آزمون ها تقریباً 15 دقیقه خواهد بود. شرکت در این مطالعه اختیاری است، پاسخ‌های دانش‌آموزان به صورت ناشناس و محرمانه خواهد بود، و در هیچ مرحله‌ای از پروژه اطلاعات شخصی درباره دانش‌آموزان به عموم منتشر نخواهد شد. این وظایف هیچ تاثیری بر نمرات دانش‌آموزان در مدرسه یا مؤسسات نخواهد داشت.

اگر سوالی درباره پروژه دارید یا به اطلاعات بیشتری نیاز دارید، لطفاً به آدرس های زیر ایمیل بزنید:

(استاد راهنما) marit.westergaard@uit.no یا (دانشجو) mas125@uit.no

Appendix 2: Consent Letter in English and Persian

Title: Cross-Linguistic Influence in English (L3) Acquisition of Mazandarani- Persian speakers

Researcher: Marjan Asghari

To: Parents

I have read the information sheet and I have been explained this research project. I have also had an opportunity to ask questions and have them answered.

I understand that I may withdraw my child or any information traceable to my child or me at any time until May 1st, 2024, without giving a reason by sending an email to mas125@uit.no or marjanasghari4@gmail.com.

I agree that ……………………………., who is my child, will participate in this research.

I agree that my child can participate in this research and do the tasks.

I agree that the information about my child can be published in a way that he/she cannot be identified.

I agree that my child's personal data can be processed until the end date of the project, approximately June 2024.

I agree with the above-mentioned information and I give consent that my child can participate in the master's project.

Signed: ……………………………………………

Name: ………………………………………….

Date: ……………………………………………

موضوع: تاثیر زبان های مادری مازندرانی - فارسی‌زبانان در یادگیری زبان سوم انگلیسی

پژوهشگر: مرجان اصغری

به: والدین

من اطلاعات این تحقیق را مطالعه کرده ام و محقق این طرح پژوهشی را برای من توضیح داده است

و این فرصت به من داده شده است تا سوال بپرسم.

من می دانم که می توانم تا ماه می ۲۰۲۴بدون ارایه دلیلی از اینکه از اطلاعات مربوط به فرزندم در این

تحقیق استفاده شود، صرف نظر کنم.برای این منظور، می‌توانید با ارسال ایمیل به آدرس mas125@uit.no یا

marjanasghari4@gmail.com اقدام نمایید.

من رضایت دارم که فرزندم،......................................، در این تحقیق شرکت کند.

من رضایت دارم که فرزندم می تواند در این تحقیق شرکت کند و به سوالات سه پرسشنامه پاسخ دهد.

من رضایت دارم که اطلاعات مربوط به فرزندم به گونه ای منتشر شود که شناسایی او امکان پذیر نباشد.

من رضایت دارم که داده های فرزندم تا پایان پروژه (ژوئن ۲۰۲۴) قابل پردازش باشد.

من با اطلاعات فوق موافقم و رضایت دارم که فرزندم در این پروژه کارشناسی ارشد شرکت کند.

امضا: ....

نام و نام خانوادگی: ....

تاریخ: ....

Appendix 3: Background Questionnaire in English and Persian

Dear parents, please answer all the questions.

- Age:
- Sex:

☐ Girl

☐ Boy

- Grade: ———————————————
- When has she/he started learning English?
- Where has she/he started learning English?

☐ Kindergarten

☐ School

☐ English class

☐ Private teacher

☐ At home with your parents

- In which language does she/he speak to the mother at home?
- In which language does she/he speak to the father at home?
- In which language does she/he speak to the siblings at home?

والدین محترم لطفاً به تمامی سوالات زیر پاسخ دهید.

- سن:
- جنسیت:

☐ دختر

☐ پسر

- پایه: ———————————————
- از کدام سن شروع به یادگیری انگلیسی کرده است؟
- در کجا شروع به یادگیری انگلیسی کرده است؟

☐ مهد کودک

☐ مدرسه

☐ آموزشگاه زبان انگلیسی

☐ معلم خصوصی

☐ در خانه با والدین

- به کدام زبان با مادر خود در خانه صحبت می‌کند؟
- به کدام زبان با پدر خود در خانه صحبت می‌کند؟

Appendix 4. List of Vocabularies used in the tests

apple	dog	farm	insect	key	mango	panda	builder	hat	crisps
boy	duck	plane	mum	lion	nose	pen	sofa	belt	cakes
bat	desk	robot	dad	lollipop	neck	queen	sock	violin	milkshake
red	chair	balloon	brother	happy	orange	quilt	towel	vase	yogurt
green	crayon	teddy bear	sister	sad	octopus	river	turtle	woman	yo yo
blue	pen	girl	grandma	hungry	bird	rainbow	umbrella	wall	zebra
black	notebook	guitar	grandpa	thirsty	bear	pupil	up	box	zoo
white	egg	hat	jug	hot	hippo	teacher	jumper	fox	Numbers (1-20)
cat	elephant	horse	juice	cold	crocodile	waiter	shirt	raisins	
car	fish	ill	kangaroo	man	tiger	vet	jacket	plums	

Appendix 5. Test Items in Mazandarani Test

|	Attributive adjective		Filler (a/an)
A or B? A. This is a balloon pink B. This is a pink balloon		A or B? A. This is an umbrella B. This is a umbrella	
A or B? A. This is a chair red B. This is a red chair		A or B? A. This is an sofa B. This is a sofa	
A or B? A. This is a green car B. This is a car green		A or B? A. This is an elephant B. This is a elephant	
A or B? A. The house of grandma B. The grandma of house	Of- Genitive	A or B? A. This is the robot. B. This is robot.	Filler (definite article)
A or B? A. The car of dad B. The dad of car		A or B? A. Girls are happy B. The girls are happy	
A or B? A. The farm of grandpa B. The grandpa of farm		A or B? A. She is grandma B. He is grandma	Filler (He/ She)
A or B? A. This is teddy bear's Kate B. This is Kate's teddy bear	Possessive 'S	A or B? A. She is grandpa B. He is grandpa	
A or B? A. This is yo-yo's Ellie B. This is Ellie's yo-yo		A or B? A. She is a girl B. He is a girl	
A or B? A. This is desk's dad B. This is dad's desk		A or B? A. The cat likes cake B. The cat like cake	Filler (S in the third singular)
A or B? A. This is his pencil B. This is pencil his	Possessive determiner	A or B? A. The lion sleep B. The lion sleeps	
A or B? A. This is violin your B. This is your violin		A or B? A. Billy like milk B. Billy likes milk	
A or B? A. This is my notebook B.This is notebook my			

Appendix 6. Test Items in Persian Test

A or B? A. The dog of Rosy B. The Rosy of dog	Of- Genitive
A or B? A. The house of grandma B. The grandma of house	Of- Genitive
A or B? A. The car of dad B. The dad of car	Of- Genitive
A or B? A. The farm of grandpa B. The grandpa of farm	Of- Genitive
A or B? A. He is Billy B. She is Billy	Filler (He/ She)
A or B? A. Rosa likes egg B. Rosa like egg	Filler (S in the third singular)
A or B? A. This is an apple B. This is a apple	Filler (a/an)
A or B? A. This is an umbrella B. This is a umbrella	Filler (a/an)

Appendix 7. The Full Version of Main Test

1. A or B?*
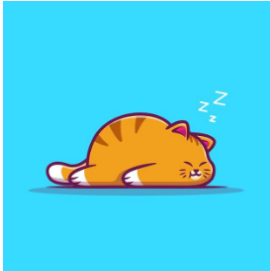
    A. This is my cat
    B. This is cat my

2. A or B? *

    A. This is an apple
    B. This is a apple

3. A or B?*

    A. This is a blue hat
    B. This is a hat blue

4. A or B?*

    A. This is duck
    B. This is the duck

5. A or B?*

  A. The dog of Rosy
  B. The Rosy o dog

6. A or B?*

  A. He is Billy
  B. She is Billy

7. A or B?*

  A. The house of grandma
  B. The grandma of house

8. A or B?*

  A. This is an umbrella

B. This is a umbrella

9. A or B?*

A. This is a balloon pink
B. This is a pink balloon

10. A or B?*

A. She is grandma
B. He is grandma

11. A or B?*

A. The car of dad
B. The dad of car

12. A or B?*

A. Rosa likes egg
B. Rosa like egg

13. A or B?*

A. This is his pencil
B. This is pencil his

14. A or B?*

A. She is grandpa
B. He is grandpa

15. A or B?*

A. This is guitar's Ali
B. This is Ali's guitar

16. A or B?*

A. This is the robot.
B. This is robot.

17. A or B?*

A. The farm of grandpa
B. The grandpa of farm

18. A or B?*
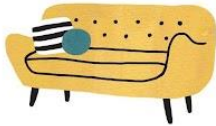
SANNY VAN LOON

A. This is an sofa
B. This is a sofa

19. A or B?*

A. This is teddy bear's Kate
B. This is Kate's teddy bear

20. A or B?*

A. The cat likes cake
B. The cat like cake

21. A or B?*

A. This is violin your
B. This is your violin

22. A or B?*

A. Girls are happy
B. The girls are happy

23. A or B?*

A. This is a chair red
B. This is a red chair

24. A or B?*

A. The lion sleep
B. The lion sleeps

25. A or B?*

A. This is my notebook
B.This is notebook my

26. A or B?

A. She is a girl
B. He is a girl

27. A or B?*

A. This is yo-yo's Ellie
B. This is Ellie's yo-yo

28. A or B?*

A. This is an elephant
B. This is a elephant

29. A or B?*

A. This is desk's dad
B. This is dad's desk

30. A or B?

A. He is Tom
B. She is Tom

31. A or B?*

A. This is a green car
B. This is a car green

32. A or B?*

A. Billy like milk
B. Billy likes milk

33. A or B?*

A. The Nila of horse
B. The horse of Nilla

34. A or B?*

A. This is rainbow
B. This is the rainbow

35. A or B?*

A. This is the cat's Nilla
B. This is Nilla's cat

36. A or B?*

    A. Nilla dislike the dog
    B. Nila dislikes the dog

37. A or B?*

    A. This is my lollipop
    B. This is lollipop my

38. A or B?*

    A. This is the panda
    B. This is panda

39. A or B?*

    A. This is a fox red
    B. This is a red fox

40. A or B?*

    A. This is a octopus
    B. This is an octopus

Appendix 8. Table of Accuracy and Standard Error in Mazandarani Test

Group	Condition	Acc	se
Group M	'S	0.3777778	0.10218081
	Attributive Adjective	0.4222222	0.07605809
	Possessive Determiner	0.5111111	0.05507731
	Of-genitiv	0.7777778	0.08399211
Group 2L1	'S	0.7333333	0.09315175
	Attributive Adjective	0.7777778	0.0900715
	Possessive Determiner	0.7111111	0.09686442
	Of-genitiv	0.7555556	0.07605809
Group P	'S	0.6	0.06666667
	Attributive Adjective	0.6222222	0.10218081
	Possessive Determiner	0.6888889	0.08888889
	Of-genitiv	0.9333333	0.04824979

Appendix 9. Table of Accuracy and Standard Error in Persian Test

Group	Condition	Acc	se
Group M	'S	0.3777778	0.10218081
	Attributive Adjective	0.4222222	0.07605809
	Possessive Determiner	0.5111111	0.05507731
	Of-genitiv	0.7777778	0.08399211
Group 2L1	'S	0.7333333	0.09315175
	Attributive Adjective	0.7777778	0.0900715
	Possessive Determiner	0.7111111	0.09686442
	Of-genitiv	0.7555556	0.07605809
Group P	'S	0.6	0.06666667
	Attributive Adjective	0.6222222	0.10218081
	Possessive Determiner	0.6888889	0.08888889
	Of-genitiv	0.9333333	0.04824979

Appendix 10. Table of Accuracy and Standard Error in Main Test

Group	Condition	Acc	se
Group M	'S	0.7066667	0.06130848
	Attributive Adjective	0.8133333	0.07162513
	Possessive Determiner	0.72	0.07508725
	Of-genitive	0.6533333	0.06609277
Group 2L1	'S	0.4133333	0.07675978
	Attributive adjective	0.7866667	0.06609277
	Possessive Determiner	0.8266667	0.05811865
	Of-genitive	0.72	0.04700557
Group P	'S	0.6133333	0.07675978
	Attributive adjective	0.5866667	0.07162513
	Possessive Determiner	0.5466667	0.06891449
	Of-genitive	0.64	0.06817345

Appendix11. Summary of Logistic Regression Model in Main Test

```
> summary(m_main)
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
 Family: binomial  ( logit )
Formula: Accuracy ~ Group * Condition + AccEn + (1 | Code) + (1 | Item)
    Data: main2
Control: glmerControl(optimizer = "bobyqa")

     AIC      BIC   logLik deviance df.resid
  1102.5   1174.5   -536.2   1072.5      885

Scaled residuals:
    Min      1Q  Median      3Q     Max
-2.9971 -1.0582  0.5021  0.7077  1.5847

Random effects:
 Groups Name        Variance Std.Dev.
 Code   (Intercept) 0.10465  0.3235
 Item   (Intercept) 0.02317  0.1522
Number of obs: 900, groups:  Code, 45; Item, 20

Fixed effects:
                                              Estimate Std. Error z value Pr(>|z|)
(Intercept)                                 -0.4964134  0.6492065  -0.765 0.444482
GroupGroup M                                 0.0002654  0.4351714   0.001 0.999513
GroupGroup P                                -0.9700970  0.3927242  -2.470 0.013505 *
ConditionPossessive Determiner               0.2672307  0.4331268   0.617 0.537248
Condition'S                                 -1.7444382  0.3897787  -4.475 7.62e-06 ***
ConditionOf-genitive                        -0.3744815  0.4012192  -0.933 0.350635
AccEn                                        2.7149457  0.8538807   3.180 0.001475 **
GroupGroup M:ConditionPossessive Determiner -0.8106760  0.5800277  -1.398 0.162218
GroupGroup P:ConditionPossessive Determiner -0.4372954  0.5402035  -0.810 0.418227
GroupGroup M:Condition'S                     1.1336948  0.5463099   2.075 0.037969 *
GroupGroup P:Condition'S                     1.8606404  0.5086330   3.658 0.000254 ***
GroupGroup M:ConditionOf-genitive           -0.4905892  0.5501740  -0.892 0.372555
GroupGroup P:ConditionOf-genitive            0.6103124  0.5189401   1.176 0.239565
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Links of Tests

Link 1. Main Task

https://forms.gle/6wCoSnHRLhRb8LmT8

Link 2. English Proficiency Test

https://forms.gle/xTPEBxx9VYDWH7Ti7

Link 3. Mazandarani Test

https://forms.gle/FH9cnLvZUS1i3Yc8A

Link 3. Persian Test

https://forms.gle/tp3v5Sqhfk27xXq19