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Crosslinguistic Influence in L3A: Acquisition of English as a Foreign Language by Arabic, Norwegian and Arabic-Norwegian Adolescents

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Dedication

To my cherished parents, whose boundless love, sacrifices, and unwavering belief in me have illuminated every step of my path.

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Abstract

Aims and objectives: This thesis is centered on examining cross-linguistic influence (CLI) in the acquisition of a third language (L3, English) by bilingual Arabic-Norwegian adolescents in comparison with their monolingual controls. The primary objectives of this investigation are to ascertain the origin of CLI, whether it stems from the first language (L1), the second language (L2), or a combination of both, and to determine whether CLI manifests as a property-by-property occurrence or not.

Methodology: This research examines Arabic-Norwegian bilinguals in the process of acquiring L3 English and compares them with L2 English learners who have either Arabic or Norwegian as their L1. The participants did an acceptability judgment task that assessed six language properties which were chosen based on crosslinguistic similarities and differences between the interacting languages. The properties included were: a) possessive agreement, b) use of the indefinite article, c) use of overt subjects (on these three properties English is similar to Norwegian but different from Arabic), d) word order in non-subject-initial declaratives (SV), e) adverb-verb word order in subject-initial declaratives (Adv-V), and f) subject-verb agreement (SV) (where English is similar to Arabic but different from Norwegian).

Data and analysis: A total of 99 participants underwent testing in English, which included an AJT and a proficiency task. The participants comprised 29 L3 learners, 39 L2 learners with L1 Norwegian, and 31 L2 learners with L1 Arabic. Additionally, the L3 learners completed a mini AJT in Arabic.

Findings: Overall, the findings support the Linguistic Proximity Model (Mykhaylyk et al., 2015; Westergaard et al., 2017; Westergaard, 2019), demonstrating that both Arabic and Norwegian, as the learners' background languages, had an impact on their performance in L3

English. The comprehensive data analysis of the AJT revealed that the Norwegian control group exhibited the highest level of accuracy, the L3 group fell in an intermediate position, and the Arabic control group demonstrated the lowest level of accuracy. These findings can be elucidated by considering the superior English proficiency results achieved by the Norwegian control group in comparison to both the Arabic control group and the L3 group. Nevertheless, upon scrutinizing the data concerning potential cross-linguistic influence (CLI), the findings indicated that the Norwegian control group performed significantly better on properties where English and Norwegian behaved the same, as compared to properties where English and Norwegian were different, Similarly, in properties where Arabic patterns with English, the Arabic control group demonstrated a significantly enhanced level of accuracy, in contrast to their performance in properties where facilitative CLI was anticipated to originate from Norwegian. Crucially, however, the performance of the L3 group across the properties was comparable to that of the two control groups. This outcome aligns with the prediction of cumulative CLI stemming from both Arabic and Norwegian for this group.

Significance: This study enriches the existing body of research on L3 acquisition and makes a substantial contribution to the ongoing discourse concerning the influence of previously acquired languages in L3A, particularly in relation to the origin and characteristics of cross-linguistic influence (CLI).

Keywords: Cross-linguistic influence, Third language acquisition, LPM, TPM.

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List of Abbreviation

3	Third person
Adv-V	Adverb-verb word order
AJT	Acceptability judgment task
AoO	Age of onset (in learning English)
CEM	Cumulative enhancement model
CLI	Cross-linguistic influence
DEF	Definite
FE	Feminine
IL	interlanguage
INDF	Indefinite
Kuw	Kuwait
L2	Second language
L2A	Second language acquisition
L2SF	Second language status factor
L3	Third language
L3A	Third language acquisition
LPM	Linguistic proximity model
MA	Masculine
NE	Neuter
Nor	Norwegian
PL	Plural
POSS	Possessive
SG	Singular
SV	Subject-verb word order
SVO	Subject-Verb-Object
TPM	Typological primacy model
V2	Verb second word order
V-Adv	Verb-adverb word order
VSO	Verb-Subject-Object
XSV	Adverb-Subject-Verb
XVS	Adverb-Verb-Subject

1 Introduction

Over the past years, the field of third language acquisition (L3A) has gained a significant recognition. An increasing volume of research studies, delving into the acquisition of third languages (L3) across diverse language combinations and methodologies, has placed a strong emphasis on the investigation of cross-linguistic influence (CLI), leading to the development of numerous innovative theoretical models (e.g., Bardel & Falk, 2007; Hermas, 2015; Jin, 2009; Flynn et al., 2004; Rothman, 2011, 2015; Westergaard et al., 2017).

Each model predicates cross-linguistic influence from a distinct perspective. For instance, the L1 Factor model posits that the L1 serves as the primary source of cross-linguistic influence (Hermas, 2010, 2014), whereas the L2 Status Factor contends that L2 holds the central role in cross-linguistic influence (Bardel & Falk, 2007; Falk & Bardel, 2011). On the other hand, the Typological Primacy Model posits a holistic influence from the background language which is typologically closer to the target language (Rothman, 2011, 2013, 2015). In contrast to the holistic perspective, there exist property-by-property-based models that posit that CLI may originate from both background languages, as evidenced by the Cumulative Enhancement Model (Flynn et al., 2004), the Scalpel Model (Slabakova, 2017), the Linguistic Proximity Model (Westergaard et al., 2017), and the Dominant Language of Communication Model (Fallah et al., 2016).

Given this context, the principal aims of this study involve examining whether CLI is solely derived from one of the previously acquired languages or arises from both. In other words, assessing whether CLI takes the form of a wholesale phenomenon or a property-by-property process. To address these research questions, the study investigates Arabic heritage speakers residing in Norway who are acquiring L3 English in a Norwegian school context. The participants are subjected to assessments across six distinct linguistic properties, more

specifically, possessive agreement, article use, and use of overt subjects, where English and Norwegian exhibit a congruent pattern and Arabic behaves differently. On the other hand, the study investigates word order in non-subject-initial declaratives (SV), adverb-verb word order in subject-initial declaratives, and subject-verb agreement in declaratives, where English aligns with Arabic in terms of linguistic patterning, while Norwegian behaves differently.

The choice of Arabic-Norwegian heritage speakers as the focal group is predicated on the substantial divergence between the background languages, Arabic and Norwegian. This selection is further informed by the fact that Norwegian bears lexical-level resemblance to the L3 (English), whereas the target language bears morphosyntactic similarity to either Norwegian or Arabic depending on the specific property in question. The heritage speakers (L3 group) are compared to L1 Norwegian and L1 Arabic L2 learners of English. The subtractive language groups design (see Westergaard et al. 2023) is adopted to isolate the role of individual background languages on the L3. All participants complete an English proficiency test to enable controlling for overall proficiency in subsequent modelling. Next, they participate in an acceptability judgment task (AJT). Additionally, the L3 group is subjected to a mini AJT in their background language (Arabic) to ascertain their acquisition of the properties under investigation in Arabic. Moreover, regarding proficiency in Norwegian, the L3 group required a prerequisite of having resided in Norway for a minimum duration of two years. In addition, they completed a two-year Norwegian language preparation program before enrolling in Norwegian schooling. Furthermore, it is important to mention that Norwegian served as their societal language.

Addressing the questions posed in this study represents a valuable contribution to the ongoing discourse concerning the interactions and influence of previously acquired languages in L3A, thereby enriching the existing body of knowledge on child L3A.

The thesis is organized as follows: Chapter 2 provides an introduction to the theoretical background encompassing L3A models and empirical evidence, while also discussing cross-linguistic variation in the included properties between English, Norwegian, and Arabic. Chapter 3 delves into the scope of the present research, encompassing research questions, and offers an in-depth description of the study's design and predictions. Additionally, it provides an overview of the results from a pilot study conducted before the main study. Chapter 4 is dedicated to a detailed presentation of the study's results, including statistical analysis, while Chapter 5 engages in a comprehensive discussion of these findings. Following that, the limitations of this research will be discussed in Chapter 6. As the concluding chapter of this thesis, Chapter 7 provides a summary of the key findings and conclusions.

2 Theoretical Background

This section outlines the major concepts and theories of cross-linguistic influence (CLI) relevant to the current research in third language acquisition (L3A). First, it outlines the primary concepts related to CLI, including its definition, the definition of L3, and an overview of the L3A field. Next, it briefly reviews the most significant L3A models. Lastly, it explores the morphosyntactic differences and similarities among the three languages involved in the project: Arabic, Norwegian, and English. It also touches upon discussions surrounding the properties examined, such as subject-verb agreement, subject-verb word order in non-subject-initial declaratives, adverb placement in subject-initial declaratives, possessive marking, null subjects, and article use.

2.1 Cross-Linguistic Influence

The main aim of research focusing on cross-linguistic influence (CLI) is to explain how previously accumulated linguistic knowledge influences the production, understanding, and development of a target language (De Angelis, 2007). The term CLI is widely used in studies of L3 acquisition and is often used interchangeably with the term transfer (e.g., Abbas et al., 2021; Ben Abbes, 2016, 2020; Foryś-Nogala et al., 2020); however, the term transfer is generally preferred in studies of generative second language acquisition (L2A) (Smith & Truscott, 2014).

The concept of transfer first emerged within the framework of contrastive analysis, pioneered by Fries (1945), a structural linguist. Fries proposed contrastive analysis (CA) as a pedagogical method aimed at highlighting the structural distinctions between a learner's first language (L1) and their target language (L2) (Foley & Flynn, 2013). Later on, Weinreich (1953) brought in the ideas of transfer and interference in L2 acquisition. Transfer refers to using L1 in a way that helps with "correct" usage in L2. Interference, on the other hand, refers to using

L1 in a way that results in "incorrect" language use (Foley & Flynn, 2013, p. 98). Following that, Lado (1957) adopted a comprehensive perspective on learners applying the traits of L1 to L2, and he proceeded to enhance contrastive analysis. According to Rajabi (2022), the contrastive analysis hypothesis (CAH) involves researchers examining both the similarities and differences between L1 and L2. It was discovered that when properties of L1 are similar to those of L2, learning the L2 can be easier, whereas differences between properties of L1 and L2 can make learning the L2 more challenging. Therefore, it was inferred that focusing on the differences between L1 and L2 could facilitate second language acquisition (SLA). In essence, during the 1950s and 1960s, research delved into mistakes made by L2 speakers, attributing them all to negative transfer (Rajabi, 2022; Lado,1957).

During the late 1960s and early 1970s, researchers focusing on second language (L2) acquisition began to observe and analyze the systematic errors made by learners (Rajabi, 2022). The concept of interlanguage (IL) was introduced by Selinker (1972). He examined the transitional process between the native language (L1) and the second language (L2). His research revealed that interlanguage (IL) exhibits a systematic set of rules distinct from those of the target language (TL) (Selinker,1972).

Later on, during the 1970s and 1980s, scholars investigated the circumstances under which knowledge of the first language transfers to the second language (Rajabi, 2022). Certain research inquiries concentrated on surface-level aspects (e.g. Gilbert 1983; Zobl 1982), while others scrutinized the foundational knowledge that guides the utilization of these surface-level aspects (e.g. Kellerman, 1979).

According to Westergaard (2021), during the late 1980s and 1990s, L2 acquisition research shifted its focus towards defining the initial state, leading to the emergence of various transfer models, which ranged from complete to no transfer. These models include Full Transfer

Full Access (Schwartz & Sprouse, 1996), advocating for complete transfer, Minimal Trees (Vainikka & Young-Scholten, 1996), suggesting transfer of only lexical categories and not functional categories (partial transfer), Weak Transfer (Eubank, 1993/94), and the Initial Hypothesis of Syntax (Platzack, 1996).

The terms transfer and CLI highlights differences in their approaches to understanding language influence and acquisition. The term transfer has been defined as the influence of a previously acquired grammar on the values or features of the target language, and it is associated with grammatical competence (as discussed in Westergaard et al., 2023). In contrast, the term CLI encompasses all forms of cross-language interaction without rejecting the term transfer itself. Additionally, CLI is used to describe phonological, lexical, and semantic interactions (Sharwood Smith, 2021). Cross-linguistic influence (CLI) is defined as an interaction between two language systems in the brain at the lexical, structural, and/or phonological levels that affects language usage and processing (Sharwood Smith, 1983, 1989; Kellerman & Sharwood Smith, 1986).

Even though CLI encompasses all forms of cross-language interaction, it is often used interchangeably with transfer in the L3 literature. However, Wang (2013) argues that the concept of transfer is restrictive and does not account for other cross-linguistic phenomena, such as the perception of linguistic distance (see Rothman et al., 2019). According to Sharwood Smith (2021) this limitation makes it difficult to explain concurrent language activation in multilinguals. Furthermore, the concept of transfer has been criticized as fundamentally misleading because it implies the transfer of properties from one language to another. For instance, it is not possible to transfer grammatical properties from one language to another without depleting the host grammar of those properties (Sharwood Smith, 2021, p. 410). To

avoid potential limitations associated with the term transfer, this thesis will use the term CLI consistently.

As mentioned by Westergaard (2021b) CLI can be either facilitative or non-facilitative. Facilitative CLI occurs when the structures and features of the previously acquired language(s) enable(s) the speaker to correctly parse and acquire grammatical properties of the input in the novel language (this typically happens in situations of overlap or similarity between languages). In contrast, non-facilitative CLI arises when previously acquired language(s) differ(s) from the target language on the grammatical level. This can potentially lead to incorrect parsing of the input or errors in production. Additionally, non-facilitative CLI can occur when the previously acquired language lacks certain features present in the new language input, resulting in non-target-like parsing or production in the novel language (for more details, see Westergaard, 2021b).

2.2 Third Language Acquisition

Compared to second language acquisition (L2A or SLA), one can argue that the field of third language acquisition (L3A) is relatively young. However, despite its recent emergence, numerous models have been introduced to define L3A in various ways. According to Perić & Novak Mijić (2017), in some studies, L3A is defined as the acquisition of non-native languages after L2, denoted as L3 = Ln. In other studies, L3A is described as the process of acquiring a new language by learners who have already acquired two other languages, making L3 ≠ Ln (Perić & Novak Mijić, 2017).

In other words, certain linguistic models, such as the L2SF model, assert that an L3 designation is applicable only when the learner has previously acquired an L2 subsequent to their native language (Bardel & Falk, 2021). Conversely, alternative model perspectives (e.g., the LPM) propose that L3 studies may include individuals who are simultaneous bilinguals,

lacking a distinct demarcation between L1 and L2, as both languages are acquired concurrently (Westergaard, 2021b; Cenoz, 2003).

Many linguistic perspectives contribute to the formal study of L3A, including sociolinguistics, psycholinguistics, and generative approaches (Rothman & Cabrelli Amaro, 2009). This field is influenced by prior L2A research (as mentioned in Westergaard, 2021a; 2021b; Westergaard et al., 2023), which also extensively investigates CLI (as mentioned in Arıbaş & Cele, 2021). However, compared to L2A, studying L3A poses more challenges.

In L2A, the process is primarily influenced by a single transferable system, the learner's native language (L1). Since there are no other alternative languages acquired, L1 becomes the sole source of linguistic transfer for L2 learners. As a result, researchers have been unable to pinpoint the variables conditioning or motivating specific transfers due to the absence of alternatives (as mentioned in Schwartz & Sprouse, 1996; Rothman & Cabrelli Amaro, 2009, p. 2).

However, in L3A, the process is more complex. Unlike L2 learners, L3 learners have two potential sources of linguistic influence: their L1 and L2. One fundamental difference between CLI studies in L2A and L3A is that L1 transfer is a necessity in L2A but not in L3A (Westergaard et al., 2023). Additionally, CLI patterns in L3A are notably more complex than in L2A because the learner's previously acquired languages are considered interconnected, forming a dynamic system (Foryś-Nogala et al., 2020).

As mentioned by Rothman & Cabrelli Amaro (2009) investigating successive multilingual acquisitions can illuminate several key aspects in the phenomenon of cross-linguistic influence (CLI). It affords the opportunity to investigate whether the L1 predominantly functions as the principal source of linguistic transfer for all subsequently

acquired languages or if the most recently acquired language assumes the role of a preparatory framework for the subsequent ones (e.g., L2 and L3, respectively). Additionally, it can reveal whether the L1 and L2 are equally activated during multilingual L3 acquisition (as mentioned in Rothman & Cabrelli Amaro, 2009). Much of the research in L3A focuses on the source of CLI, examining whether all previously learned languages influence L3 or if only one language has a significant impact (Foryś-Nogala et al., 2020; Westergaard et al., 2017). Defining L3 acquisition as a complex phenomenon arises from the need to examine it within bilingual contexts, considering various perspectives and the intricate interactions of active variables (Sanz, 2000, p. 37).

2.3 L3A Models

L3A is composed of many variables with many interactions (Wang, 2013), which has led to various models being proposed to explain or even determine the source of CLI (Arıbaş & Cele, 2021). The following subsections present several models of L3A, with their main research questions revolving around CLI sources. These questions primarily concern whether the L1, the L2, or both play influential roles in shaping the L3, whether CLI is wholesale or property-based, and how other variables, such as the dominant language of communication, typology, or structural similarity, impact the L3.

2.3.1 The Default L1 Effect

The Default L1 Effect suggests that L1 is the optimal language for transfer to L3A (Hermas, 2010, 2014). Several studies have suggested that L3A is strongly influenced by the L1 (Jin, 2009; Na Ranong & Leung, 2009; Hermas, 2010, 2015), arguing that the native language may play a primary role in L3A, as learners are more proficient in their first language, making it more transferrable (see Lloyd-Smith et al., 2017).

Despite not formalizing the L1 Factor as a model, Hermas' (2010, 2014) studies of English morphosyntax in the early stages of L3A (with Arabic as L1 and advanced French as L2) provide evidence for it. He examined both verb movement and null subject parameters in L3 English acquisition (Hermas, 2010, 2014). It is noteworthy that the proficiency of participants in both L2 French and L3 English was assessed, using the Oxford Placement Tests. Both studies revealed participants' early morphosyntactic transfer from L1 Arabic to L3 English (Hermas, 2010, 2014).

An additional study that demonstrates L1 influence is Jin (2009). The purpose of this study was to examine how Chinese graduate students, who were advanced learners of L2 English, acquired Norwegian objects in L3A. As subject-prominent languages, Norwegian and English prohibit null objects and require a referential pronoun or noun phrase, while Chinese allows null objects as a topic-prominent language. The research results indicated that L1 Chinese negatively influences L3 Norwegian object acquisition, while L2 English has little influence (Jin, 2009).

2.3.2 The L2 Status Factor

The L2 Status Factor Model (L2SF) suggests that the L2 serves as the primary source of transfer in acquiring an L3 (Bardel & Falk, 2007; Falk & Bardel, 2011). The model proposes that learners are more likely to transfer from their L2 rather than their L1 and transfer can occur both as facilitative and non-facilitative. This inclination stems from the fact that the L2 learning experience bears more resemblance to L3 acquisition in aspects like metalinguistic awareness of syntactic features, age of onset, and learning environment, in contrast to the naturalistic acquisition of their L1 (Bardel & Falk, 2007; Falk & Bardel, 2011).

The L2SF model, stemming from Paradis' Declarative/Procedural model (2009), elucidates two distinct mechanisms in bilingualism. Paradis (2004, 2008, 2009) defines these

mechanisms as the acquisition of implicit linguistic competence in L1 and the cultivation of explicit metalinguistic knowledge in L2.

Paradis' perspective delineates fundamental disparities in linguistic competence acquisition and maintenance between one's first language (L1) and a second language (L2). L1 entails incidental acquisition, implicit storage, automatic utilization, and reliance on procedural memory. Conversely, L2 acquisition involves conscious and deliberate learning, explicit linguistic knowledge storage, conscious control during application, and dependence on declarative memory (Paradis, 2008: 343).

Furthermore, L1 and L2 engage distinct neural regions within the brain. This implies that native grammars are housed in procedural memory, while non-native grammars reside in declarative memory. Consequently, L3 and L2 are both stored in declarative memory since they are acquired in the same way; making it easier to transfer between them than between L1 and L3 (Paradis, 2008: 343).

This model is supported by some studies on L3 acquisition (e.g., Bardel & Falk, 2007; Brown, 2020; Falk & Bardel, 2011) examining different language combinations and features, such as placement of sentential negation, grammatical gender, placement of object pronouns, etc. An eminent study that supports this model was conducted by Bardel and Falk (2007). They examined sentential negation in main finite clauses in the acquisition of L3 (Dutch and Swedish). Dutch and Swedish are both V2 languages, where finite verbs precede negation. Depending on their previous language, participants were divided into two groups. The L1 of the first group consisted of English, Hungarian, Italian, or Albanian, which are not V2, and the L2 consisted of German or Dutch, which are V2 languages. In contrast, the other group comprised individuals whose L1 was either Dutch or Swedish, both of which are V2 languages, while their L2 was English, a language that does not follow the V2 word order. The

comprehensive findings suggested that L2 exerted the primary influence on L3A, as evidenced by variations in negation placement corresponding to the L2 (Bardel & Falk, 2007).

Another study that was conducted by Falk and Bardel (2011) investigated the placement of object pronouns in L3 German and found evidence that further supports the L2SF model. German and English main clauses present a similar structure, in which the object pronoun is placed in postverbal position, while German and French subordinate clauses display a similar structure in that both languages place the object pronoun in preverbal position. Results indicated that L2 played a significant role in the performance of the participants. Participants with French as their second language accepted object pronouns in the preverbal position, whereas participants with English as their second language tended to accept object pronouns in the postverbal position (Falk & Bardel, 2011).

2.3.3 The Cumulative Enhancement Model

According to the Cumulative Enhancement Model (CEM, Flynn et al., 2004), language learning is cumulative, and CLI can manifest from both the L1 and the L2, irrespective of the sequence in which they were acquired. This model suggests that transfer from previous languages is either facilitative or neutral rather than non-facilitative. The CEM was developed based on a study by Flynn et al. (2004) that examined the comprehension of restrictive relative clauses in English by two groups: adult L1 Kazakh - L2 Russian - L3 English speakers and child L1 Kazakh - L2 English speakers. There are notable distinctions between these languages; for example, English and Russian display features of head-initial and right-branching languages, whereas Kazakh showcases characteristics of head-final and left-branching languages (Flynn et al., 2004).

Overall, results indicated a significant advantage of the adult L3 English group over the child L2 English group. Flynn et al. (2004) explained the study's outcome by attributing the

difference in accuracy between the adult L3 group and the child L2 group to the adult learners' prior familiarity with L2 Russian, which provided them with an advantage in acquiring complementizer phrase properties in the L3. In contrast, the L2 child group exhibited lower accuracy in acquiring English relative clauses compared to the L3 adult group, as their L1 Kazakh did not influence the process, due to the distinct structural differences between the two languages. The results of this study are considered to support the CEM model proposed by Flynn et al. (2004).

2.3.4 The Typological Primacy Model

The Typological Primacy Model (TPM, Rothman, 2011, 2013, 2015) posits that in the early stages of language acquisition, the key factor influencing CLI in the L3 is not the order of acquisition, but rather the typological proximity of languages. This means that the language that is typologically the most similar to the L3 is the one that is transferred. Hence, learners engage in holistic transfer of features from the typologically more similar language into the L3, a process that can result in both facilitative and non-facilitative effects (Rothman, 2011, 2013, 2015).

Rothman (2011) proposed the TPM based on an analysis of adjectival placement and semantic nuances of two L3 groups, namely L1 Italian – L2 English – L3 Spanish, and L1 English – L2 Spanish – L3 Brazilian Portuguese. The result of the study revealed that CLI in L3 Spanish stemmed from L1 Italian, whereas in L3 Brazilian Portuguese, it originated from L2 Spanish. The study's outcomes pointed to the primacy of typological similarity over the chronological order of language acquisition. In this context, language transfer originated from a language within the same linguistic group as L3, specifically Romance languages (Rothman, 2011).

Moreover, as proposed by Rothman (2013, p.238), the language serving as the source of transfer is determined through a hierarchy of linguistic cues, encompassing lexical, phonological, morphological, and syntactic characteristics. It is proposed that in the early stages of acquisition, L3 learners prioritize the identification of lexical similarities. This preference arises from the fact that recognizing lexical resemblances requires a lesser degree of language proficiency compared to discerning phonological or morphological similarities (Rothman, 2013, 2015).

As outlined by Rothman (2013, 2015), learners develop a holistic perception of linguistic proximity between their previous languages and the L3 once they have received a certain amount of input amount of input. This implies that learners gather sufficient linguistic information to pinpoint which of their previous languages is the most akin to the L3, without the need for individual scrutiny of linguistic properties. In Rothman's view (2013, p. 219), holistic transfer in L3 acquisition is driven by cognitive economy, where learners prioritize wholesale transfer of existing linguistic features over analyzing them individually, in order to simplify the process.

Likewise, Hopp (2019) found transfer from a typographically related language to English for Turkish-German speakers learning English, compared to German monolinguals learning English. In both groups, sentence repetition and oral sentence production tasks showed evidence of transfer from German. The results were considered evidence of transfer from the typologically closest language to the target language (English) (Hopp, 2019).

Several studies examining CLI at early stages in L3 acquisition across various language pairings and grammatical features, such as adjective placement, number concord, and the null-subject parameter, have consistently reinforced the TPM model (e.g., Ben Abbes, 2020; Picoral & Carvalho, 2020; Puig-Mayenco & Marsden, 2018). Although the Typological Primacy

Model (TPM) finds substantial backing in research involving English and Romance language pairings, there is a notable dearth of evidence when it comes to examining combinations of languages that are more distantly related.

2.3.5 The Linguistic Proximity Model

The Linguistic Proximity Models (LPM) was developed as a means of explaining how CLI occurs property by property (Westergaard et al., 2017; Westergaard, 2019). The LPM asserts that CLI can occur at any stage of the acquisition of an L3, and that a learner uses both the L1 and L2 grammars already acquired. In other words, CLI arises from the co-activation of previously acquired grammars (varying based on structural similarity) to parse L3 input. The parser can access all the previous grammars during this process (Westergaard, 2019; 2021a; 2021b).

The LPM suggests that CLI can be both facilitative and non-facilitative. Input misanalysis, input deficiency or co-activation of competing related structures from both previously acquired languages can contribute to non-facilitative CLI, whereas facilitative CLI occurs as a result of similar linguistic properties between the previous language(s) and the L3 (Westergaard et al., 2017)

Furthermore, Westergaard et al. (2017, p. 670) assert that adopting a property-by-property transfer approach is a more cognitively efficient process. Their argument revolves around the idea that such an approach reduces the cognitive effort required to unlearn incorrectly transferred properties. Expanding on this perspective, Westergaard (2019, p. 393) adds that it remains uncertain whether transferring the entire grammar in one go is more cognitively economical compared to transferring it incrementally in smaller portions.

The LPM was originally based on a study (Westergaard et al., 2017) that examined the order of words in the acquisition of L3 English, namely adverb-verb word order and subject-auxiliary inversion among Russian-Norwegian bilingual children and two control groups of L1 Russian and L1 Norwegian learners of L2 English. Overall, the results showed that all learners exhibited a ceiling effect for subject-auxiliary inversion, while the adverb-verb phenomenon indicated that L3 learners scored between the two L2 control groups, suggesting that both previous languages affected the performance of Russian-Norwegian bilinguals. Furthermore, the results also indicated that the group with a property similar to the target language scored higher than the L2 group lacking this property in their L1 (Westergaard et al., 2017).

Similarly, research conducted by Kolb et al. (2022) discovered that structural proximity may override typological similarity at later stages, suggesting that CLI obtains cumulatively from both languages. The study focused on Russian-German heritage bilinguals acquiring L3 English in comparison to L2 English learners with either L1 German or L1 Russian, matched in age, proficiency, age of onset, and length of exposure. They investigated two structures in English that bear structural resemblance to German (subject-auxiliary inversion, determiner use) and two to Russian (adverb placement, non-subject-initial declaratives). The results unveiled both facilitating and non-facilitating CLI from Russian and German. Regarding properties that exhibit structural similarities between English and Russian, the L3 learners surpassed the L2 learners with L1 German but were surpassed by the L2 learners with L1 Russian. Conversely, for properties akin to English and German, the opposite trend was observed. The findings were interpreted as evidence suggesting that structural proximity might take precedence over typological similarity in later stages, indicating that CLI accumulates from both languages cumulatively (Kolb et al., 2022)

Likewise, Jensen et al. (2021) offer further support for the LPM model through their study on the acquisition of L3 English by Norwegian-Russian bilinguals, examining three linguistic modules: syntax (word order), morphology (subject-verb agreement and copula), and the syntax-semantics interface (genericity and definiteness). In each domain, at least one condition focused on a feature shared between Norwegian and English (while differing from Russian) or between Russian and English (while differing from Norwegian). The comparison between bilinguals and two groups of monolingual controls (L1 Russian and L1 Norwegian) presented two potential scenarios. In one scenario, the L3 learners exhibited a pattern similar to the higher-accuracy L2 group, suggesting successful inhibition of the non-facilitative language. Conversely, in the other scenario, their scores fell between those of the L2 groups. The study uncovered both simultaneous facilitative and non-facilitative influences from previously acquired languages on subject-verb agreement. Additionally, it emphasized the importance of other factors such as complexity and saliency, which contributed to different developmental trajectories across the investigated properties. The results were interpreted as supportive of the LPM model, suggesting that CLI accumulates from both languages (Jensen et al., 2021).

Numerous studies have also supplied additional evidence supporting the influence of property-by-property transfer in L3A, aligning with the LPM (e.g., Stadt et al., 2016, 2018, 2020; Dahl et al., 2021, 2022; Kolb et al., 2022; Ben Abbes 2016, 2020; Jensen et al., 2021). Studies aimed at supporting the LPM have tested the acquisition of multiple properties within distinct linguistic modules (e.g., morphology, syntax, semantics).

2.3.6 The Dominant Language of Communication

Fallah et al. (2016) proposed the Dominant Language of Communication Model, in which the language of communication is defined as the language that is most frequently used by subjects in various contexts. The objective of this study was to examine how prior knowledge

of linguistic systems, specifically Mazandarani and Persian, influences the initial stages of acquiring English as a third language (L3). The data were collected from 31 students aged 13 to 14 years. They underwent testing involving tasks such as grammaticality judgment, element rearrangement, and elicited oral imitation to assess the placement of attributive possessives. The results indicated that in the early stages of L3A, the dominant language of communication plays a decisive role in the selection of the CLI source(s) (Fallah et al., 2016).

2.4 Crosslinguistic Differences in Arabic, Norwegian and English

Norwegian and English share many characteristics, since both are Germanic languages; Arabic, in contrast, is a semitic language with a different script and writing system. The three languages behave differently when it comes to the language properties that will be investigated in this study. There are some structural similarities between English and Norwegian, e.g., possessive agreement, definiteness, and non-null subjects, while English and Arabic pattern together with respect to subject-verb word order in non-subject-initial declaratives, adverb-verb word order in subject-initial declaratives, and subject-verb agreement in declaratives.

This particular set of properties was chosen because they are considered problematic for Norwegian and Arab L2 English learners. For example, Arab L2 learners of English find definiteness difficult, even at advanced levels (Thyab, 2016; Abudalbuh, 2016; Sarko, 2008; Abbas et al., 2021). Additionally, one of the parameters examined among trilingual Arabic-Hebrew-English university students by Abbas et al. (2021) was possessive agreement, which was shown to be problematic for the learners. Moreover, Hermas (2010) examined the verb movement parameter of Arabic-French bilingual adults in L3 English. In the literature, these properties are regarded as challenging parameters in the acquisition of an L3 by Arabic learners. Furthermore, Norwegian L2 learners of English seem to have difficulties acquiring basic non-V2 word order, due to the fact that their L2 English is often influenced by their L1 Norwegian

in non-subject-initial declaratives and sentences that have adverbs (Westergaard, 2003). A detailed discussion of the grammar of the three languages is provided in the remainder of this section.

2.4.1 Possessive agreement

English has many ways to express possession, but the pre- and post-nominal possessives are the most commonly contrasted (Barker, 2011; Börjars et al., 2013; Peters & Westerståhl, 2013). English possessives are expressed either with non-pronominal noun phrases or with pronominal elements (Eisenbeiss et al., 2009). There are two types of nominal possessives: s-possessives and of-possessives, which are used to express noun phrases that do not employ pronouns (Barker, 2011; Börjars et al., 2013; Marinis, 2016; Vásquez Carranza, 2010). This study only focuses on s-possessives, and the other types are not taken into account. According to Barker (2011) and Vásquez Carranza (2010), the s-possessive, also known as the Saxon genitive, is pre-nominally realized with the 's marker as in [1a].

[1]

a. Fatima washed Ali**'s** shirt. (English)

For this property, Norwegian patterns with English, where genitive s is used to express possessive as in [1b]. Arabic, on the other hand, does not have a possessive pronoun or a genitive marker for expressing possession. In Arabic, there are two ways to indicate possession. The first method involves appending a suffix to a noun reflecting the gender and number of the possessor, as in [1c]. A second method is a genitive construct to show possession, which is a pair of nouns without any genitive markers, as in [1d], which is the focus of this study.

[1]

b. Fatima vasket Ali**s** skjorte. (Norwegian)
   Fatima washed Ali.POSS shirt.
   'Fatima washed Ali's shirt.'

c. ʔxtk dʒmjlh dʒdaː. (Arabic)
   Sister.your beautiful very.
   'Your sister is very beautiful.'

d. Faːtˤm ɣslt qmjsˤ ʕlj. (Arabic)
   Fatima washed shirt Ali **Ø**.
   'Fatima washed Ali's shirt.'

2.4.2 Indefiniteness

Norwegian and English both use grammaticalized articles to mark indefiniteness on nouns. The indefinite article *a* or *an* is used in English to indicate indefiniteness when referring to a singular countable noun (Aarts, 2011). Example [2a and 2b] illustrates the indefiniteness of a singular count noun.

[2]

a. Sara saw **a** dog. (English)
b. Sara ate **an** apple.

Norwegian marks indefiniteness by using three different prefixes, depending on gender: *ei* for feminine singulars, *en* for masculine singulars, and *et* for neuter singulars. Additionally, the suffix *-er* marks the indefiniteness of plural nouns in Norwegian. The examples below illustrate the indefiniteness of singular and plural count nouns in Norwegian.

[2]

c. Sara så **<u>en</u>** hund. (Norwegian)
Sarah saw INDF.M. dog
'Sara saw a dog.'

d. Sara så **<u>ei</u>** jente.
Sarah saw INDF.F. girl.
'Sara saw a girl.'

e. Sara så **<u>et</u>** tog.
Sarah saw INDF.N. train
'Sara saw a train.'

f. Sara så mange hund**<u>er</u>**.
Sarah saw many dogs. INDF.P.
'Sara saw many dogs.'

In Arabic the article system is different from that of English or Norwegian. The Arabic definite article, equivalent to the English word *the*, is formed by combining the Arabic letters *a+l*. In the Arabic language, the definite article is not a separate word; rather, it is always attached to the noun or adjective it specifies. This remains consistent regardless of the gender or number of the word being described. This is illustrated in [2g].

[2]

g. Mħmd rʔa **<u>ʔl</u>**klb fj **<u>ʔl</u>**mħl. (Arabic)
Mohammed saw DEF-dog in DEF-store.
'Mohammed saw the dog in the store.'

Arabic does not use indefinite articles to express indefiniteness grammatically. In Arabic, indefiniteness is expressed by the noun's original form. To put it another way, the absence of definite markers is actually an indefinite marker. Thus, bare nouns are indefinite, as illustrated in [2h].

[2]

h. Saːr rʔaːt klb
Sara saw **Ø** dog.
‘Sara saw a dog.’

Nonetheless, Arabic does employ an indefinite marker in conjunction with a noun, which is referred to as *nunation*, as illustrated in [2i]. Nunation is conventionally described as an additional /n/ sound appended to the end of a noun when spoken (in standard Arabic), rather than when written, without serving any purpose of emphasis. The differentiation between [2h] and [2i] hinges on the presence or absence of a pause at the noun. When a pause occurs, the nunation is excluded, whereas its pronunciation ensues when continuity is maintained (Taher, 2019). There exist additional applications of nunation; however, as they fall outside the scope of this study, they will not be elucidated.

[2]

i. Saːr rʔaːt klbaː**un** qbjħaːun
Sara saw dog.INDF ugly.
‘Sara saw an ugly dog.’

2.4.3 Null subjects

English clauses necessitate the overt realization of the subject (Wegerbauer, 2023). Generally, English is regarded as a non-pro-drop language, in which null subjects are not permitted (Valian, 2016). Among [- null subject] languages, English is the most studied (Valian, 2016), with most studies focusing primarily on expletives and embedded clauses (e.g., Rothman & Cabrelli Amaro, 2009; Tavakol & Jabbari, 2014; Valian, 2016). In this study, the embedded structure will primarily be investigated as in [3a]. The extraction of subjects from embedded clauses in English is restricted (Bentzen, 2014; Judy & Rothman, 2010; Rothman & Cabrelli Amaro 2009; Valian, 2016). Embedded clauses in English cannot have null referential subjects, even in casual conversation (Judy & Rothman, 2010; Rothman & Cabrelli Amaro, 2009).

[3]

a. Ali took off his shoes when **he** entered the room. (English)
   *Ali took off his shoes when **Ø** entered the room.

As in English, overt subjects are mandatory in modern Norwegian (Faarlund, 2013; Faarlund & Hagemann, 2014; Kinn, 2016). Norwegian is therefore classified as a non-pro-drop language, since there must be overt expression of both referential and non-referential subjects (Kinn, 2016). Hence, a null referential subject is ungrammatical in Norwegian embedded clauses (Kinn, 2016; Rosenkvist, 2009) as in [3b].

[3]

b. Ali tok av seg skoene da **han** kom inn i rommet. (Norwegian)
   Ali took off his shoes when **he** entered the room.
   *Ali tok av seg skoene da **Ø** kom inn i rommet.
   *Ali took off his shoes when **Ø** entered the room.

In contrast to English and Norwegian, Arabic is a pro-drop language that allows covert subjects. Despite the fact that overt subjects are not syntactically obligatory, several factors influence the choice. Contrastiveness, emphasis, reference switch, or novel information introduction are some of the contextual factors that can determine whether or not a subject is overt or null. In Arabic, although the null subject option is available for almost all sentences, some sentences must be displayed without a subject. A valid example is embedded sentences with the same referential subject as the main clause, which necessitates a null subject. In other words, a null subject must be used in embedded clauses when the subject entity contained in the embedded clause matches the entity contained in the matrix clause, as in [3c]. In this particular instance, since the subjects in the main and the embedded clause are identical, the inclusion of a null subject in the embedded clause becomes necessary. However, as evidenced in [3d], there is a disparity between the subject of the main clause, Ali, and the subject in the embedded clause, denoted by *he*. With distinct subjects present in both the main and embedded

clauses, the utilization of a null subject would potentially lead to a misinterpretation. Note that Arabic embedded clauses with overt subject pronouns signal a change of reference, which implies a contrast.

[3]

c. ʕlj ʃlħ bwtw lma: dxl ʕa:lɣrf. (Arabic)
Ali took off shoes.POSS when **Ø** entered the room.
'Ali took off his shoes when he entered the room.'

d. ʕlj ʃlħ bwtw lma: **hw** dxl ʕa:lɣrf.
Ali took off shoes.POSS when **he** entered the room.
'Ali took off his shoes when he (someone else not Ali) entered the room.'

2.4.4 Subject-verb word order in non-subject-initial declaratives

Norwegian is a V2 language, so the finite verb must be in second position. Consequently, Norwegian non-subject-initial declaratives have XVS word order as in [4a]. In English, however, XVS word order in non-subject-initial declarative sentences is generally considered ungrammatical[1]. Hence, English non-subject-initial declaratives maintain the SV word order, with or without the presence of an adverbial at the beginning, as in [4b].

Despite the fact that SVO and VSO are both used in written Arabic, the spoken language has moved more towards SVO word order. In spoken Arabic, transitive verbs are usually avoided in non-subject initial declaratives in order to avoid ambiguity, so both Arabic and English have XSV word orders as in [4b] and [4c].

[1] While English is typically not classified as a V2 language, there is historical evidence that English relinquished its V2 characteristic during the Middle English era. Nevertheless, isolated instances of V2 structure endure in English, albeit confined to specific clause types and verb forms. Consequently, proponents argue for the categorization of English as a mixed V2 language (for a detailed overview, see e.g., Westergaard, 2007).

[4]

a. I går kokte Fatima ris til middag. (Norwegian)
X V S
Yesterday cooked Fatima rice for dinner.
'Yesterday, Fatima cooked rice for dinner.'

b. Yesterday Fatima cooked rice for dinner. (English)
X S V

c. ʔmbaːrħ faːtˁmh tˁbxt rz llʕʃaːʔ.(Arabic)
X S V
Yesterday Fatima cooked rice for dinner.
'Yesterday, Fatima cooked rice for dinner.'

2.4.5 Adverb-verb word order in subject-initial declaratives

As a V2 language, Norwegian employs a V-Adv word order for declarative sentences with frequency adverbs as in [5a]. The English language typically uses the Adv-V word order, in which adverbs precede lexical verbs, as in [5b]. Similarly, Arabic patterns with English, where frequency adverbs typically precede verbs (Adv-V) as in [5c].

[5]

a. Fatima **koker ofte** ris. (Norwegian)
V Adv
Fatima **cooks often** rice.
'Fatima often cooks rice.'

b. Fatima **often cooks** rice. (English)
Adv V

c. Faːtˁmh **ɣaːlbaːun ttˁbx** rz. (Arabic)
Adv V
Fatima **often cooks** rice.

2.4.6 Subject-verb agreement in declaratives

Generally, English is regarded to have an impoverished agreement system (Hudson 1999; Koeneman & Zeijlstra, 2014). The verb in English shows partial agreement with the

subject as in [6a], when the subject is 3rd person singular. This signifies that within the English language, there is number and person agreement between the subject (S) and the verb (V). As for Norwegian, it does not have subject-verb agreement, and the same verb form is used for all subjects as in [6b].

[6]

a. Ali **likes** this cat. (English)
   Fatima **likes** this cat.
   Fatima and Ali **like** this cat.
b. Ali **liker** denne katten. (Norwegian)
   Fatima **liker** denne katten.
   Fatima og Ali **liker** denne katten.

In Arabic, unlike many other languages such as English and Norwegian, the verb fully expresses the grammatical features of the subject (Person, Number, Gender). As an illustration, consider [6c], where the verb clearly indicates the subject's third-person singular masculine identity. In contrast, in [6d], the verb denotes a third-person singular feminine subject. Furthermore, [6e] demonstrates that the verb signifies the presence of third-person dual subjects.

[6]

c. ʕlj **bjħb** hl ʔqtˤh. (Arabic)
Ali **M.like.3.SG** this cat.
'Ali likes this cat.'

d. Faːtˤmh **btħb** hl ʔqtˤh.
Fatima **F.like.3.SG** this cat.
'Fatima likes this cat.'

e. Faːtˤmh w ʕlj **bjħbwa**ː hl ʔqtˤh.
Fatima and Ali **like.3PL** this cat.
'Fatima and Ali like this cat.'

2.5 Chapter Summary

In the first section of this chapter, I introduced the concept of cross-linguistic influence. I stated that cross-linguistic influence occurs when an individual language's grammar affects the grammar of another language. Later, existing models and theories of L3A were described. The models were designed to focus on variables that can help determine the source of CLI in L3A.

The Default L1 Effect and L2SF suggest that CLI source selection is influenced by order of acquisition. Default L1 Effect argues that first languages play a vital role in affecting target languages, while the L2SF claims that the second language is the more accessible source for CLI. Both models were supported by empirical evidence that CLI can arise from either L1 or L2, yet they cannot both be true. However, other dominant models claim that the order of acquisition is a less significant variable. The TPM suggests a hierarchy of properties from which the parser selects the language (L1 or L2) that is typologically more similar to the target language as the only CLI source. The Linguistic Proximity Model (LPM) postulates that cross-linguistic influence (CLI) ensues due to co-activation of existing grammatical representations. The choice of the source of CLI is influenced significantly by the structural resemblance

between the properties of the previous grammar and those found within the target language. In contrast, the dominant language of communication model states that in the early stages of L3 acquisition, the dominant language of communication plays a decisive role in selecting the sources of cross-linguistic influence (CLI).

Subsequently, I presented a syntactic analysis of the properties investigated in this thesis in Arabic, Norwegian, and English. While Norwegian and English are typologically very similar and pattern together in possessive agreement, indefiniteness, and the null subject property (where Arabic patterns differently), they differ in SV and Adv-V word order and Subject-verb agreement (where Arabic patterns with English). Table 1 summarizes crosslinguistic similarities and differences for these three languages in the relevant properties.

Table 1. Summary of the properties

Language Properties	
Possessive agreement	(Eng =Nor≠Ara)
Indefiniteness	(Eng =Nor≠Ara)
Null subject	(Eng =Nor≠Ara)
SV in non-subject initial declaratives	(Eng =Ara≠Nor)
Adv-V in subject initial declaratives	(Eng =Ara≠Nor)
Subject-verb agreement in declaratives	(Eng =Ara≠Nor)

The next chapter introduces the research questions and hypotheses that are based on the models discussed here. Details about the study design and methods are provided along with a brief description of the pilot study.

3 Research Questions and Methodology

The present chapter introduces the objectives of the study and makes predictions based on previously introduced models and supporting evidence. The chapter is dedicated to outlining the methodology involving acceptability judgment tasks. Participants, procedure, and pilot study are described and discussed towards the end of the chapter. Approval for this study has been granted by the Norwegian Centre of Research Data (NSD).

3.1 Research Questions and Predictions

In light of the significant amount of research on the topic and the ongoing discourse surrounding the origin and character of CLI in L3A, this study is oriented towards investigating the two primary research questions:

1. What are the potential sources of CLI in L3A? Does CLI originate from both previously acquired languages, or is only one language selected as the dominant source of influence?
2. Does cross-linguistic influence impact the acquisition of a third language in a holistic manner or on a property-by-property basis?

Considering the primary predictions about the origin and characteristics of CLI in L3A (refer to section 2.4) and the morphosyntactic features and languages examined in this research, the following predictions are formulated:

The Linguistic Proximity Model (LPM): As per this model, cross-linguistic influence (CLI) can originate from both L1 and L2 since language acquisition is a cumulative process. Therefore, the LPM proposes property-by-property transfer, which can result in both facilitative and non-facilitative CLI. Facilitative transfer occurs when there is a structural resemblance between the previously acquired languages and the L3. However, non-facilitative transfer may

occur due to (i) an erroneous assumption by the speaker that a linguistic characteristic is shared between one of the previously acquired languages and the L3, and (ii) inadequate input. Consequently, the co-activation of competing related structures from both previously acquired languages will have a larger effect, resulting in non-facilitative influence (Westergaard et al., 2017).

According to the LPM model, it is predicted that for language properties in which Norwegian and English exhibit similar patterns but differ from Arabic, the L1-Norwegian group is expected to achieve the highest, while the L1-Arabic group is anticipated to achieve the lowest, with the L3 group expected to fall in the middle of this range or behave similarly to the L1-Norwegian group if they have learned to inhibit non-facilitative CLI. Conversely, for the language properties where Arabic and English pattern together, but Norwegian is different, it is predicted that the L1-Arabic group would achieve the highest scores while the L1-Norwegian group would obtain the lowest scores, with the L3 group falling in the middle or behave similarly to the L1- Arabic group if they have learned to inhibit non-facilitative CLI. However, this outcome is dependent on appropriate timing to avoid floor and ceiling effects (for further information, see Westergaard et al., 2023; Jensen et al., 2021).

Based on the LPM Model, the rationale for placing the L3 group in the middle or observing comparable behavior to the high-accuracy group stems from the suggestion that the parser can leverage both previously acquired languages as potential sources of cross-linguistic influence (CLI). Consequently, the learner will experience both facilitative and non-facilitative CLI from the background languages, leading to an intermediate position between the two control groups. However, if the L3 group has learned to inhibit non-facilitative CLI, they can also exhibit similar behavior to the high-accuracy group (Westergaard et al., 2022; Jensen et al., 2021).

The Typological Primacy Model (TPM): According to this model the crucial factor in determining which of the previously acquired languages is transferred holistically, is the typological resemblance between the L1/L2 and the L3. That is to say, the language that is typologically closest to the L3 is the one that is transferred (Rothman, 2011, 2013, 2015). It is anticipated that in cases where Norwegian and English exhibit similar language properties, but Arabic differs, both the L3 and L1-Norwegian groups will score the highest (with no significant difference between the two groups), while the L1-Arabic group will obtain the lowest scores.

In contrast, in cases where Arabic and English share the same language properties, but Norwegian differs, the L1-Arabic group is expected to have the highest score, while both the L3 and L1-Norwegian groups will have the lowest score (with no significant difference between the two groups). The L3 group is projected to perform similarly to the L1-Norwegian group because, according to the TPM and the hierarchy of properties discussed earlier in section 2.3.4, the parser selects one of the previously learned languages based on the highest level of lexical similarities. Consequently, the L3 group learner is expected to choose Norwegian as the exclusive source of CLI and reproduce the entire representation, regardless of whether the influence is facilitative or non-facilitative (for further information, see Rothman, 2011, 2013, 2015). Table 2 summarizes the predictions of this study.

Table 2. Overview of the predictions

Condition	LPM Predictions	TPM Predictions	
Possessive agreement	L1-Ara[1] < L3 < L1-Nor[2]	L1-Ara < L3 = L1-Nor	(Eng[3] =Nor≠Ara)
Indefiniteness	L1-Ara < L3 < L1-Nor	L1-Ara < L3 = L1-Nor	(Eng =Nor≠Ara)
Null subject	L1-Ara < L3 < L1-Nor	L1-Ara < L3 = L1-Nor	(Eng =Nor≠Ara)
SV in non-subject initial declaratives	L1-Nor < L3 < L1-Ara	L3 = L1-Nor < L1-Ara	(Eng =Ara≠Nor)
Adv-V in subject initial declaratives	L1-Nor < L3 < L1-Ara	L3 = L1-Nor < L1-Ara	(Eng =Ara≠Nor)
SV agreement in declaratives	L1-Nor < L3 < L1-Ara	L3 = L1-Nor < L1-Ara	(Eng =Ara≠Nor)

[1]Ara = Arabic, [2]Nor = Norwegian, [3]Eng = English

3.2 Method

In this subsection, the tasks employed in the study are outlined. Subsections 3.2.1 to 3.2.3 provide a thorough account of the diverse tasks undertaken during the study, including AJT, background questionnaire, and English proficiency test.

3.2.1 Acceptability Judgment Task

Considering the research questions and predictions outlined earlier, it was essential to employ an appropriate methodology to investigate CLI as both a holistic and property-by-property phenomenon, covering the two tested models. To achieve this, the present study employed a subtractive experimental design method (based on Westergaard et al., 2023), which can identify possible CLI from previously acquired languages.

The method employed in this study enables a clear distinction between the potential influences from the L1 and L2, achieved through the use of subtractive language groups that are summarized in Table 3. This experimental design involves comparing the performance of the L3 group with L2 controls, where the target language remains constant, but the other languages are varied parametrically, as described by Westergaard et al. (2023, p.9). Through this approach, the study can also investigate the type of CLI, determining whether the influence is solely facilitative or both facilitative and non-facilitative.

Table 3. Combinations of properties to be investigated in the subtractive experimental design

	Property 1 $L_C = L_A \neq L_B$	Property 2 $L_C = L_B \neq L_A$
L_A - L_C group	L_A group >> L_B group	
L_B - L_C group		L_B group >> L_A group
L_A - L_B - L_C group	Facilitation from L_A Non-facilitation from L_B	Facilitation from L_B Non-facilitation from L_A

Source: adapted from Westergaard et al. (2023, p.9).

The selection of tested properties is crucial in the subtractive experimental design proposed by Westergaard et al. (2023). This is because learners may experience facilitation in grammatical properties that share similar features with their previously acquired languages, whereas those that have different or absent features may not receive the same benefit. To isolate the possible influence from each language, a combination of contrasting properties between L1 and L2 is employed (Westergaard et al., 2023).

The terms acceptability judgment tests and grammaticality judgment tests are often used interchangeably in the literature, but in this study, only the former term is used, as acceptability and grammaticality are distinct concepts. According to Chomsky (1965, p.11), “acceptability belongs to the study of performance” while “grammaticality belongs to the study of competence”. As suggested by Leivada and Westergaard (2020), there may be sentences that are grammatical but unacceptable, and vice versa. This implies that acceptability is influenced by factors other than grammaticality, such as processing constraints and memory limitations (Leivada &Westergaard, 2020).

The study consists of three primary categories of experimental tasks, which were: (a) an acceptability judgment task (AJT), (b) a questionnaire regarding participants' language background, and (c) a language proficiency test. Due to its ease of administration, AJT is a commonly utilized method in the field of linguistics (Dabrowska, 2010). During acceptability judgment tests, participants make a determination regarding the acceptability or unacceptability of sentences. Figure 1 presents the task of the Acceptability Judgement Test, in which participants were tasked with evaluating a list of sentences and determining whether they sound "good" or "bad" in the English language. The purpose of the AJT was to identify variations in participants preferences based on different linguistic features. The test consisted of 48 target

items, evenly distributed across six morphosyntactic properties, with each property comprising eight items. These items were further categorized into four grammatical sentences and four ungrammatical sentences for each property.

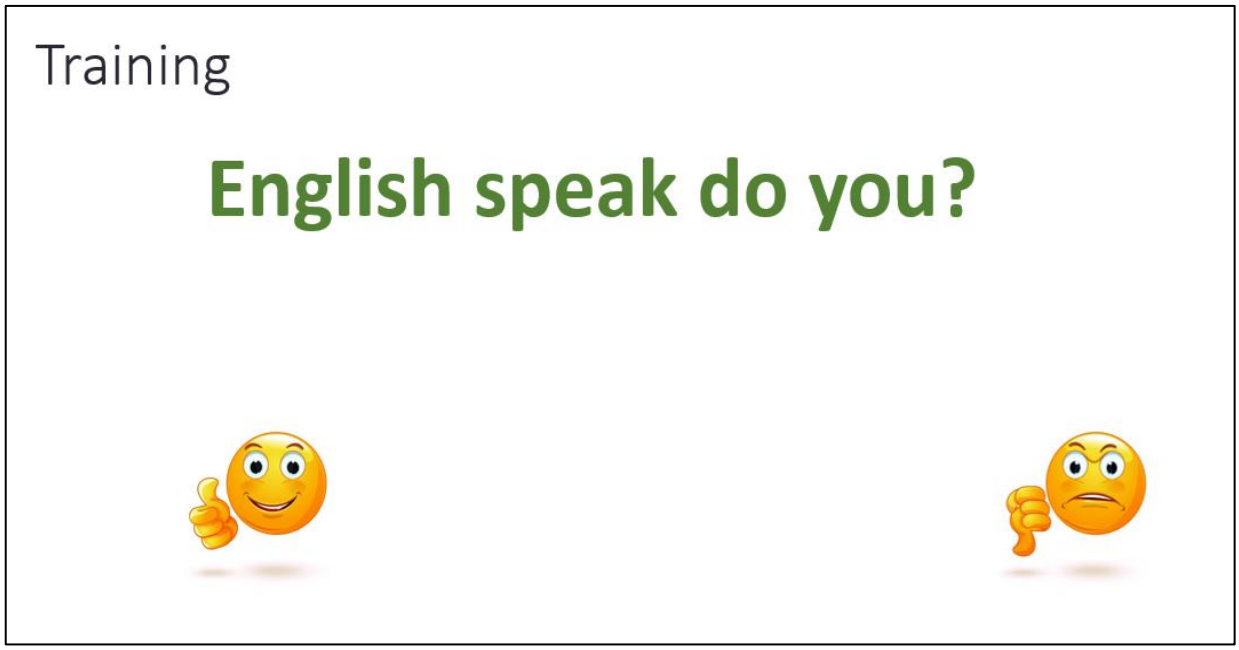

Figure 1. The AJT

To ensure a randomized sequence and minimize potential bias, the order in which the 48 target items were presented in the AJT was manually randomized. Further adjustments were manually made to ensure that items belonging to the same morphosyntactic category appeared at least five items apart. The AJT task did not include any additional filler sentences, as the sentences within different conditions already served as fillers for each other. In table 4, you can find example items for each condition. However, a complete list of these items can be found in Appendix 4.

Table 4. AJT items in different properties

Properties	Grammatical	Ungrammatical
Adv-V	Fatima often cooks rice.	Fatima cooks often rice.
SV-in-Non-Su-In	Yesterday, Fatima cooked rice for dinner.	Yesterday, cooked Fatima rice for dinner.
SV	Nura knows this girl.	Nura know this girl.
Indefiniteness	Ali had a brother.	Ali had brother.
Possessive	Ali broke Ahmed's bike.	Ali broke Ahmed bike.
NullSu	Fatam ate ice cream before she entered the class.	Fatam ate ice cream before entered the class.

An additional AJT task was implemented in the study, which involved conducting audio based AJTs in Arabic. This AJT was conducted to ensure that the participants had acquired the tested properties under investigation in their L1 language. This task consisted of 20 items in total, with an equal distribution of 10 grammatical and 10 ungrammatical sentences as presented in figure 2. To ensure the highest quality recordings possible, the sentences were recorded by native Arabic and English speakers using a headset microphone and Microsoft PowerPoint program. This approach was taken to minimize background noise during the recording process.

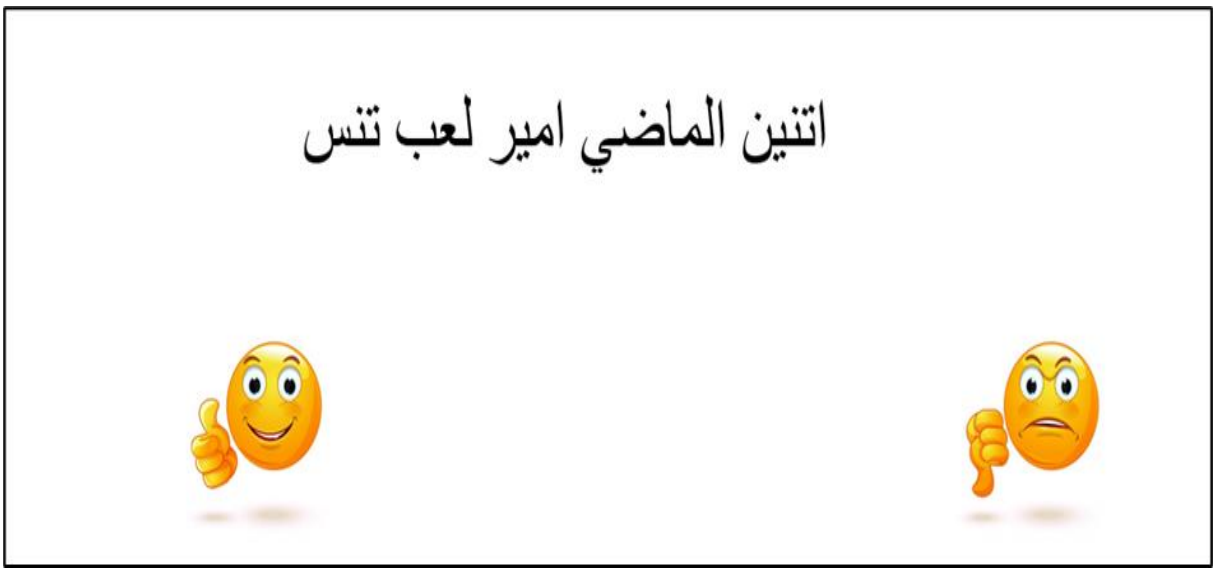

Figure 2. The Arabic AJT

3.2.2 Background questionnaire

The experiment also included a background questionnaire. The questionnaire consisted of two main types of inquiries: one focused on general information about the participants and the other centered around their linguistic background.

The general information section included questions about the participants' age, gender, and length of stay in Norway. The linguistic background questions required participants to specify the language they used to communicate with their parents and friends, along with indicating the age at which they began learning English.

The purpose of the linguistic background questionnaire was twofold: first, to categorize participants based on their native language and knowledge of additional languages, and second, to consider excluding participants whose linguistic background did not align with the study's scope. For the complete set of language proficiency questions, please refer to Appendix 3.

3.2.3 English proficiency test

An assessment of the participants' English lexical proficiency was used to ensure comparability among the three groups in terms of their English proficiency. This evaluation also aimed to ascertain whether segregating participants into age groups was warranted. Given that participants' ages alone could not offer evidence regarding whether their proficiency aligned with the expected level, this test was deemed essential. Consequently, a selected subset of the British Picture Vocabulary Scale (BPVS 3; Dunn & Dunn, 2009), consisting of 20 items was administered, as detailed in Appendix 2. The test was utilized in various studies (e.g., Jensen et al., 2021; Westergaard et al., 2017)

The British Picture Vocabulary Scale test is a multiple-choice task in which participants select the most appropriate image from four options corresponding to an auditory stimulus.

Participants may choose only one option for each word, and a correct response earns them one point. To mitigate the risk of misunderstandings or confusion, supplementary information was provided in both Arabic and Norwegian.

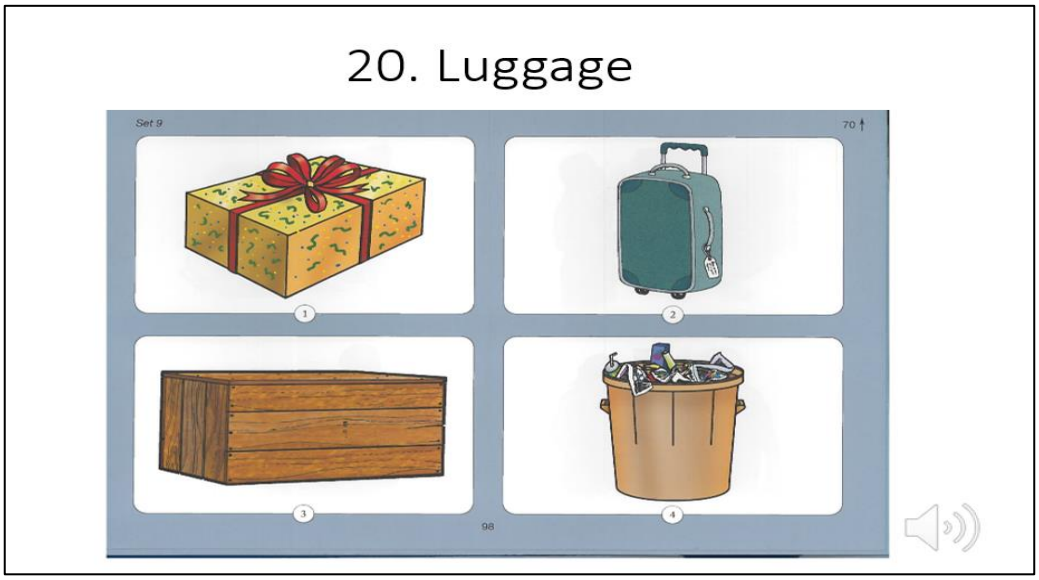

Figure 3. English proficiency test

3.3 Participants

In this study, three groups of English learners participated. The first group comprised 29 Arab-Norwegian bilingual speakers who were acquiring English as an L3 at school in Norway (L3 group). The second group was made up of 31 Arab speakers who were acquiring English as an L2 in Kuwait (Arabic control group), while the last group consisted of 36 Norwegian speakers who were acquiring English as an L2 in Norway (Norwegian control group). The study targeted participants between the ages of 9 and 14.

Participants for this study were recruited from different cities in Norway and Kuwait. Arab-Norwegian bilinguals from Syrian families were selected and asked to participate in the experiment during their free time. L1 Arab learners were recruited from Kuwaiti families in various cities in Kuwait and were encouraged to participate during their free time. L1 Norwegian learners were selected from one school in Tromsø, Norway, and were asked to

participate during school hours. Further details about the participants in each group can be found in table 5.

Table 5. Description of the participants

Groups	N.	Gender	Age (in years)	AoO[1] in English (in years)	Years in Norway	Mean English Proficiency	LOC[2] with mother/father	LOC with friends
L3	29	Boys=14 Girls=15	Range=4 Mean=11.62	Range=5 Mean=6.31	Range=6 Mean= 5.27	Mean= 16.17	Ara[3]/Ara (n=29)	Nor[4] (n=21) Eng[5] (n=1) Nor&Ara (n=5) Nor&Eng (n=2)
Arabic Control	31	Boy=11 Girl=20	Range=4 Mean=11.03	Range=4 Mean=5.16	——	Mean= 16.35	Ara/Ara (n=30) Ara/Ara&Eng (n=1)	Ara (n=24) Ara&English(n=7)
Norwegian Control	36	Boy=13 Girl=23	Range=3 Mean=11.50	Range=4 Mean=5.02	——	Mean= 18.51	Nor/Nor (n=33) Nor/Eng (n=1) Nor/Sam[6] (n=1) Nor&Eng/Nor&Eng (n=1)	Nor (n=35) Nor&Eng (n=1)

[1] AoO = Age of Onset, [2]LOC = Language of Communication, [3]Ara= Arabic, [4]Nor = Norwegian, [5]Eng = English, [6]Sam=Samisk

3.4 Procedure

The experiment was entirely constructed using a PowerPoint application, and all data were collected and analyzed offline throughout the entirety of the experiment. The experiment took approximately 35-40 minutes to complete. The participants underwent various tasks based on their respective groups. The L3 group completed all the outlined steps below, while the two control groups did not participate in the last one.

1. A consent form.
2. An acceptability judgment task in English.
3. A background questionnaire.
4. An English proficiency test.
5. A mini AJT of the properties under investigation in Arabic.

The consent form was sent prior to the experiment. The document included an information section, which contained essential details about the experiment (refer to Appendix 1), and a consent form, where the parents of the participants confirmed their agreement with their child's

involvement in the study. After completing the consent form, the participants were then given instructions about the AJT task, in English as well as either Arabic or Norwegian. After completing two practice trials, they proceeded to the main AJT task, where all items were randomized.

Following the AJT, the participants were presented with a brief background questionnaire. They were required to answer some questions regarding their age, gender, and language usage with their mother, father, and friends (refer to Appendix 3). The background questionnaire was provided in English.

The fourth segment of the experiment was an English proficiency test that contained 20 items (refer to Appendix 2). As illustrated previously, the proficiency test was a multiple-choice task where the participants had to select the most appropriate image among four options that represented the audio. The participants were allowed to choose only one option for each word audio.

The last components of the experiment involved mini acceptability judgement tasks in Arabic (see Appendix 5 for the list of items). Since many Arabic-Norwegian bilingual speakers were incapable of reading or writing in the Arabic language, it was determined that language features in their background language (Arabic) would be assessed through an acceptability judgment task. In this task, participants were presented with sentences and their audio, and they decided their acceptability as either good or bad. No practice trials were conducted as the task was relatively straightforward, and participants were already familiar with it since they had gone through the main AJT task in English. The objective of this task was to determine whether the participants in the L3 group had acquired the language properties under investigation in Arabic.

3.5 Pilot Study

A pilot study was conducted before the main experiment. This section will discuss the pilot study and its results. Based on the results obtained from the pilot study, several modifications were made to the main experiment. These modifications will be explained in detail throughout the rest of this section. The pilot study consisted of the consent form, an AJT task in English, a short background questionnaire asking about the participants' age, gender, and language of communication with their parents and friends, and an English proficiency test.

Three Arab students from Kuwait participated in the study. Arabic was their first language, and they communicated with their family and friends in Arabic. The purpose of the study was to test the clarity and suitability of the instructions and timing for the target age group. Based on feedback from the participants, some minor adjustments were made. They requested the audio to be played again and more time to be allotted per question. As a result, in the main study, each audio clip was repeated twice, and each sentence was presented for a longer period (from 15 seconds to 25 seconds) than in the pilot study.

3.6 Chapter Summary

In this chapter, the research objectives of the current study were elucidated, encompassing a dual focus: the investigation of the source of cross-language influence (CLI) and the determination of whether CLI occurs on a property-by-property basis or as a comprehensive phenomenon. Next, predictions were formulated based on the two primary models in the field of third language acquisition (L3A), namely, the Typological Primacy Model (TPM) and the Linguistic Proximity Model (LPM).

The Typological Primacy Model (TPM) posits that English language learners (L3 group) would only be influenced by Norwegian, as it shares typological similarities with

English. Additionally, according to the TPM, the parser would replicate the entire language representation (Norwegian, in this case). Conversely, the Linguistic Proximity Model (LPM) asserts that both Arabic and Norwegian would affect the acquisition of English due to the structural similarities among the target language (English) and the background languages (Arabic and Norwegian). Thus, the LPM suggests that CLI happens on a property-by-property basis.

Following the pilot study's outcomes, some adjustments were made to the experiment's design. These changes included playing the audio twice instead of once and displaying the sentences on the screen for a longer time, which were extended from 15 seconds to 25 seconds. By implementing these modifications, the experiment's design was improved, and the potential risks were mitigated.

4 Results

This chapter presents an overview of the results obtained in this research by employing both the AJT and mini AJT. The data were analyzed using the R statistical software[2], which is a free tool for statistical computing and graphics (R Core Team, 2020). The statistical analyses were carried out using the lme4 and emmeans packages (Bates et al., 2014; Lenth et al., 2020). The primary aim of this chapter is to provide a more detailed perspective on the participants and to examine how their accuracy levels vary across different AJT properties. Specifically, the analysis will investigate whether there are any significant differences in accuracy rates among the three groups for the properties in the AJT.

4.1 The background questionnaire

In this section, information related to the background variables of the participants are presented. Details regarding variables such as gender, age, age of onset for English as the target language, and duration of residence in Norway (for the L3 group) can be found in Table 4 within Section 3.3.

Out of these variables, only the chronological age of the participants turned out to be a significant predictor of accuracy (p-value < 0.001). Appendix 6 includes the syntax and output of the statistical findings related to the background questionnaire data.

4.2 The English proficiency test

As mentioned in section 3, a short picture-selection task was employed as a proxy for assessing the participants' receptive vocabulary size in English. The test had a score range of 1-

[2] It's important to note the use of additional software, OpenAI, for grammar checking and editing purposes only throughout the thesis. Instead of relying solely on human editors, AI software has been employed (OpenAI, 2022), as numerous studies have indicated its efficiency and benefits for academic purposes (e.g., Golan et al., 2023; Kim, 2023).

20. To evaluate the comparability of the groups concerning their English proficiency, a linear regression analysis was performed on the data (see Appendix 7).

The model revealed a significant effect for the Norwegian control group (ß= 2.34, p <0.0001). No other effects were significant. Moreover, Post-hoc pairwise comparisons of estimated marginal means were carried out to assess differences between the specific pairs of groups. The results of this analysis revealed that the Norwegian group performed significantly better than the Kuwaiti (Arabic) control group and the L3 group (p=0.0172 for the Norwegian vs Arabic contrast, and p= 0.0103 for the Norwegian vs L3 group contrast). Figure 4 plots the differences in proficiency between the three groups (Arabic group taken as the intercept, at 0). The differences in lexical proficiency are important for our subsequent evaluation of the AJT task in English in section 4.3 below.

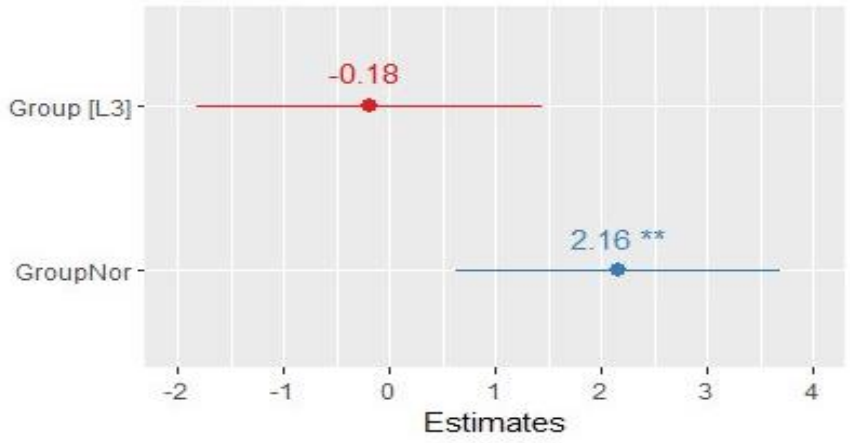

Figure 4. Means of English proficiency

4.3 The Mini AJTs in Arabic

The mini AJT in Arabic assessed the L3 group's knowledge of the relevant grammatical structures in Arabic. The objective was to ascertain the participants' competence in the linguistic properties under scrutiny within their L1. The results of the mini-AJT are presented in figure 5. It's important to note that Arabic, aside from standard Arabic, lacks grammatical marking for

indefiniteness or possessive genitive case in both written and spoken forms. As a result, these specific properties were not subject to investigation within the Arabic linguistic context.

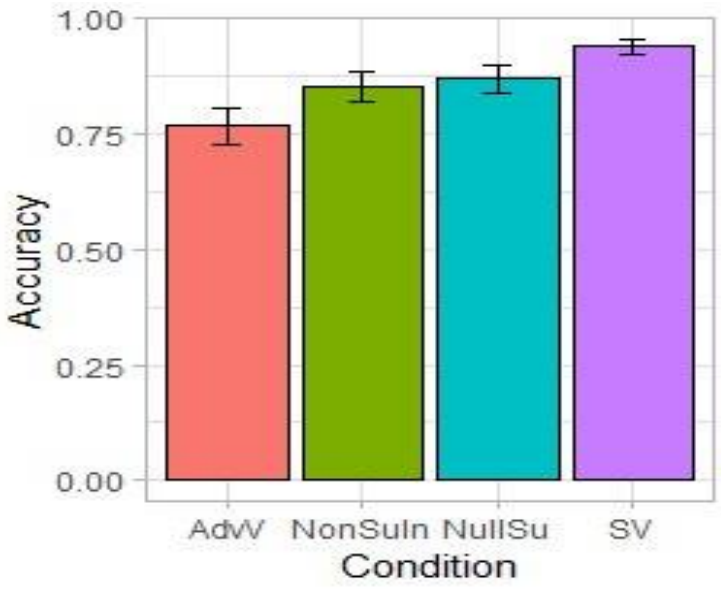

Figure 5. Accuracy rate in the Arabic AJT

As illustrated in figure 5, participants performed quite accurately (above 75%) on all included properties, ranging in accuracy from 76% on Adv-V placement to 93% on Subject-Verb agreement.

4.4 The Acceptability Judgement Task

Figure 6 illustrates the accuracy group scores related to the evaluation of the properties under investigation in the English AJT for each respective group. As mentioned in section 3, participants evaluated the sentences using a binary scale, categorizing them as either "good" or "bad." For the analysis, these scores were treated as a binary variable, with "good" assigned the value 1, representing acceptability, and "bad" assigned the value 0, representing unacceptability. Therefore, in the context of grammatical sentences, the response of 1 indicates a correct judgment, while 0 signifies an incorrect judgment. Conversely, for ungrammatical sentences, a response of 0 denotes a correct judgment, while 1 denotes an incorrect judgment.

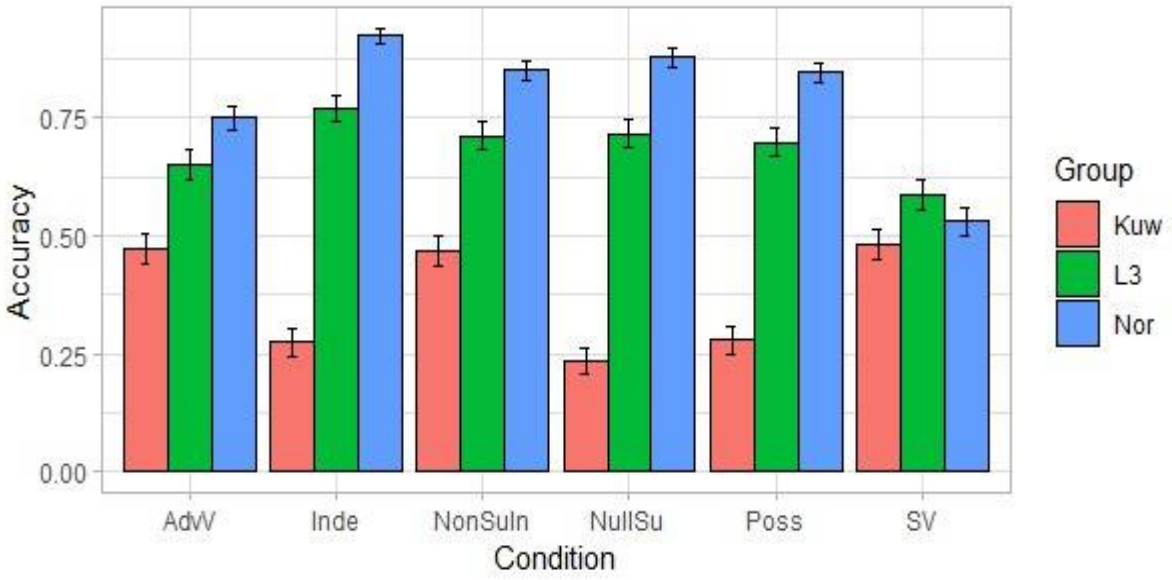

Figure 6. Accuracy rates in the AJT of L3 English

As evident from Fig.6, in absolute accuracy, the Arabic (Kuwait) group always scores lower than the Norwegian and the L3 groups. We therefore suggest that a more appropriate analysis should not be based on absolute accuracy, but on relative accuracy, considering the structural (dis)similarity/facilitation between the previously acquired language(s) and English.[3] Examining relative accuracy enables meticulous scrutiny of performance, allowing observation of improvements or declines in participants' performance and providing the opportunity to compare different groups regardless of their English proficiency levels. We have therefore grouped all conditions where Arabic is similar to English as "(facilitative) CLI-Arabic" conditions (S-V word order in non-subject-initial declaratives, Adv-V word order in subject-initial declaratives, and S-V agreement in declarative statements) and all conditions where Norwegian is similar to English as "(facilitative) CLI-Norwegian" (possessive agreement, indefiniteness, and overt/null subject). Figure 7 depicts the mean accuracy scores on the "Arabic-like" and "Norwegian-like" conditions for each corresponding group.

[3] The concept of relative accuracy was a combination of ideas proposed by Sergey Minor, Natalia Mitrofanova, and Bentolhoda Bahrani.

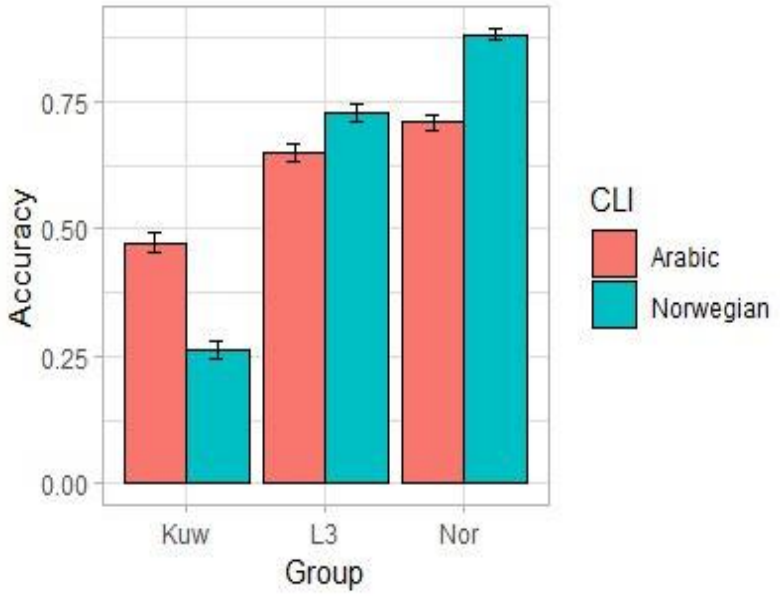

Figure 7. Relative accuracy rates in the AJT of L3 English based on structural (dis)similarity

As evident from Fig.7, the participants from Kuwait scored higher on Arabic-like conditions (where English and Arabic are alike) than on Norwegian-like conditions (where Norwegian and English are alike, but Arabic is different). A reverse pattern is observed for the Norwegian group: higher accuracy on Norwegian-like conditions than Arabic-like conditions. The L3 groups exhibited a comparable performance with respect accuracy on Norwegian-like and Arabic-like conditions, with a slightly higher accuracy on Norwegian-like conditions.

To assess whether the observed differences between Arabic-like vs Norwegian-like conditions were statistically significant, we fit a binomial generalized linear mixed effects model (m2 in the Appendix 8). Within this model, the dependent variable, accuracy, was predicted as an interaction of group (Norwegian, Kuwaiti, L3) and condition (Norwegian-like vs Arabic-like). The English lexical proficiency score was included as covariate (motivated by the difference in lexical proficiency between the groups). Random effects included the participants, the condition, and sentences within condition.

The model revealed significant effects of both the L3 group (ß = 0.76, $p < 0.0001$) and the Arabic control group (ß = -0.91, $p < 0.0001$). Furthermore, two interactions were found to be significant: the interaction between the Arabic control group (GroupKuw) and Norwegian-

like conditions (CLI-Norwegian) (ß = -1.47, $p < 0.0001$), and the interaction between the Norwegian control group (GroupNor) and Norwegian-like conditions (CLI-Norwegian) (ß = 0.84, $p < 0.0001$).

In other words, the results reveal a statistically significant interaction between the Arabic control group and Norwegian-like conditions, characterized by a strong, negative relationship (ß = -1.47, $p < 0.0001$). This indicates a significant deviation in the performance or behavior of the Arabic control group in these conditions, resulting in notably lower outcomes.

Similarly, a statistically significant interaction is observed between the Norwegian control group and Norwegian-like conditions, marked by a substantial, positive relationship (ß = 0.84, $p < 0.0001$). This suggests a significant divergence in the performance or behavior of the Norwegian control group in these conditions, leading to notably higher outcomes compared to other groups or conditions. For a more detailed analysis, including the syntax and the complete model output, please refer to Appendix 8.

In addition, post-hoc pairwise comparisons of conditions within groups (EMMs) were performed. For the Norwegian group, the analysis revealed a significantly higher level of accuracy on Norwegian-like conditions than on Arabic-like conditions ($p <0.0001$). For the Arabic group, the findings revealed a reverse pattern: higher accuracy on the Arabic-like conditions than on Norwegian-like conditions ($p <0.0001$). For the L3 group, the findings indicate no statistically significant difference between the Arabic-like and the Norwegian-like conditions ($p= 0.1143$). Figure 8 illustrates the predicted probabilities of accuracy for the properties under investigation in the English AJT, taking into account CLI, for each group.

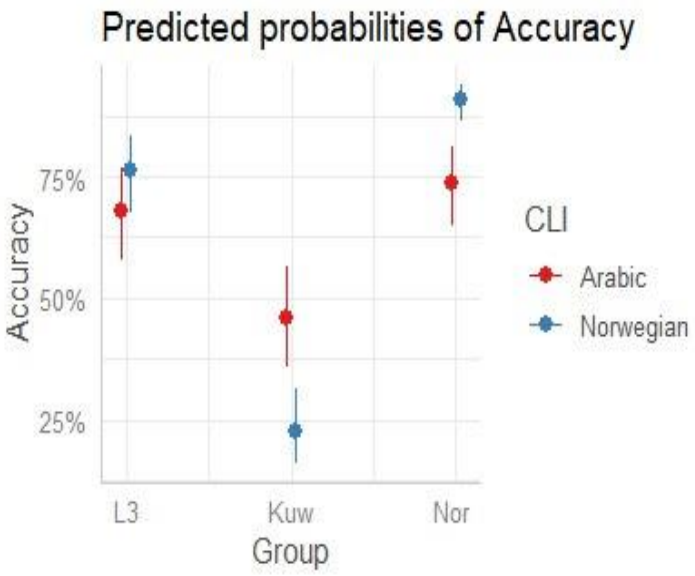

Figure 8. Predicted probabilities of relative accuracy by condition and group across all properties

4.5 Chapter Summary

The primary objective of this chapter was to determine if significant performance differences exist among the different groups, that is, the L3 group, the Norwegian control group, and the Arabic control group, for the AJT (Acceptability Judgment Task). The investigation delved into the role of potential cross-linguistic influence (Arabic-like vs Norwegian-like conditions) on accuracy across various linguistic properties within each group.

Firstly, mini AJT assessments were conducted in the Arabic language for the L3 group to ascertain whether the participants in this group had acquired the linguistic features under investigation. The overall findings confirmed that the L3 group had successfully acquired all the properties under scrutiny (accuracy above 75%).

Overall, the findings from the English AJT indicated that participants in the Norwegian control group exhibited higher accuracy compared to the other two groups, with the Arabic control group achieving the lowest accuracy scores, and the L3 group falling in the middle range across all linguistic properties.

The analysis of a generalized linear mixed-effects model revealed a significant discrepancy in accuracy among the Norwegian control group, the Arabic control group, and the L3 control group. Furthermore, the result of the post-hoc pairwise comparisons of estimated marginal means (EMMs) indicated that the Norwegian group had a higher accuracy rate for the Norwegian-like conditions, whereas the accuracy rated dropped significantly for the Arabic-like conditions.

In a similar vein, the results for the Arabic control group exhibited the opposite pattern. The Arabic control group exhibited a notably higher accuracy rate for the Arabic-like conditions. However, there was a substantial decline in the accuracy rate for the Norwegian-like conditions.

Nevertheless, concerning the L3 Group, while there was a marginal decrease for the Arabic-like conditions, it is worth noting that the disparity in accuracy between the Arabic-like conditions and Norwegian-like conditions did not attain statistical significance.

In the subsequent chapter, the findings of this study will be discussed in more detail, and an elucidation will be provided as to whether the predictions posited in Chapter 3 are substantiated.

5 Discussion

As previously articulated (section 3.1), the current investigation undertook the examination of two primary research inquiries:

1. What are the potential sources of CLI in L3A? Does CLI originate from both previously acquired languages, or is only one language selected as the dominant source of influence?
2. Does cross-linguistic influence impact the acquisition of a third language in a holistic manner or on a property-by-property basis?

In this chapter, responses to these inquiries are provided, grounded in the outcomes and findings elucidated in Chapter 4, in conjunction with the inferences drawn from the two principal models of L3A introduced in Chapter 2.

On the one hand, with regard to the Linguistic Proximity Model (LPM), it was postulated that the source of both facilitative and non-facilitative CLI would involve previously acquired languages, and that CLI would occur on a property-by-property basis (Westergaard et al., 2023). On the other hand, the Typological Primacy Model (TPM) would posit that Norwegian would serve as the exclusive source of both facilitative and non-facilitative cross-linguistic influence (CLI), and CLI would manifest as a wholesale in the early stages of acquisition (Rothman, 2011, 2013, 2015), although it remains unclear from when these stages start and until when they last (Westergaard et al., 2023; Bahrani, 2023).

More precise predictions, based on the Linguistic Proximity Model (LPM), yield the following expectations: In properties where Norwegian and English exhibit congruent patterns, while Arabic diverges, it is anticipated that, all else being equal, the Norwegian control group (Norwegian L2 group) will outperform the Arabic control group (Kuwaiti L2 group) in these properties. Conversely, in cases where Arabic and English patterns align, while Norwegian

diverges, it is anticipated that, all else being equal, the Arabic control group will outperform the Norwegian control group in these properties (for further information, see Westergaard et al., 2023).

For the L3 group, in properties where Norwegian and English exhibit congruent patterns, it is expected that they will perform more accurately or equally (in the case of a ceiling effect) compared to the Arabic control group, which lacks these properties. Conversely, their performance is anticipated to be less accurate or equal (in the case of a ceiling effect) compared to the Norwegian control group. However, when Arabic and English share similar patterns, the LPM expects to see the reverse pattern. If the experiment is timed correctly, the L3 group is expected to typically perform in between the two L2 groups on both types of properties: those where Norwegian and English patterns coincide, and those where Arabic and English patterns align or pattern with the higher-scoring group if the participants have already learned to suppress non-facilitative influence from the language exhibiting a divergent pattern (for further information, see Jensen et al, 2022; Westergaard et al., 2023).

On the contrary, the TPM predicts that in cases where Norwegian and English exhibit similar language properties, but Arabic differs, the L3 group will consistently align with the Norwegian group. In other words, both the Norwegian control group and the L3 group are expected to achieve the highest scores, with no significant difference between them, while the Arabic control group is projected to attain the lowest scores. In contrast, in cases where Arabic and English share the same language properties, but Norwegian differs, the L1-Arabic group is expected to have the highest score, while both the L3 and L1-Norwegian groups will have the lowest score (with no significant difference between the two groups) (for further information, see Rothman, 2011, 2013, 2015).

5.1 The Acceptability Judgement Task

As discussed in the previous chapter, in terms of absolute accuracy, the Norwegian group consistently scored the highest, the Arabic (Kuwaiti) group consistently scored lower, while the L3 group fell in between. In terms of absolute accuracy, these results are not surprising and can be readily interpreted. This aligns with the findings of the English proficiency test, which indicated that the Norwegian control group outperformed both groups and exhibited a significantly higher accuracy rate.

To mitigate the impact of disparities in overall proficiency levels among groups, a common concern in studies where variations in English proficiency exist across different countries, this research introduced an innovative data analysis methodology. To address this challenge, one proposed solution involves a framework couched not in terms of absolute accuracy but in terms of relative accuracy, based on the structural (dis)similarity/facilitation between the previously acquired language(s) and English.

The results from the data align with the predictions made by the Linguistic Proximity Model (LPM) and do not support the results of the Typological Primacy Model (TPM). The Arabic control group (participants from Kuwait) scored higher on Arabic-like conditions (where English and Arabic are alike, and Norwegian is different) than on Norwegian-like conditions (where Norwegian and English are alike, but Arabic is different). A reverse pattern was observed in the Norwegian control group, where a higher accuracy was noted in Norwegian-like conditions compared to Arabic-like conditions. This outcome aligns with the prediction of the LPM model, which posited that the L2 group possessing a property shared by the target language should perform better on this property than on a property distinct from the target language. Conversely, the opposite pattern should be observed for the other L2 group (Westergaard, 2021).

On the other hand, the L3 group exhibited a comparable performance with respect to accuracy on Norwegian-like and Arabic-like conditions, with a slightly higher accuracy on Norwegian-like conditions. The results of the L3 group fall between those of the two bilingual groups, namely the Arabic and Norwegian control groups. This positioning can be attributed to a combination of facilitative and non-facilitative influences from L1 Arabic and L2 Norwegian.

This result is best interpreted in accordance with the predictions of the LPM model, which posited that, under appropriate experimental timing, the L3 group would typically exhibit performance levels situated between those of the two L2 groups for both properties A and B. Property A corresponds to the feature shared between the first L2 control group and the target language, while property B relates to the feature common between the second L2 control group and the target language. Under the model's framework, such results can be interpreted as compelling evidence for the cumulative activation of both previously acquired languages and the ensuing cross-linguistic influence (Westergaard, 2021). According to Westergaard (2021), the linguistic properties of the three languages assume a pivotal role, as they are responsible for the co-activation of structures within the learner's cognitive framework.

However, the TPM model might question the findings by suggesting that the result does not represent the initial stage and that the L3 group could have initially transferred wholesale from Norwegian and then learned the other properties. To address this criticism, it is necessary to divide it into two parts. Firstly, the aspect concerning the initial stage. The TPM model introduces initial stages as the brief period during which learners must develop a foundational familiarity with the L3 before the parser can engage in decision-making processes (Rothman, 2011; 2013; 2015). Yet, the model doesn't explain exactly when these initial stages start and end, leaving their temporal duration ambiguous. This means the concept needs to be explained and refined more because it is still not very clear (Westergaard et al., 2023; Bahrani, 2023).

The second part pertains to the possibility that the learner may have transferred wholesale from Norwegian and subsequently acquired other linguistic properties. Yet in this scenario, explaining the non-facilitative CLI from Norwegian in the L3 group becomes more challenging. Particularly when comparing the results of the L3 group to the control groups (Norwegian and Kuwaiti), where the accuracy of the control groups increases or decreases depending on whether the properties of the L1 match or diverge from L3. However, concerning the L3 groups, they showed a comparable performance in terms of accuracy under Norwegian-like and Arabic-like conditions, with slightly higher accuracy observed under Norwegian-like conditions, which is understandable considering Norwegian's role as a societal language.

In simpler terms, if the L3 group had completely transferred from Norwegian and then acquired the other properties, they should have demonstrated equal accuracy to the Norwegian control group in properties where L1 Norwegian aligns with L3 English and even better accuracy than the Norwegian control group when the properties diverge. In other words, when facilitative CLI is expected, the L3 group's performance should be comparable to that of the Norwegian control group, and when non-facilitative CLI is anticipated, it should surpass the Norwegian control group. This is because the L3 group has already acquired the properties, enabling them to manage non-facilitative CLI from both Arabic and Norwegian. However, the results indicate otherwise. So, this result rules out the argument that the L3 group entirely transferred from Norwegian and then learned the other properties.

Under the interpretation of the LPM model, however, the result can be further clarified and interpreted. According to Westergaard et al. (2023), the LPM model suggests that linguistic and structural proximity plays a significant role, potentially determining the source of CLI. However, the model does not involve direct representational copying; rather, learning primarily occurs through processing (both in comprehension and production; see Westergaard, 2021b). Essentially, when encountering the L3, the parser looks for potentially beneficial structures

from languages already acquired. Should an existing linguistic representation prove suitable for parsing the new input, it will be adopted and gradually integrated into the evolving L3 grammar. Initially, this L3 structure is a fragile representation, which will either be reinforced with additional input and usage, or diminished if subsequent input presents conflicting signals (Westergaard et al., 2023).

The LPM emphasizes the significance of additional factors like the frequency of relevant input, where constructions encountered more frequently attain higher activation levels more rapidly. Furthermore, the LPM underscores also the significance of superficial lexical or phonological resemblance, which is readily accessible to the learner. This resemblance may lead to heightened activation of the morphosyntax of this language, potentially overriding structural morphosyntactic similarities, particularly in the early stages of the acquisition process. In general, while the LPM Model typically predicts that linguistic (or, in early stages, surface typological) proximity plays a pivotal role in determining transfer from previously learned languages, this prediction can be counteracted by additional experiential and linguistic factors. Despite this, the LPM asserts that as the acquisition of L3 unfolds, structural similarity should progressively become a more dominant factor (Westergaard et al., 2023).

Concerning non-facilitative influence, the LPM suggests that it can be attributed to several factors, including (i) a speaker's erroneous assumption that a linguistic characteristic is shared between one of the previously acquired languages and the L3, and (ii) inadequate input. As a result, the co-activation of competing related structures from both previously acquired languages will have a more pronounced effect, resulting in non-facilitative influence (Westergaard et al., 2017). Based on the study's results, it is feasible to infer a more comprehensive interpretation in line with the Linguistic Proximity Model (LPM), and further substantiated by studies that endorse LPM principles (eg. Kolb et al., 2022; Jensen et al., 2021;

Stadt et al.,2016, 2018, 2020; Kulundary & Gabriele, 2012; Wrembel, 2015; Wrembel et al.,2019).

In this context, the findings of the current investigation address both of the proposed research questions as follows:

Regarding RQ1, the current thesis provides evidence that CLI originates from both previously acquired languages in third language acquisition, rather than a single dominant source of influence.

Concerning RQ2, whether CLI occurs holistically or on a property-by-property basis, the findings suggest that the source of transfer is influenced by the structural similarity between the L3 and the L1 and L2 on a property-by-property basis, rather than being driven by a holistic approach like typological proximity between the L3 and the L1/L2.

5.2 Chapter Summary

In this chapter, the findings of the present study were discussed in relation to previous research and predictions from models of third language acquisition (L3A). The results obtained through the AJT method revealed that both Arabic and Norwegian languages, acting as sources of both facilitative and non-facilitative cross-linguistic influence (CLI), had a significant impact on L3 English acquisition. Based on the results obtained from the AJT analysis, it can be suggested that they align most effectively with the predictions outlined by the Linguistic Proximity Model (LPM). Given that the results of the L3 learners fell between the performance levels of the two groups, with the Norwegian control group outperforming both, while the Arabic control group scored the lowest in terms of accuracy, one could argue that these outcomes can be elucidated through the lens of the Linguistic Proximity Model (LPM). This observation also challenges the notion of cross-linguistic influence (CLI) as a wholesale phenomenon.

6 Limitations

The existing study bore several limitations that it is imperative to acknowledge. Firstly, one of the limitations pertained to the challenge of securing an adequate number of participants for all three groups. Consequently, we were unable to establish a predefined threshold for both the English proficiency testing, and the mini AJT (Arabic AJT).

Secondly, while the L3 group had a prerequisite of residing in Norway for at least two years and completing a two-year language preparation program, it is advisable to conduct an additional mini AJT in Norwegian to ensure that the properties under investigation have also been acquired in their Norwegian language. In other words, it is imperative to conduct a more precise assessment of the proficiency of L3 learners in their background languages.

However, it is noteworthy to state that this aspect (the absence of the mini AJT in Norwegian) is not believed to have influenced the outcome of the current study, primarily for two reasons. Firstly, the established criterion for residency in Norway is two years, requiring participants to successfully complete a two-year Norwegian preparation program. In Norway, upon successful completion of the program, individuals are permitted to attend Norwegian school alongside native Norwegian students, and all the participants met this requirement. Secondly, the decision of not including the mini AJT in Norwegian was reinforced by the perception that appending another component would exacerbate task lengthiness, considering participants already perceived the existing task as overly prolonged.

Finally, a subset of the British Picture Vocabulary Scale was chosen and utilized to assess the participants' English proficiency. However, it is advisable to employ an alternative test that can more comprehensively measure their proficiency in grammatical structure. This recommendation stems from the realization that although participants may achieve high scores in this test, it may primarily reflect their strong vocabulary skills in English, rather than their

comprehensive knowledge of grammar. However, this method has been chosen in this study based on the understanding that lexical proficiency has been demonstrated to correlate with syntactic proficiency in numerous studies. Nonetheless, selecting participants based on syntax and subsequently testing them on syntax poses a risk of circularity in the study.

7 Conclusion

The current study examined cross-linguistic influence (CLI) in L3A of English within the context of Arabic-Norwegian speakers in Norway. Two primary research inquiries were formulated concerning the origin and nature of CLI: firstly, whether the source of CLI lies in the L1, L2, or a combination of both, and secondly, whether CLI manifests on a property-by-property basis or as a comprehensive phenomenon. Many previous studies have delved into the realm of L3A, examining the origins and nature of CLI. Nevertheless, the subject of CLI remains a contentious topic in the field of L3A, primarily due to conflicting findings across different studies.

The study employed an acceptability judgment task (AJT) to assess the participants' preferences for six language properties. These properties include possessive agreement, indefiniteness, and null subject, where English and Norwegian exhibit similar patterns. Additionally, English and Arabic display common patterns in subject-verb word order for non-subject-initial declaratives, adverb-verb word order for subject-initial declaratives, and subject-verb agreement in declarative statements.

The AJT results, in terms of absolute accuracy, revealed a general trend where the Norwegian control group outperformed the Arabic control group, and the performance of the L3 group fell between the two groups across linguistic properties. The statistical results, in terms of relative accuracy, which were based on the structural (dis)similarity/facilitation between the previously acquired language(s) and English, yielded the following findings. The Arabic control group (participants from Kuwait) achieved higher scores in Arabic-like conditions (where English and Arabic are similar, and Norwegian is dissimilar) compared to Norwegian-like conditions (where Norwegian and English are similar, but Arabic is dissimilar). In contrast, a reverse pattern emerged in the Norwegian control group, where higher accuracy

was observed in Norwegian-like conditions in comparison to Arabic-like conditions. On the other hand, the L3 groups demonstrated comparable performance in terms of accuracy on both Norwegian-like and Arabic-like conditions, with slightly higher accuracy in Norwegian-like conditions. Regarding the source of CLI the results align with the predictions made by the Linguistic Proximity Model (LPM) and do not support the results of the Typological Primacy Model (TPM).

Concerning the nature of cross-linguistic influence (CLI), the results also suggest that group performance was influenced by syntactic similarities between the L3 and previously acquired languages, which aligns with the property-by-property account of L3 acquisition rather than a holistic CLI approach. In summary, the present study concludes that the results can be interpreted in alignment with the predictions of Linguistic Proximity Model (LPM).

Overall, this research enriches our comprehension of Cross-linguistic Influence (CLI) in the context of L3 acquisition and sheds light on the potential factors influencing the acquisition process.

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Appendices

Appendix 1– Information Letter and Consent Form

Dear participants,

This is an inquiry about participation in a research project which is a part of a master's thesis the main purpose of which is to understand how the previously acquired languages affect the acquisition of L3/L2 English. In this letter, we will give you information about the purpose of the project and what your participation will involve.

Purpose of the project

In this research project we want to investigate how children with different native languages acquire particular structures in English language. The aim of the project is to understand how previously acquired language interact and influence the process of English language learning.

Who is responsible for the research project?

UiT The Arctic University of Norway is the institution responsible for the project.

Why are you being asked to participate?

You are being asked to participate because your children speak Norwegian or Arabic as their first language, and we are interested in studying how this language affects the acquisition of English.

What does participation involve for you?

The participants will be asked to complete a test that consists of 3 modules: English / Arabic Proficiency Test, Acceptability Judgement Task and Background Questionnaire. In the Acceptability Judgement Test the participants need to evaluate the list of sentences and decide whether they sound 'good' or 'bad' in in English language. The participants will be also asked

to complete a questionnaire which aim is to identify the languages spoken in the family. It will take approx. 30-45 minutes to complete the full test.

Participation is voluntary

Participation in the project is voluntary. If you chose to participate, you can withdraw your consent at any time without giving a reason. All information about you will be made anonymous. There will be no negative consequences for you if you chose not to participate or later decide to withdraw.

Your personal privacy – how we will store and use your personal data

We will only use personal data for the purposes specified in this information letter. We will process your personal data confidentially and in accordance with data protection legislation (the General Data Protection Regulation and Personal Data Act).

The data collected will be stored only on the student's computer and will be shared with the academic supervisor only. Directly identifiable participants' data will be removed and replaced with a code.

What will happen to your personal data at the end of the research project?

The project is scheduled to end in November 2023. As mentioned above, names of participants will be anonymised so the only personal data available will be participants' age and language(s) spoken. These data will be kept as part of the data file as it is indispensable for studies of language use. The data will be archived for further research.

Your rights

So long as you can be identified in the collected data, you have the right to:

- access the personal data that is being processed about you
- request that your personal data is deleted
- request that incorrect personal data about you is corrected/rectified
- receive a copy of your personal data (data portability), and

- send a complaint to the Data Protection Officer or The Norwegian Data Protection Authority regarding the processing of your personal data

What gives us the right to process your personal data?

We will process your personal data based on your consent.

Based on an agreement with UiT The Arctic University of Norway, Sikt – Data Protection Services has assessed that the processing of personal data in this project is in accordance with data protection legislation.

Where can I find out more?

If you have questions about the project, or want to exercise your rights, contact:

- UiT The Arctic University of Norway via

  Natalia Mitrofanova (supervisor), by email: natalia.mitrofanova@uit.no or by telephone: + 47 91 16 27 74

  Marit Westergaard (supervisor), by email: marit.westergaard@uit.no or by telephone: +4777644256

  Bentolhoda Bahrani (student), by email: bba066@uit.no

- UiT The Arctic University of Norway via

  our Data Protection Officer: Joakim Bakkevold at personvernombud@uit.no

- Data Protection Services, by email: (personverntjenester@sikt.no) or by telephone: +47 53 21 15 00.

Yours sincerely,

Natalia Mitrofanova	Marit Westergaard	Bentolhoda Bahrani
Project Leader	Project Leader	Student
(Researcher/ supervisor)	(Researcher/ supervisor)	

Consent form

I have received and understood information about the project “Crosslinguistic influence in L3 acquisition of English by Arabic-Norwegian bilinguals” and have been given the opportunity to ask questions. I give consent:

- ☐ to take part in the experiment by completing the following modules:

  Acceptability Judgement Task (English / Arabic);

  English Proficiency Test;

  Language background questionnaire.

- ☐ for my/ my child’s data (the results of Acceptability Judgement test, English proficiency score, age, and language background) to be stored after the end of the project for follow-up studies,

I give consent for my personal data to be processed until the end date of the project, approx. 1 November, 2023.

(Signed by participant, date)

Appendix 2– English Proficiency Test

Instructions: On the screen you will see four images. Only one of them matches the word you hear. Circle the correct answer. Let's try.

	Word	Pictures			
1	Duck	1	2	3	4
2	Mouth	1	2	3	4
3	Jumping	1	2	3	4
4	Money	1	2	3	4
5	Toe	1	2	3	4
6	Belt	1	2	3	4
7	Empty	1	2	3	4
8	Fence	1	2	3	4
9	Happy	1	2	3	4
10	Dressing	1	2	3	4
11	Mountain	1	2	3	4
12	Branch	1	2	3	4
13	Sharing	1	2	3	4
14	Diving	1	2	3	4
15	Target	1	2	3	4
16	Delivering	1	2	3	4
17	Terrified	1	2	3	4
18	Island	1	2	3	4
19	Valley	1	2	3	4
20	Luggage	1	2	3	4

Appendix 3– Background Questionnaire

Instructions: Please answer the following questions:

How old are you? _____

I am ☐ Boy ☐ Girl

When have you started learning English? _____

What language do you use speaking to your mother? _____

What language do you use speaking to your father? _____

What language do you use speaking to your friends? _____

how long have you been living in Norway? _____

Appendix 4– List of Test Items for English AJT

Test Item	Grammaticality	Syntactic Condition
1. Fatima often cooks rice.	Grammatical	Adv-V
2. Yesterday, Fatima cooked rice for dinner.	Grammatical	SV- in-Non-Su-In
3. Nura knows this girl.	Grammatical	SV
4. Ali had a brother.	Grammatical	Indefiniteness
5. Ali broke Ahmed's bike.	Grammatical	Possessive
6. Fatam ate ice cream before entered the class.	Ungrammatical	NullSu
7. Nura watches often the match.	Ungrammatical	Adv-V
8. Last night, Fatima slept on the chair.	Grammatical	SV- in-Non-Su-In
9. Nura likes this cat.	Grammatical	SV
10. Ahmed had sister.	Ungrammatical	Indefiniteness
11. Yusuf bought Ali glasses.	Ungrammatical	Possessive
12. Mohammed greeted the teacher when entered the school.	Ungrammatical	Null Subject
13. Layla always cleans the house.	Grammatical	Adv-V
14. Last week, talked Ali with Ahmed.	Ungrammatical	SV- in-Non-Su-In
15. Yusuf love this school.	Ungrammatical	SV
16. Nura lost a book	Grammatical	Indefiniteness
17. Fatima washed Ali's shirt.	Grammatical	Possessive
18. Ali took off his shoes when he entered the room.	Grammatical	Null Subject
19. Nura brushes always her teeth.	Ungrammatical	Adv-V
20. Last Monday, Amir played tennis.	Grammatical	SV- in-Non-Su-In
21. Yusuf dislikes this music.	Grammatical	SV
22. Nura lost key.	Ungrammatical	Indefiniteness
23. Sara cleaned Nura's bag.	Grammatical	Possessive
24. Fatima was very hungry, when she arrived.	Grammatical	Null Subject
25. Yusuf eats usually Pizza.	Ungrammatical	Adv-V
26. Last month, went Nura and Ali out to eat.	Ungrammatical	SV- in-Non-Su-In
27. Ali and Amir likes this cake.	Ungrammatical	SV
28. Sara saw a dog.	Grammatical	Indefiniteness
29. Ali lost Fatima's doll.	Grammatical	Possessive
30. Ahmad felt tired, when returned home.	Ungrammatical	Null Subject

31. Ali usually drinks juice.	Grammatical	Adv-V
32. Yesterday, Ali won the game.	Grammatical	SV- in-Non-Su-In
33. Yusuf and Nura like this shop.	Grammatical	SV
34. Sara saw boy.	Ungrammatical	Indefiniteness
35. Yusuf invited Mohammed friend.	Ungrammatical	Possessive
36. Sara was at the party, when she started singing.	Grammatical	Null Subject
37. Fatima reads sometimes books.	Ungrammatical	Adv-V
38. Last Saturday, went Nura swimming.	Ungrammatical	SV- in-Non-Su-In
39. Sara and Layla love this house.	Grammatical	SV
40. Yusuf repaired a chair.	Grammatical	Indefiniteness
41. Nura cut Fatima hair.	Ungrammatical	Possessive
42. Mohammed studied hard, when was young.	Ungrammatical	Null Subject
43. Mohammed sometimes rides the bike.	Grammatical	Adv-V
44. Last year, travelled Yusuf to Turkey	Ungrammatical	SV- in-Non-Su-In
45. Fatima and Nura needs these books.	Ungrammatical	SV
46. Ali repaired bike.	Ungrammatical	Indefiniteness
47. Fatima stole Nura pen.	Ungrammatical	Possessive
48. Noura liked skiing, when she was 7 years old.	Grammatical	Null Subject

Appendix 5 – List of Test Items for Arabic Mini AJT

Test Item	Grammaticality	Syntactic Condition
1. نورا غالبا بتشوف المباراة	Grammatical	Adv-V
2. امبارح نامت فاطمه على الكر سي	Ungrammatical	SV- in-Non-Su-In
3. نورا بتحب هل قطه	Grammatical	SV
4. فاطمه و نورا بيحتاجو هل كتب	Grammatical	SV
5. علي شلح بوطو لما دخل الغرفه	Grammatical	Null Subject
6. ليلى بتنظف دائما البيت	Ungrammatical	Adv-V
7. الاسبوع الماضي علي حكى مع احمد	Grammatical	SV- in-Non-Su-In
8. نورا بيعرفوا هل بنت	Ungrammatical	SV
9. يوسف و علي بيعرفو القصه	Grammatical	SV
10. محمد سلم على الاستاذ لما دخل المدرسه	Grammatical	Null Subject
11. نورا دائما بتفرشي اسنانها	Grammatical	Adv-V
12. اتنين الماضي امير لعب تنس	Grammatical	SV- in-Non-Su-In
13. يوسف بيحبو هل مدرسه	Ungrammatical	SV
14. علي و احمد بيكره هل طاقيه	Ungrammatical	SV
15. فاطمه اكلت بوظه قبل ما هي تفوت الصف	Ungrammatical	Null Subject
16. فاطمه بتقرا احيانا كتب	Ungrammatical	SV
17. الشهر الماضي راحوا نورا وعلي برا لياكلو	Ungrammatical	SV- in-Non-Su-In
18. يوسف بيحب هل موسيقى	Grammatical	SV
19. فاطمه و نورا بتفهم هل لغه	Ungrammatical	SV
20. سارا كانت بالحفله لما هي بلشت تغني	Ungrammatical	Null Subject

Appendix 6– Statistics on background data

6.1 Interaction between gender and accuracy: Not significant

Logistic regression

Family: binomial (logit)

Formula: Accuracy ~ 1 + gender + (1 | PID) + (1 | Sentences)

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	0.69005	0.23356	2.955	0.00313 **
gendergirl	-0.05095	0.26076	-0.195	0.84509

6.2 Correlation between age and accuracy: significant correlation

Kendall's rank correlation tau

data: AgeTest and Accuracy

z = 3.5408, p-value = 0.0003988

Sample estimates: tau = 0.04752643

6.3 Correlation between age of onset and accuracy: Not significant correlation

Kendall's rank correlation tau

data: Accuracy and AgeLEnglish

z = -0.99308, p-value = 0.3207

Sample estimates: tau = -0.01335137

Appendix 7– Statistics on English proficiency test data

7.1 Summary of the regression model for the English proficiency test

```
Call:

lm(formula = EnglPro ~ Group, data = allAJT_prof)

Residuals:
     Min       1Q   Median       3Q      Max
-11.1724  -0.5135   0.6452   1.6452   3.8276

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  16.1724     0.5892  27.446  < 2e-16 ***
GroupKuw      0.1824     0.8198   0.223  0.82438
GroupNor      2.3411     0.7870   2.975  0.00373 **
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 3.173 on 94 degrees of freedom
Multiple R-squared:  0.1092,   Adjusted R-squared:  0.09026
F-statistic: 5.762 on 2 and 94 DF,  p-value: 0.004359
```

7.2 Regression tables of English proficiency test

	EnglPro		
Predictors	*Estimates*	*CI*	*p*
(Intercept)	16.17	15.00 – 17.34	**<0.001**
Group [Kuw]	0.18	-1.45 – 1.81	0.824
GroupNor	2.34	0.78 – 3.90	**0.004**
Observations	97		
R^2 / R^2 adjusted	0.109 / 0.090		

7.3 Post-hoc pairwise comparison

```
$emmeans

 Group emmean    SE df lower.CL upper.CL
 L3      16.2 0.589 94     15.0     17.3
 Kuw     16.4 0.570 94     15.2     17.5
 Nor     18.5 0.522 94     17.5     19.5

Confidence level used: 0.95

$contrasts

 contrast   estimate    SE df t.ratio p.value
 L3 - Kuw     -0.182 0.820 94  -0.223  0.9731
 L3 - Nor     -2.341 0.787 94  -2.975  0.0103
 Kuw - Nor    -2.159 0.773 94  -2.794  0.0172


P value adjustment: tukey method for comparing a family of 3 estimates
```

Appendix 8–Statistics on the acceptability judgement task (English)

8.1 Summary of the regression model for the AJT

```
Generalized linear mixed model fit by maximum likelihood (Laplace
Approximation) [glmerMod]
 Family: binomial  ( logit )
Formula:
Accuracy ~ Group * CLI + EnglPro_C + (1 | PID) + (1 | SyntCondition) +
    (1 | Sentences:SyntCondition)
   Data: allAJT
Control: glmerControl(optimizer = "Nelder_Mead")

     AIC      BIC   logLik deviance df.resid
  4764.4   4828.7  -2372.2   4744.4     4598

Scaled residuals:
    Min      1Q  Median      3Q     Max
-4.7625 -0.6172  0.3191  0.5591  6.5807

Random effects:
 Groups                   Name        Variance  Std.Dev.
 PID                      (Intercept) 4.498e-01 0.6706787
 Sentences:SyntCondition (Intercept) 6.188e-01 0.7866521
 SyntCondition            (Intercept) 1.349e-07 0.0003672
Number of obs: 4608, groups:
PID, 97; Sentences:SyntCondition, 48; SyntCondition, 6

Fixed effects:
                       Estimate Std. Error z value Pr(>|z|)
(Intercept)             0.76090    0.22328   3.408 0.000655 ***
GroupKuw               -0.91965    0.21189  -4.340 1.42e-05 ***
GroupNor                0.27425    0.21497   1.276 0.202051
CLINorwegian            0.41147    0.26058   1.579 0.114318
EnglPro_C               0.03726    0.02442   1.525 0.127137
GroupKuw:CLINorwegian  -1.47161    0.17794  -8.270  < 2e-16 ***
GroupNor :CLINorwegian  0.84522    0.18989   4.451 8.54e-06 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Correlation of Fixed Effects:
            (Intr) GropKw GropNr CLINrw EngP_C GK:CLI
GroupKuw    -0.499
GroupNor    -0.516  0.519
CLINorwegin -0.577  0.141  0.137
EnglPro_C    0.109 -0.028 -0.264  0.004
GrpKw:CLINr  0.195 -0.384 -0.204 -0.354  0.004
GrpNr:CLINr  0.184 -0.193 -0.359 -0.325  0.005  0.468
```

8.2 Regression tables of the AJT

	Accuracy		
Predictors	*Log-Odds*	*CI*	*p*
(Intercept)	0.76	0.32 – 1.20	**0.001**
Group [Kuw]	-0.92	-1.33 – -0.50	**<0.001**
GroupNor	0.27	-0.15 – 0.70	0.202
CLI [Norwegian]	0.41	-0.10 – 0.92	0.114
EnglPro C	0.04	-0.01 – 0.09	0.127
Group [Kuw] × CLI [Norwegian]	-1.47	-1.82 – -1.12	**<0.001**
Group [Nor] × CLI [Norwegian]	0.85	0.47 – 1.22	**<0.001**
Random Effects			
σ^2	3.29		
$\tau_{00\ PID}$	0.45		
$\tau_{00\ Sentences:SyntCondition}$	0.62		
$\tau_{00\ SyntCondition}$	0.00		
ICC	0.25		
N_{PID}	97		
$N_{SyntCondition}$	6		
$N_{Sentences}$	48		
Observations	4608		
Marginal R^2 / Conditional R^2	0.232 / 0.420		

8.3 Post-hoc pairwise comparison

```
$emmeans

Group = L3:
 CLI       emmean    SE  df asymp.LCL asymp.UCL
 Arabic     0.761 0.223 Inf     0.323     1.199
 Norwegian  1.172 0.225 Inf     0.731     1.613

Group = Kuw:
 CLI       emmean    SE  df asymp.LCL asymp.UCL
 Arabic    -0.159 0.218 Inf    -0.586     0.269
 Norwegian -1.219 0.222 Inf    -1.654    -0.784

Group = Nor :
 CLI       emmean    SE  df asymp.LCL asymp.UCL
 Arabic     1.035 0.216 Inf     0.612     1.458
 Norwegian  2.292 0.230 Inf     1.841     2.743

Results are given on the logit (not the response) scale.
Confidence level used: 0.95

$contrasts
Group = L3:
 contrast           estimate    SE  df z.ratio p.value
 Arabic - Norwegian   -0.411 0.261 Inf  -1.579  0.1143

Group = Kuw:
 contrast           estimate    SE  df z.ratio p.value
 Arabic - Norwegian    1.060 0.258 Inf   4.104  <.0001

Group = Nor :
 contrast           estimate    SE  df z.ratio p.value
 Arabic - Norwegian   -1.257 0.268 Inf  -4.689  <.0001
```