

## CROSS-LINGUISTIC EFFECTS OF ARABIC EXPERIENCE ON L3 LEARNING AND EXPLICIT KNOWLEDGE

Katherine J. Riestenberg, Hana S. Jan, Luciane Maimone, Cristina Sanz

*Georgetown University*

*This study investigates the roles of cross-linguistic influence (CLI) and explicit knowledge in explaining the posited advantage of previous language experience in L3 learning, as well as the potential role of amount of L2 exposure in modulating these relationships. We examine a unique L2-L3 language pairing, Arabic and Latin respectively, among native speakers of English. Like Sanz, Park, and Lado (2015), we employ Bates and MacWhinney's (1989) Competition Model (CM), a functional-typological framework that allows for the examination of learners' usage of language-specific cues in sentence processing. We build on this previous work by additionally investigating (1) whether there is a relationship between amount of classroom experience studying L2 Arabic and reliance on Arabic cues when learning L3 Latin, and (2) whether accuracy in L3 Latin is correlated with explicit knowledge of Latin cues and whether learners with more L2 Arabic experience are more likely to develop such explicit knowledge. Thirty-five native English-speaking learners of Arabic at three different levels completed computer-based training and testing tasks dealing with thematic role assignment in Latin following a pretest, posttest, delayed posttest design as well as a test of explicit knowledge of Latin cues. We show that learners in the early stages of L3 development start with an L1-based strategy (SVO word order), replicating the findings in Sanz, Park, and Lado (2015). We add to these results evidence that with more exposure participants showed increased accuracy on items requiring the use of Latin cues present in their L2 Arabic but not in their L1 English (i.e., subject-verb agreement and case). Importantly, there was emergent evidence that this increase in accuracy was mitigated by amount of Arabic experience. In addition, L3 explicit knowledge was a significant predictor of Latin performance and was also related to level of L2 experience. These results suggest that amount of L2 exposure may mediate CLI in L3 acquisition, and add to a growing body of evidence showing an important role for explicit knowledge in adult language learning, at least among classroom learners.*

**Keywords:** cross-linguistic influence; third language acquisition; morphosyntactic transfer; Competition Model; agency assignment; explicit knowledge; exposure

## INTRODUCTION

A number of empirical studies published over the last few decades have generated evidence that previous experience with more than one language provides an advantage when learning additional languages (e.g., Cenoz & Valencia, 1994; Hernandez, Sierra, & Bates, 2000; Sanz, 2000, 2007; Thomas, 1988; see Cenoz 2003, 2013 for overviews). In this article, we follow previous research in employing the term “L3” to refer to any additional language beyond one’s native language(s) and a later acquired second language (Hammarberg, 2010; Ecke, 2015). We thus refer to this posited advantage for experienced language learners as the “L3 advantage.”<sup>1</sup> While a range of empirical work shows support for the L3 advantage, the question of what precisely it is about previous language experience that contributes to this advantage remains open. One possible answer is that learners employ linguistic knowledge from their previous languages when developing the L3. Such positive transfer effects from learners’ first languages are well documented in SLA (Weinreich, 1953), but in L3 acquisition, cross-linguistic influence (CLI) becomes more complex, with both the L1 and L2 as potential sources of transfer to the L3. Results of previous studies investigating CLI in L3 acquisition have been mixed (see Sanz, Park, & Lado, 2015 for an overview), and there is thus far no consensus as to whether learners employ linguistic knowledge from their L2 when learning an L3. As a contribution to this debate, we hypothesize in the current study that if CLI from an L2 to an L3 is indeed occurring, this effect should be mediated by the learners’ amount of experience in the L2.

A second and complementary explanation for the posited L3 advantage is that learners with previous language experience have a greater level of metalinguistic, “explicit” knowledge and are able to apply this knowledge to the new learning task (Jessner, 1999, 2006; Thomas, 1988). A number of recent studies have shown that explicit knowledge of the L2 correlates with higher accuracy on performance tasks in that language (Martin & N. Ellis, 2012; Roehr, 2005, 2008; Gutierrez, 2013; R. Ellis, 2005, 2006), and research also suggests that bilinguals consistently display a higher level of explicit knowledge about language than do monolinguals (Bialystok, 1986, 1987, 1991; Diaz, 1985; Galambos & Goldin-Meadow, 1990; Yelland, Pollard, & Mercury, 1993; Ricciardelli, 1992a, 1992b; Sanz, 2000). It has been proposed that this difference is one of the contributors to the L3 advantage (e.g., Bialystok, 2007; Cenoz, 2013). However, the role of explicit knowledge in L3 learning remains unclear, as few studies have addressed this question directly.

The current study adopts the framework of the Competition Model (CM) (Bates & MacWhinney, 1989), a functional-typological approach to language processing and acquisition in which the strength of various morphosyntactic cues in linguistic input probabilistically determines the mapping between form and function. The advantage of this approach for investigating CLI is that it views language representation as fluid, allowing for natural explanations of first, second, and additional language development. Sanz, Park, and Lado (2015) were the first to successfully rely on the CM framework as an alternative to the Universal Grammar paradigm to investigate CLI in L3 acquisition. The present study builds on this previous work by investigating the roles of CLI and explicit knowledge in explaining the posited L3 advantage, and the potential mediation of these factors by L2 experience.

## BACKGROUND AND MOTIVATION

### *Cross-linguistic Influence, L3 Acquisition, and the Competition Model*

The nature of CLI in L3 acquisition has been the subject of much debate over the last two decades, mostly from within a generative framework (Bardel & Falk, 2007; Flynn, Foley, & Vinnitskaya, 2004; García Mayo & Rothman, 2012; Leung, 2006; Rothman & Cabrelli Amaro, 2010; Rothman, Iverson, & Judy, 2011; see Cenoz, 2001 for a volume of papers that adopted an alternative psycholinguistic perspective, and Cabrelli Amaro, Flynn, & Rothman, 2012 and García Mayo, 2012 for reviews of work from multiple perspectives). As Rothman (2010) notes, the central question of this line of research has been: “Is the only possibility in L3 transfer from the L1 (Leung, 2006), or is the chronologically last system acquired (the L2) the main source (Bardel & Falk, 2007), or can transfer come from either system (Flynn, Foley, & Vinnitskaya, 2004)?” (p. 110).

A growing body of work on CLI in L3 acquisition favors an answer to this question that emphasizes typological similarity among a learner’s languages and deemphasizes acquisition order. Odlin and Jarvis (2004) conducted a study of written L3 English narratives by adolescent native speakers of Swedish who began learning Finnish in elementary school (in their 3<sup>rd</sup> or 5<sup>th</sup> year of English) and native speakers of Finnish who began learning Swedish in elementary school (in their 3<sup>rd</sup>, 5<sup>th</sup>, or 7<sup>th</sup> year of English). The targets of their investigation were the English-Swedish cognates *instead/i stället* and *for/för* (which do not resemble the Finnish equivalents). They examined the frequency of occurrence and discourse properties of these words in each narrative and compared them to narratives by different groups of participants in their respective L1s (Swedish, Finnish, or English). They argued that native speakers of Swedish (L2 Finnish) and native speakers of Finnish (L2 Swedish) both relied more on Swedish in their use of *instead* and *for* (see also Ringbom, 1987, 2001).

Rothman (2010) used a semantic interpretation reading task and a context-based collocation writing task to examine adjective use between L1 Italian/L2 English learners of L3 Spanish and L1 English/L2 Spanish learners of L3 Brazilian Portuguese. Using a cloze test and a general grammar test, Rothman determined that all participants were at the advanced or near-native level in their L2 and at the intermediate level in their L3. He found that learners in both language groups demonstrated target knowledge of subtle adjectival semantic nuances obtained via noun-raising, which English lacks and the other languages share. Furthermore, ANOVAs uncovered no statistically significant group differences on either task. Rothman suggested that this knowledge was transferred to the L3 from Italian (L1) and Spanish (L2) respectively, and therefore argued that all previous languages can be a possible source of transfer for additional language learning. To further explain these findings, he proposed the Typological Proximity Model, which claims that actual and/or perceived typological similarity best predicts whether or not transfer from previously learned languages occurs in L3 learning, with the order in which the languages were acquired having little or no effect (Rothman, 2010; 2015).

In a later paper, Rothman (2015) elaborated on the Typological Proximity Model and raised a set of specific questions that follow from the model’s claims. In particular, he pondered whether L2s that are “not fully developed at the onset of L3/Ln exposure...transfer in the same way” as what he calls “end-state” L2s (p. 188). He proposes that the answer is a “decisive yes” (p. 188), provided that there is indeed sufficient typological similarity in the L2 and the L3 of the feature in question (according to criteria laid out in Rothman, 2015), though he largely leaves this question for future research.

To contribute to the discussion regarding CLI in L3 learning, and as a departure from the

bulk of previous L3 research which has relied on Universal Grammar models, Sanz, Park, and Lado (2015) conducted a study of L3 learning using Bates and MacWhinney's (1987, 1989) Competition Model (CM). The CM is a functional-typological approach to language processing and acquisition in which the strength of various morphosyntactic cues in linguistic input probabilistically determines the mapping between form and function. Within the CM, a cue's strength is determined by its "validity," that is, its frequency and reliability of form-meaning mapping. The CM assumes that additional language learning must involve either the cooperation or competition among surface cues from the learners' language repertoire. Cooperation will result in positive transfer and facilitate learning while competition is posited to inhibit the learning process.

Sanz, Park, and Lado (2015) applied the CM framework to study the role of the L1 (English) and L2 (Japanese or Spanish) in the *ab-initio* development of L3 Latin. They used a pretest, posttest, delayed posttest design, with a training session in Latin before the posttest consisting only of yes/no feedback. Learners were required to determine the thematic roles of nouns in Latin transitive sentences. (A more detailed explanation can be found in the section on Methods and Procedure in the current paper, as the same tasks were employed for our study.) Two sets of hierarchical linear model analyses (HLM) were used, using overall accuracy and accuracy by sentence type. The HLM analysis of overall accuracy showed that there was no significant Time x Group interaction, suggesting that the L2 Japanese and Spanish groups did not differ in terms of rate of growth across the three time periods. The HLM analysis of accuracy by Sentence Type showed that (1) at the unconditional level, significant variation within individuals was only present with AGR and CASE items, indicating that participants' accuracy on SVO items did not change significantly over time and that (2) at the second level condition, a model of AGR and CASE revealed no significant interaction between Time and Group, suggesting that the growth trajectories of AGR and CASE items for the Spanish and Japanese groups were similar. Sanz et al. explained that the lack of variability could be used as evidence that L2 experience did not have a significant effect on L3 performance, whereas L1 did, and that their participants, learning Latin as an L3, are at a point that resembles the early L2 learning process, where the L1's engrained system is the main source of transfer in L2 learning. They argued that if L2 played a role in L3 learning, the two groups would have shown varying reliance on processing cues when learning Latin. They thus reported that three to five semesters of classroom L2 learning was not sufficient to show emerging reliance on L2 patterns, despite typological similarities between the L2s and L3. However, their study left open the question of whether more L2 experience would yield an effect on L3 development.

The present study picks up where Sanz, Park, and Lado (2015) ends. Like theirs, our study adopts the CM framework but chooses a previously uninvestigated language "triplet" (L1 English, L2 Arabic, and L3 Latin). This particular configuration allows us to make a distinction between the dominant cue for assigning thematic roles in learners' L1 (English), which is SVO word order (McDonald, 1987), and the dominant cues for assigning thematic roles in learners' L2 (Arabic), which are subject-verb agreement and case marking (Taman, 1993) (see Table 1). Of these three cues, case marking is the most "valid" in Latin, according to Bates and MacWhinney's (1989) definition, in that it consistently, uniquely, and reliably maps onto the function of thematic agent/patient roles. Without a grasp of the Latin case system, one cannot reliably interpret the meaning of a Latin sentence. Subject-verb agreement is the second most valid cue, but, because it relies on number agreement only, it is not reliable when the subject and the object of a sentence share the same singular or plural status. Latin word order is highly

flexible and therefore word order is seldom considered to be a valid cue for assigning thematic roles. We suspect that learners with less exposure to Arabic may rely heavily on the English cue of word order throughout their performance on the Latin tests, thereby performing poorly on items requiring the use of subject-verb agreement and case rules. However, if Rothman's (2010; 2015) Typological Primacy Model holds, learners with higher levels of Arabic experience should be able to make use of subject-verb agreement and case cues in Latin.

Table 1. Agency assignment cue hierarchies of English, Arabic, and Latin

L1 English	SVO Word Order > Subject-Verb Agreement, Animacy	McDonald (1987)
L2 Arabic	Subject-Verb Agreement > Case Marking > Animacy	Taman (1993)
L3 Latin	Case Marking > Subject-Verb Agreement > SOV (flexible) Word Order	Sanz, Park, and Lado (2015)

### ***Explicit Knowledge in (Additional) Language Learning***

Why should we expect learners with greater L2 experience to perform better in the initial stages of learning an L3? As mentioned in the previous section, some researchers have suggested that more experienced language learners are better able to reflect on language and to manipulate it (Jessner, 1999, 2006; Thomas, 1988). This ability has been extensively investigated in SLA using the construct of "explicit knowledge." R. Ellis (2004) defines explicit knowledge as the type of knowledge about language that is *conscious, declarative, verbalizable, accessible, and learnable*. This definition is adopted for the current study. Most modern scholars in the field believe that development of explicit knowledge is beneficial for SLA (although there is significant disagreement about why this is true from a cognitive perspective (see e.g., DeKeyser, 1997; Hulstijn, 2002; R. Ellis, 2004, 2005, 2006; N.C. Ellis, 2005, 2006). A number of recent studies have shown that explicit knowledge of an L2 correlates with higher accuracy on performance tasks in that language (Martin & N. Ellis, 2012; Roehr, 2005, 2008; Gutierrez, 2013; R. Ellis, 2005, 2006).

Research also suggests that bilinguals consistently display higher levels of explicit knowledge about language than do monolinguals (Bialystok, 1986, 1987, 1991; Diaz, 1985; Galambos & Goldin-Meadow, 1990; Yelland, Pollard, and Mercury, 1993; Ricciardelli, 1992a, 1992b; Sanz, 2000), and it has been proposed that this difference contributes to an advantage in additional language learning (e.g., Bialystok, 2007; Cenoz, 2013). However, the role of explicit knowledge in L3 learning remains unclear, as very few studies have addressed this question directly. One exception is work by Jessner (1999; 2006), who used think-aloud protocols with bilingual Italian/German learners of English to show that metalinguistic processes were at play when performing in a third language and argued for teaching strategies that increase metalinguistic awareness. A more recent study by Grey, Williams, and Rebuschat (2014) used an incidental exposure paradigm to investigate the acquisition of word order and case rules in a semi-artificial language modeled after Japanese among L2 Spanish learners with English as an L1. They found that most learners were able to learn the Japanese word order rules after 20 minutes of incidental exposure but that fewer learners developed an awareness of the Japanese

case system. Furthermore, 68% of their participants were able to state the correct Japanese word order rule, and 35% to 38% of learners were able to state a correct case-marking rule. This provides evidence that explicit rule knowledge can be developed even when exposure to an L3 is incidental. However, subsequent analyses revealed an additional interesting finding. Such rule knowledge was not crucial for accurate performance on items testing word order but was important for accuracy on items requiring application of a case rule. These results suggest an advantage for learners with explicit knowledge of morphosyntactic rules in an L3, and they also indicate that complex rule systems such as case marking paradigms may be more difficult to learn than other types of sentence processing cues. However, this study does not address any possible effects of L2 typology or L2 experience. Clearly, more research looking directly at explicit knowledge in L3 learning is needed and has been called for by researchers such as Rothman (2011) and Sanz (2013). The current study takes up this call by employing a measurement of L3 explicit knowledge alongside L3 performance tasks.

### ***Interim Summary and Research Questions***

This study follows Sanz, Park, and Lado (2015) in using the Competition Model to investigate CLI in early stages of learning Latin as an L3. We build on this previous work by additionally investigating (1) whether there is a relationship between amount of classroom experience studying L2 Arabic and reliance on L2 Arabic cues when learning L3 Latin, and (2) whether accuracy in L3 Latin is correlated with explicit knowledge of Latin cues and whether learners with more L2 Arabic experience are more likely to develop such explicit knowledge. Based on previous literature, we made the following predictions:

1. *Learners with different levels of Arabic classroom experience (1-2, 3-5, and 6+ semesters respectively) will differ with regards to reliance on the L2 cue hierarchy when determining thematic roles in L3 Latin sentences.* Specifically, we expected the three groups to show no differences at pretest as they would all initially rely on the L1 English cue of word order. As predicted by Rothman's (2010; 2015) Typological Primacy Model, we hypothesized that after exposure to L3 input, learners with the most Arabic experience would exhibit the most reliance on L2 cues and therefore perform better on the Latin tests overall and on items requiring the use of subject-verb agreement or case in particular.

2. *Learners with different levels of classroom Arabic experience (1-2, 3-5, and 6+ semesters respectively) will differ in the degree of development of explicit knowledge of the L3, and higher levels of explicit knowledge will positively correlate with performance in the L3 (as has been shown for L2 learning).* A number of recent studies have shown that explicit knowledge of an L2 correlates with higher accuracy on performance tasks in that language (Martin & N. Ellis, 2012; Roehr, 2005, 2008; Gutierrez, 2013; R. Ellis, 2005, 2006), and one recent study by Grey, Williams, and Rebuschat (2014) showed such a relationship for L3 acquisition as well. We therefore expected to see a positive correlation between explicit test scores and posttest and delayed posttest scores on the Latin tests. We also expected the development of explicit L3 knowledge to be mediated by amount of L2 experience, either because of the similarity in L2 and L3 typology or because the greater language learning experience gives these learners a cognitive advantage in grammar learning. Note that the current study does not aim to tease apart the relative contributions of the two possible causes but rather to show that both of these factors are at play.

## METHODS AND PROCEDURE

### *Participants*

Thirty-five undergraduate students (ages 18-21) completed the study. All were native speakers of American English and did not have prior experience learning Latin or any other case-rich language. Participants fell into three different groups according to their classroom experience with Arabic: 1-2, 3-5, and 6<sup>+</sup> semesters respectively. These groups are hereafter referred to as Beginner ( $n=15$ ), Intermediate, ( $n=14$ ), and Advanced ( $n=6$ ). Participants received extra credit in their Arabic course for their participation.

### *Procedure*

The study employed a pretest, posttest, delayed posttest design. The experiment was conducted in three sessions over a four-week period. All tasks were computer-administered in a quiet laboratory setting. During the first session, participants completed a Latin vocabulary lesson and quiz, a vocabulary review, a pretest, and a language background questionnaire. During the second session (5-7 days later), participants completed a vocabulary review, a treatment session, and an immediate posttest. After 12-16 days, participants came back for the final session, which consisted of a vocabulary review, a delayed posttest, and a test of explicit knowledge of the Latin target structures.

### *Materials*

The linguistic target of the study was Latin morphosyntax related to the assignment of thematic agency roles to nouns in transitive sentences (thereby deducing the patient role as well). We employed the materials of The Latin Project, an application that combines ColdFusion and Flash programming to deliver audiovisual lessons, practice, and tests of Latin agency assignment. The overarching goal of the project is to investigate the roles of cross-linguistic influence, practice, and feedback in the acquisition of morphosyntax among different populations of adult learners (see e.g., Cox & Sanz, 2015; Sanz, Lin, Lado, Stafford & Bowden, 2014; Sanz, Park, & Lado, 2015; Stafford, Bowden, & Sanz, C., 2012). Target sentences were generated from a list of 35 human nouns and 11 transitive verbs, all of which were morphophonologically regular. Based on the availability of the three cues, there were three types of stimuli sentences for both treatment and test items: (1) SVO sentences with all three cues available (henceforth SVO items); (2) non-SVO sentences with verb agreement and case morphology cues available (henceforth AGR items); (3) non-SVO sentences where both nouns are either singular or plural with only case morphology cues available (henceforth CASE items). Examples are given in (1) – (3) below. While the case morphology cue in Latin is always present, the agreement and word order cues were manipulated so that their availability would be inconsistent.

(1) SVO Item:           Potentissimus salutatur stultum.  
king-nom.sing. greet-3<sup>rd</sup> sing. fool-acc.sing  
*The king greets the fool.*

(2) AGR Item:           Stultum salutant potentissimi.  
fool-acc.sing. greet-3<sup>rd</sup> pl. king-nom.pl  
*The kings greet the fool.*

(3) CASE item:         Potentissimus stultum salutatur.

king-nom.sing. fool-acc.sing. greet-3<sup>rd</sup> sing  
*The king greets the fool*

### ***Vocabulary Lesson and Reviews***

At the beginning of the first session participants completed a vocabulary lesson. This provided them with the 46 Latin words that would appear in the treatment and tests. After the lesson, a multiple-choice vocabulary quiz was administered to ensure that vocabulary learning had taken place. Participants were required to score 100% on the quiz in order to advance to the training session. If they did not meet the criterion score, the computer program cycled back through the lesson until their score reached criterion to prevent participants from making errors as a result of incomplete lexical knowledge. Before the posttest and the delayed posttest, participants completed multiple-choice vocabulary reviews. A criterion score of 100% was also required at each review session.

### ***Latin Tests***

The Latin test battery consisted of three different Latin language tasks with the goal of providing a comprehensive picture of L3 learning. The tasks included (1) a written interpretation task, (2) an aural interpretation task, and (3) a grammaticality judgment test. There were three versions (A, B, and C) of each task, and participants were randomly assigned to take different versions of the pretest, the immediate posttest, and the delayed posttest. Although these test versions were equivalent in format and content, the stimuli sentences for each version appeared in a different order to ensure that the order of presentation did not affect participants' scores. The order of the written interpretation and aural interpretation tests was counterbalanced.

In the written interpretation (WI) task, participants read a Latin target sentence and were asked to choose from two photographs the one that correctly represented the sentence. Incorrect images showed the agent and patient roles reversed. Participants also had a third option: "Neither of the two." The aural interpretation (AI) task was the same as the WI task, but Latin target sentences were heard through headphones rather than read on the screen. The grammaticality judgment test (GJT) presented participants with a written Latin sentence that either (1) was completely correct, (2) contained a subject-verb agreement error, (3) contained a case marking error, or (4) contained a subject-verb agreement error and a case marking error. Participants were asked to choose from the options RIGHT, WRONG, or to press the space bar if they could not make up their mind. Participants were encouraged to use this latter option sparingly. Of the 55 items included on the three tasks, 34 were critical items and 21 were distractors. Participants were instructed to complete each task as quickly as possible. Total time for completion of a testing session was 30-40 minutes.

### ***Treatment***

During the second session, after the vocabulary review, participants completed the treatment session. This consisted of six practice interpretation tasks (three written and three aural). The first task required participants to read 10 Latin sentences and choose the correct English interpretation from two choices onscreen. The second task involved reading nine Latin sentences and choosing in each case the photo that best matched the sentence. In the third task, participants were asked to examine 10 photos and identify the corresponding sentence from two choices. Tasks 4 and 5 maintained the same format as Tasks 1 and 2 except that aural input was provided instead of written input. Task 6 required participants to indicate whether the photo



presented matched the sentence heard by clicking either right or wrong. Throughout the tasks, participants received only “yes/no” feedback for each answer given. The lesson did not include any explicit input; i.e., any metalinguistic explanation of how the language works prior to or during practice.

### ***Test of Explicit Knowledge***

The test of explicit knowledge was given at the end of the third session after participants completed the delayed posttest. It included three tasks for a total of 27 items. Tasks were based on the instruments and recommendations in Brooks and Kempe (2013), R. Ellis (2004, 2005), and Roehr (2005, 2007). All Latin target sentences drew from the same set of 46 words that had appeared in the Latin treatment and test battery. The first task asked learners to state whether a given sentence was correct or incorrect, or they could choose “I don’t know.” If they chose “incorrect,” they were asked to provide a correction of the sentence along with a brief explanation of what they corrected. This task included four incorrect items and three correct items as distractors. The second task presented learners with a Latin sentence in which one word was underlined and contained an error (i.e., there was either a verb which did not agree in number with the subject, or a noun with incorrect case marking). Participants were asked to correct the underlined word and provide a brief explanation of what they corrected. The final task presented learners with the same type of item as those given in the third task, but differed in that it was a multiple-choice task rather than a free answer task. Participants were asked to choose from one of three choices that offered a correction of the underlined word and a brief explanation. See Appendix A for explicit knowledge task items.

### ***Scoring***

The written and aural interpretation tasks and the grammaticality judgment test each consisted of 12 critical items and 8 distractors. To calculate overall accuracy scores, participants received one point for each correct response to a critical item for a maximum score of 12 on each task (36 points total). Scores were also calculated by item type (SVO, AGR, and CASE). Final scores were converted to percentages for statistical analysis.

The three tasks on the test of explicit knowledge were scored separately. On the first task, participants received one point for choosing “correct” when the item was correct or one point for a correct explanation when the item was incorrect. For the second task, participants received one point for a correct rewrite of an underlined item and one point for a correct explanation. For the third task, participants received one point for a correct answer. This resulted in 23 total possible points. Final scores were converted to percentages for statistical analysis.

## **RESULTS**

Several statistical analyses were conducted to address our research questions. Our sample sizes for this study ( $N=35$ ; Beginner Arabic  $n=15$ , Intermediate Arabic  $n=14$ , and Advanced Arabic  $n=6$ ), while in line with those in other CLI studies, suggest a note of caution. Distributions were relatively normal, however, with no substantial skewness or kurtosis, except for SVO scores, which were highly negatively skewed due to a ceiling effect. Although this violates the basic assumption that the population is normally distributed, this effect is in line with our hypothesis and previous findings that predict high reliance on SVO cues by English native speakers at early stages of L3 learning. In addition, some of the CASE and AGR scores were slightly positively skewed, namely CASE scores at the posttest and delayed posttest as well as

AGR scores at the pretest, posttest, and delayed posttest. Several outliers were identified under the different conditions on the basis of comparatively high or low scores. However, the identification of these outliers is likely to be attributable to gaps in the data due to the small number of participants. Therefore, outliers were retained for all analyses. Only one participant was excluded from the analyses pertaining to explicit knowledge because his explicit knowledge test score was missing.

### ***The Role of L2 Experience in L3 Learning***

Our first research question asked whether learners with different levels of L2 classroom Arabic experience (1-2, 3-5, and 6+ semesters respectively) differed with regards to reliance on the L2 cue hierarchy. We expected that the three groups would show no differences at pretest but that after treatment, learners with the most Arabic experience would exhibit the most reliance on L2 cues, and therefore show higher accuracy rates overall. Specifically, we expected that there would be no between-group differences at pretest but significant between-group differences at posttest and delayed posttest. A mixed between-within factorial ANOVA (3x3x3) was conducted, with Time of testing (pre, post, and delayed) and Cue (SVO, AGR, and CASE) as within-subjects factors, and Group (Beginner,  $n = 15$ ; Intermediate,  $n = 14$ ; and Advanced,  $n = 6$ ) as a between-subjects factor, to identify the change in over all accuracy on the Latin tests (the dependent variable). Table 5 shows the mean scores for each group on each item type at the different testing times.

Box's M test indicated no violation of equality of covariance matrices overall ( $p = .513$ ), and the subsequent MANOVA omnibus test indicated a statistically significant overall effect for Time, Pillai's trace  $F(2, 31) = 14.42, p = .000$ , a statistically significant effect for Cue, Pillai's trace  $F(2, 31) = 52.03, p = .000$ , and a statistically significant interaction effect for Time x Cue, Pillai's trace  $F(4, 29) = 11.21, p = .000$ . However, there was no interaction effect for Time x Group, Pillai's trace  $F(4, 64) = .78, p = .544$ , Cue x Group, Pillai's trace  $F(4, 64) = .28, p = .888$ , and Time x Cue x Group, Pillai's trace  $F(8, 60) = 1.49, p = .179$ . Follow up analyses were conducted to identify the effects attributable to significant factors. For the within-subjects factors, Mauchly's test indicated no violation of the assumption of Sphericity for Time,  $X^2(2) = 4.73, p = .094$ , for cue,  $X^2(2) = .12, p = .941$ , or for the interaction between Time and Cue,  $X^2(9) = 10.66, p = .301$ . A statistically significant main effect for Time,  $F(2, 64) = 18.24, p = .000$ , partial  $\eta^2 = .36$ , was accompanied by a statistically significant main effect for Cue,  $F(2, 64) = 55.29, p = .000$ , partial  $\eta^2 = .63$ . There was also a statistically significant interaction effect for Time x Cue,  $F(4, 128) = 12.87, p = .000$ , partial  $\eta^2 = .29$ . Pairwise comparisons identified mean differences in the Latin scores from time 1 to time 2 ( $p = .000$ ) and from time 1 to time 3 ( $p = .001$ ), but not from time 2 to time 3 ( $p = .506$ ). For cues, pairwise comparisons identified mean differences between SVO and Agreement ( $p = .000$ ) and between SVO and CASE ( $p = .000$ ) but not between AGR and case ( $p = .094$ ). For the between-subjects factor group, Levene's test indicated a violation of equality of error of variance ( $p = .000$ ) on the CASE cue at the pre-test, and no effect for Group was found,  $F(2, 32) = .294, p = .748, \eta^2 = .018$ . Plotted means for AGR scores (Figure 2) and CASE scores (Figure 3) show that the three groups pattern similarly on AGR and CASE items, although there is slight advantage for the Advanced group, performing better than the Beginner and Intermediate groups on CASE items, on the delayed test. The lack of significance is possibly due to the small sample size in general, as well as the very small number of participants in the advanced group ( $n=6$ ), and the means plot in Table 5 shows emergent

evidence that the Advanced group indeed performed better than the other two groups on CASE items. This suggests that the lack of significant results may be attributable to Type II error.

Table 5. Mean Latin test scores by group by item type

Group	<i>N</i>	Sentence Type	Pretest Mean (SD)	Posttest Mean (SD)	Delayed Posttest Mean (SD)
Beginner	15	SVO	73.89 (16.05)	81.30 (19.43)	81.11 (21.39)
		AGR	41.97 (17.29)	70.33 (19.96)	64.62 (22.73)
		CASE	49.33 (12.52)	54.22 (22.01)	50.81 (23.88)
Intermediate	14	SVO	81.94 (20.92)	75.00 (15.94)	81.55 (14.60)
		AGR	36.13 (17.60)	65.24 (19.29)	65.96 (17.66)
		CASE	45.79 (24.86)	52.18 (21.48)	45.95 (20.24)
Advanced	6	SVO	83.33 (10.54)	71.76 (25.24)	80.55 (18.76)
		AGR	29.62 (10.41)	74.97 (20.79)	72.16 (21.23)
		CASE	46.30 (4.12)	59.72 (19.13)	60.09 (10.70)

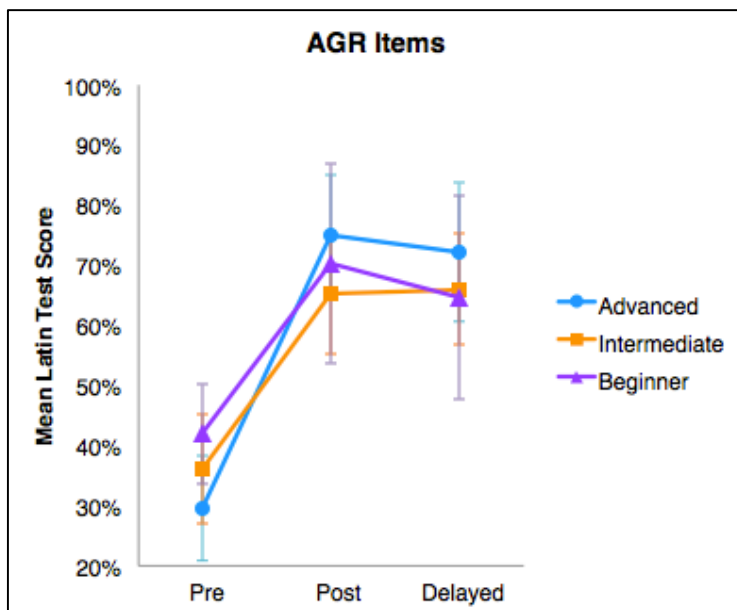


Figure 2. Means for agreement scores by the three groups

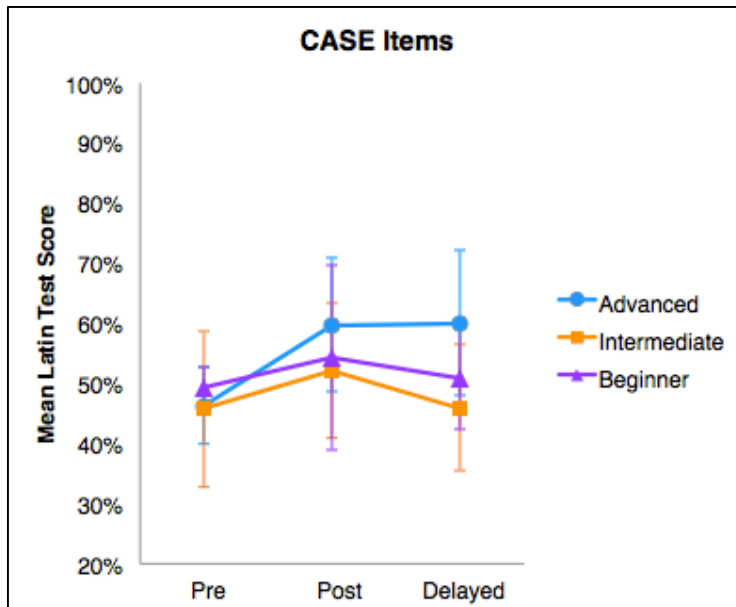


Figure 3. Means for case scores by the three groups

#### *The Role of L2 Experience on Explicit L3 Knowledge*

The first part of our second research question asked whether learners with different levels of Arabic experience also differed with regards to development of explicit knowledge of the L3. A one-way ANOVA was conducted to examine the difference in performance on the explicit knowledge test (the dependent variable) among the three groups (Beginner,  $n = 14$ ; Intermediate,  $n = 14$ ; and Advanced;  $n = 6$ ). Levene's test for homogeneity of variance indicated no violation of equality of error of variance, and the omnibus F-test showed no significant difference between the three groups,  $F(2, 31) = .188, p = .830$ . Mean explicit knowledge test scores for the three groups are given in Table 6 below and plotted in Figure 4.

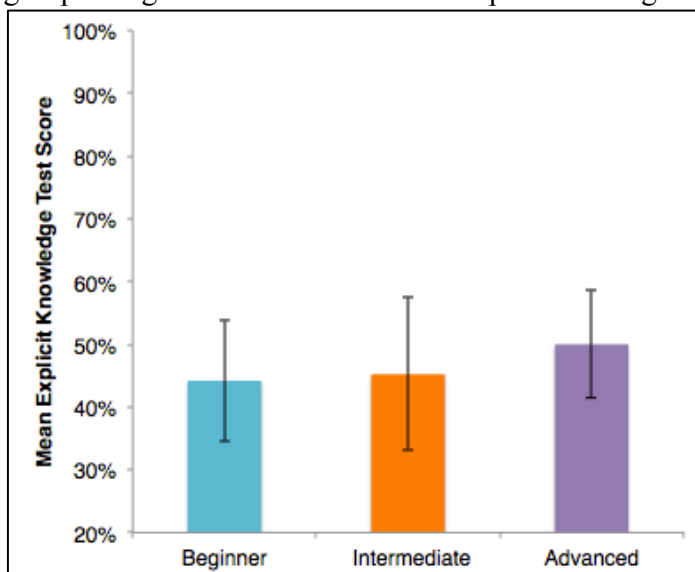


Figure 4. Mean explicit knowledge test score for the three groups.

Table 6. Mean explicit knowledge test scores for the three groups

Group	N	Mean (SD)
Beginner	14	44.18 (19.46)
Intermediate	14	45.23 (23.30)
Advanced	6	45.64 (19.23)

The second part of our second research question asked whether higher levels of L3 explicit knowledge predicted better performance in the L3. We expected to see a positive correlation between explicit test scores and overall posttest and delayed posttest scores on the Latin tests. A Pearson’s *r* correlation was conducted between the explicit test scores (the predictor) and the Latin test scores (the criterion). There was a significant correlation between the explicit test score and the Latin scores on the posttest ( $r = .429$ , 95% CI: .11, .67,  $p = .011$ ) and the delayed posttest ( $r = .589$ , 95% CI: .31, .77,  $p = .000$ ). Figure 5 shows the correlation between explicit test scores and the Latin scores on the posttest and delayed posttest.

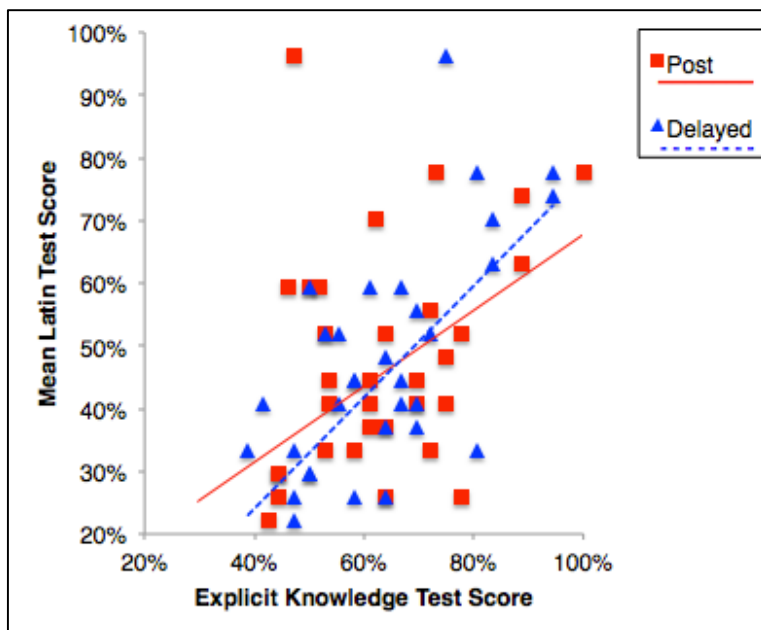


Figure 5. Correlation between explicit test scores and Latin test scores

### DISCUSSION

This study investigated two important issues pertaining to the bilingual advantage in L3 acquisition. First, we investigated whether there is a relationship between amount of classroom experience in an L2 and the ability to make use of L2 sentence processing cues when similar

cues exist in the L3. Second, we asked whether the development of explicit knowledge in the L3 was also mediated by L2 experience, and whether such explicit L3 knowledge correlates with L3 performance. The specific predictions for the study are repeated below, and each is followed by a discussion of the relevant results.

1. *Learners with different levels of Arabic classroom experience (1-2, 3-5, and 6+ semesters respectively) will differ with regards to reliance on the L2 cue hierarchy when determining thematic roles in L3 Latin sentences.* Given Rothman's (2010; 2015) proposal that CLI in L3 acquisition is driven by typological similarity between the L3 and previous languages, but noting that L2 to L3 CLI effects were not found for learners with 3-5 semesters of L2 experience even when such typological similarities were manipulated (Sanz, Park, & Lado, 2015), the present study asked whether we might see such effects with learners at a broader range of proficiency levels. We hypothesized that Beginner, Intermediate, and Advanced Arabic learners would show no differences in overall accuracy at pretest but that after treatment, learners with the most Arabic experience would exhibit the most reliance on L2 cues, and therefore show higher accuracy rates overall and higher accuracy on items requiring the use of subject-verb agreement and case cues in particular. Specifically, we expected that there would be no between-group differences at the Latin pretest but significant between-group differences at posttest and delayed posttest.

Two points warrant discussion here. First, there was an emergent trend in favor of our hypothesis (see Table 5 and Figures 2-3), and the lack of significant results may be attributable to Type II error due to our low (and unbalanced) sample sizes (Beginner  $n = 15$ , Intermediate  $n = 14$ , Advanced  $n = 6$ ). If this result were to hold with increased sample sizes, it would suggest that amount of L2 experience may not play a crucial role in "the bilingual advantage" for L3 learning. In that case, the advantage may have more to do with level of daily L2 use rather than proficiency, a suggestion consistent with Bialystok (2001, 2007) who argues that bilinguals and multilinguals who use more than one language regularly develop a particularly adept inhibitory control mechanism which allows them to repress irrelevant information and focus attention on relevant information during learning, facilitating the process. However, we expect to see significant between-group differences at posttest and delayed posttest when the number of Advanced group participants is increased, and we take the emergent trend in that direction as evidence that amount of L2 exposure may mediate CLI in L3 acquisition.

We see this finding as consistent with Rothman's (2010; 2015) Typological Primacy Model and consider this study to offer preliminary empirical support in favor of his suggestion that CLI from an L2 to an L3 occurs at the initial stage of the L3 even among learners whose L2s are "not fully developed" (Rothman, 2015, p. 188). That is, the Advanced learners in our study are not native nor near-native speakers, and yet they showed evidence of CLI from their L2 to the L3. At the same time, Beginner and Intermediate learners did not demonstrate such an effect. Therefore, our findings, along with those of Sanz, Park, and Lado (2015), suggest that a minimal threshold of L2 proficiency may be necessary in order to see the effects of typologically driven CLI from an L2 to an L3.

2. *Learners with different levels of classroom Arabic experience (1-2, 3-5, and 6+ semesters respectively) will differ in the degree of development of explicit knowledge of the L3, and higher levels of explicit knowledge will positively correlate with performance in the L3.* Drawing on a number of studies that have shown correlations between explicit knowledge and better performance in an L2, especially among classroom learners, this study asked whether such a result could be replicated for early stages of L3 learning. Indeed, our results revealed a

significant, medium-strength positive correlation between explicit test scores and posttest and delayed posttest scores on the Latin tests. This suggests that explicit knowledge plays an important role in L3 learning as it does for L2 learning.

Based on suggestions that the L3 advantage is due to an increased ability to reflect on language and manipulate it (Jessner 1999, 2006; Thomas, 1988) and calls for research looking directly at explicit knowledge in L3 learning (Rothman, 2011; Sanz, 2013), our study also investigated whether more extensive L2 experience contributed to increased explicit L3 knowledge at early stages of L3 exposure. This question was considered to be exploratory, as there does not yet exist a reliable body of research on which to base predictions. The results showed no statistically significant effect for Arabic Level on explicit knowledge test score. However, we again saw an emergent trend in favor of our hypothesis (shown in Table 6 and Figure 4).

Let us examine some possible explanations for this result. First, the lack of statistical significance could again be attributable to Type II error due to the small (and unbalanced) sample sizes in our groups. However, if this result holds with increased sample sizes, and if Thomas (1988) is correct that instruction aids in the development of sensitivity to grammar in turn leading to a greater ability to learn a third language, then another possibility is that beginners at the end of their 2<sup>nd</sup> semester of intensive Arabic instruction have already received the amount of instruction that gives them this “edge.” If with an increased sample size a significant difference in explicit knowledge test scores is seen between the Advanced group and the two lower proficiency groups, we would take this as evidence in favor of an important relationship between explicit knowledge and CLI in L3 learning. What is clear is that, as in the case of Grey, Williams, and Rebuschat (2014), explicit knowledge of the L3 was learner-generated rather than provided by the lesson prior to or during practice. Future work should more carefully consider the amount and type of L2 instruction in the development of explicit L3 knowledge.

We would like to close this section by adding that our findings are compatible with each other; i.e., that more L2 exposure leads to positive transfer of L2 processing strategies as well as to the development of explicit knowledge, and that both predict L3 development. It is even possible to hypothesize that one results from the other or that one facilitates the other. In any case, our results demonstrate that it is not one or the other, but both.

## CONCLUSION

This study investigated early stages of development of L3 Latin among native English-speaking learners of L2 Arabic. In particular, the study adopted the CM to explore the role of CLI at early stages of L3 morphosyntactic processing. The results emphasize the need to consider amount of L2 experience. In the absence of exposure to the L3, learners relied on their L1 cue hierarchy but later increased use of L2 processing cues as they received continued exposure to L3 Latin. Furthermore, we showed emergent evidence that the employment of L2 cues at these post-treatment stages was mediated by participants’ amount of experience with the L2. More data need to be collected in order to confirm these results, and future efforts will focus on increasing and balancing sample sizes across groups.

We also showed emergent evidence that amount of L2 experience is related to the development of explicit L3 knowledge and showed a correlation between explicit L3 knowledge and L3 performance on agency assignment tasks, thus joining Grey, Williams, and Rebuschat (2014) in providing empirical evidence that explicit knowledge plays an important role in L3

learning in the same way that it has been shown for second language development. This result could be further probed by including a measure of explicit L2 knowledge and looking at development of explicit (and implicit) L3 knowledge over a longer period of time.

---

<sup>i</sup> In this article we use the term “L3” to refer to any language learned or used in addition to one’s native language(s) as well a later acquired second language (L2) (Hammarberg, 2010; Ecke, 2015). Under our definition, learners who are still beginners in their L2 can be considered to be learning an L3 as soon as they begin learning an additional language beyond the L2.

### **Acknowledgments**

*Initial reports of these data were presented at the 2013 Second Language Research Forum in Provo, UT. The study is part of The Latin Project, developed by Cristina Sanz, Catherine Stafford, and Harriet Bowden with funding to Sanz from the Spencer Foundation and Georgetown’s Graduate School. The authors would like to thank Professors Dima Ayoub, Hana Kilany, Sahar Mohammed, Terry Potter, and Kassem Wahba in the Department of Arabic and Islamic Studies at Georgetown University for their help with data collection. We are very grateful to Dr. Jessica Cox for her methodological and technical guidance and to our undergraduate research assistant Nicholas Childress for his assistance in data collection and analysis in fall 2013. We would also like to thank Dr. John Norris and two anonymous referees for their insightful comments on earlier versions of this paper. Lastly, we want to express our gratitude to the hardworking editors of this volume of the Arizona Working Papers in Second Language Acquisition. Any remaining errors are exclusively the responsibility of the authors.*



## REFERENCES

- Andonova, E. (1998). Sentence interpretation in Bulgarian: The contribution of animacy. In *Proceedings of the 20th Annual Meeting of the Cognitive Science Society* (pp. 54-58).
- Bardel, C., & Falk, Y. (2007). The role of the second language in third language acquisition: The case of Germanic syntax. *Second Language Research*, 23(4), 459-484.
- Bates, E., & MacWhinney, B. (1989). Functionalism and the competition model. *The crosslinguistic study of sentence processing*, 3-73.
- Bialystok, E. (1986). Factors in the growth of linguistic awareness. *Child Development*, 57, 498–510.
- Bialystok, E. (1987). Words as things: Development of word concept by bilingual children. *Studies in Second Language Learning*, 9, 133–140.
- Bialystok, E. (1991). *Language processing in bilingual children*. Cambridge: Cambridge University Press.
- Bialystok, E. (2001). *Bilingualism in development: Language, literacy, and cognition*. New York: Cambridge university Press.
- Bialystok, E. (2007). Cognitive effects of bilingualism: How linguistic experience leads to cognitive change. *The International Journal of Bilingual Education and Bilingualism*, 10, 210-223.
- Brooks, P. J. & Kempe, V. (2013). Individual differences in adult foreign language learning: The mediating effect of metalinguistic awareness. *Memory and Cognition* 41, 281–296.
- Cabrelli Amaro, J. , Flynn, S., & Rothman, J. (Eds.). (2012). *Third language acquisition in adulthood*. Amsterdam: John Benjamins.
- Cenoz, J. (2001). *Cross-linguistic influence in third language acquisition: Psycholinguistic perspectives* (Vol. 31). Clevedon: Multilingual Matters.
- Cenoz, J. (2003). The additive effect of bilingualism on third language acquisition: A review. *The International Journal of Bilingualism* 7, 71– 88.
- Cenoz, J. (2013). The influence of bilingualism on third language acquisition: Focus on multilingualism. *Language Teaching*, 46, 71-86.
- Cenoz, J., Hufeisen, B. and Jessner, U. (2001) *Cross-linguistic Influence in Third Language Acquisition*. Clevedon: Multilingual Matters.
- Cenoz, J. & Valencia, J. F. (1994). Additive trilingualism: Evidence from the Basque Country. *Applied Psycholinguistics* 15 (2), 195-207.
- DeKeyser, R. M. (1997). Beyond explicit rule learning. *Studies in second language acquisition*, 19(02), 195-221.
- Diaz, R. M. (1985). Bilingual cognitive development: Addressing three gaps in current research. *Child Development*, 56, 1356–1378.
- Ecke, P. (2015). Parasitic vocabulary acquisition, cross-linguistic influence, and lexical retrieval in multilinguals. *Bilingualism: Language and Cognition*, 18(2), pp. 145-162.
- Ellis, N. C. (2005). At the interface: Dynamic interactions of explicit and implicit language knowledge. *Studies in second language acquisition*, 27(02), 305-352.
- Ellis, N. C. (2006). Cognitive perspectives on SLA: The associative-cognitive CREED. *AILA Review*, 19(1), 100-121.
- Ellis, R. (2004). The definition and measurement of L2 explicit knowledge. *Language learning*, 54(2), 227-275.

- Ellis, R. (2005). Measuring implicit and explicit knowledge of a second language. *Studies in Second Language Acquisition*, 27(2), 141-172.
- Ellis, R. (2006). Modelling learning difficulty and second language proficiency: The differential contributions of implicit and explicit knowledge. *Applied linguistics*, 27(3), 431-463.
- Falk, Y., & Bardel, C. (2011). Object pronouns in German L3 syntax: Evidence for the L2 status factor. *Second Language Research*, 27(1), 59-82.
- Flynn, S., Foley, C., & Vinnitskaya, I. (2004). The cumulative-enhancement model for language acquisition: Comparing adults' and children's patterns of development in first, second and third language acquisition of relative clauses. *International Journal of Multilingualism*, 1(1), 3-16.
- Galambos, S. J., & Goldin-Meadow, S. (1990). The effects of learning two languages on levels of metalinguistic awareness. *Cognition*, 34, 1-56.
- García Mayo, M. P. (2012). Cognitive approaches to L3 acquisition. *International Journal of English Studies*, 12(1), 129-146.
- García Mayo, M. P. & Rothman, J. (2012). L3 morphosyntax in the generative tradition: From the initial state and beyond. In J. Cabrelli Amaro, S. Flynn, & J. Rothman (Eds.), *Third language acquisition in adulthood*. Amsterdam: John Benjamins.
- Grey, S., Williams, J. N., & Rebuschat, P. (2014). Incidental Exposure and L3 Learning of Morphosyntax. *Studies in Second Language Acquisition*, 36(04), 611-645.
- Gutiérrez, X. (2013). Metalinguistic knowledge, metalingual knowledge, and proficiency in L2 Spanish. *Language Awareness*, 22(2), 1-16.
- Hammarberg, B. (2010). The languages of the multilingual: Some conceptual and terminological issues. *International Review of Applied Linguistics*, 48, 91-104.
- Harrington, M. (1987). Processing transfer: Language-specific processing strategies as a source of interlanguage variation. *Applied Psycholinguistics*, 8, 351-377.
- Hernandez, A. E., Sierra, I., & Bates, E. A. (2000). Sentence interpretation in bilingual and monolingual Spanish speakers: Grammatical processing in a monolingual mode. *Spanish Applied Linguistics*, 4(2), 179-213.
- Hulstijn, J.H. (2002). Towards a unified account of the representation, processing and acquisition of second language knowledge. *Second Language Research* 18(3), 193-223.
- Jessner, U. (1999). Metalinguistic awareness in multilinguals: Cognitive aspects of third language learning. *Language Awareness*, 8(3-4), 201-209.
- Justus, T. (2004). The cerebellum and English grammatical morphology: evidence from production, comprehension, and grammaticality judgments. *Journal of cognitive neuroscience*, 16(7), 1115-1130.
- Jessner, U. (2006). Linguistic awareness in multilinguals: English as a third language.
- Lasagabaster, D. (2000). Three languages and three linguistic models in the Basque Educational System. In J. Cenoz & U. Jessner (eds.), *English in Europe: The acquisition of a third language*. Clevedon: Multilingual Matters, 179-197.
- Liu, H., Bates, E., & Li, P. (1992). Sentence interpretation in bilingual speakers of English and Chinese. *Applied Psycholinguistics*, 13(04), 451-484.
- Lueng, Y.K.I., (2006). Full transfer vs. partial transfer in L2 and L3 acquisition. In Slabakova, R., Montrul, S. and Prévost, P., editors, *Inquiries in linguistic development: in honor of Lydia White* (pp. 157-187). Amsterdam: John Benjamins.
- Leung, Y.K.I. (2007). Third language acquisition: why it is interesting to generative linguists. *Second Language Research*, 23(1), 95-114.

- MacWhinney, B. (1987). Applying the competition model to bilingualism. *Applied Psycholinguistics*, 8(4), 315-327.
- MacWhinney, B. (2005). Extending the competition model. *International Journal of Bilingualism*, 9(1), 69-84.
- Martin, K. I., & Ellis, N. C. (2012). The roles of phonological short-term memory and working memory in L2 grammar and vocabulary learning. *Studies in Second Language Acquisition*, 34(03), 379-413.
- McDonald, J. L. (1987). Sentence interpretation in bilingual speakers of English and Dutch. *Applied Psycholinguistics*, 8(4), 379-413.
- Mitsugi, S., MacWhinney, B., & Shirai, Y. (2010). Cue-based processing of relative clauses in L2 Japanese. Paper presented at the *Selected Proceedings of the 2008 Second Language Research Forum*, 123-138.
- Munoz, C. (2000). Bilingualism and trilingualism in school students in Catalonia. In J. Cenoz and U. Jessner (eds.) *English in Europe: The acquisition of a third language* (pp. 157-178). Clevedon: Multilingual Matters.
- Odlin, T. (2013). Crosslinguistic Influence in Second Language Acquisition. *The Encyclopedia of Applied Linguistics*.
- Odlin, T., & Jarvis, S. (2004). Same source, different outcomes: A study of Swedish influence on the acquisition of English in Finland. *International Journal of Multilingualism*, 1(2), 123-140.
- Pavlenko, A., & Jarvis, S. (2002). Bidirectional transfer. *Applied Linguistics*, 23(2), 190-214.
- Ricciardelli, L. A. (1992a). Bilingualism and cognitive development in relation to threshold theory. *Journal of Psycholinguistic Research*, 21, 301-316.
- Ringbom, H. (1987). *The role of the first language in foreign language learning*. Clevedon: Multilingual Matters.
- Ringbom, H. (2001). Lexical transfer in L3 production. *Bilingual Education and Bilingualism*, 59-68.
- Ringbom, H. (2007). *Cross-linguistic similarity in foreign language learning*. Clevedon: Multilingual Matters Limited.
- Roehr, K. (2005). *Metalinguistic Knowledge in Second Language Learning: An Emergentist Perspective*. Unpublished Ph.D. Thesis, Lancaster University.
- Roehr, K. (2008). Metalinguistic knowledge and language ability in university-level L2 learners. *Applied Linguistics* 29 (2), 173-199.
- Rothman, J. (2010). On the typological economy of syntactic transfer: Word order and relative clause high/low attachment preference in L3 Brazilian Portuguese. *IRAL, International Review of Applied Linguistics in Language Teaching*, 48(2/3), 245-273.
- Rothman, J. (2015). Linguistic and cognitive motivations for the Typological Primacy Model (TPM) of third language (L3) transfer: Timing of acquisition and proficiency considered. *Bilingualism: Language and Cognition*, 18(2), pp. 179-190.
- Rothman, J. (2011). L3 syntactic transfer selectivity and typological determinacy: The typological primacy model. *Second Language Research*, 27(1), 107-127.
- Rothman, J., & Cabrelli Amaro, J. (2010). What variables condition syntactic transfer? A look at the L3 initial state. *Second Language Research*, 26(2), 189-218.

- Rothman, J., Iverson, M., & Judy, T. (2011). Introduction: Some notes on the generative study of L3 acquisition. *Second Language Research*, 27(1), 5-19.
- Sanz, C. (2000). Bilingual education enhances third language acquisition: Evidence from Catalonia. *Applied Psycholinguistics* 21, 23-44.
- Sanz, C. (2007). The role of bilingual literacy in the acquisition of a third language. In C. Perez-Vidal, A. Bel & M. J. Garau (eds.), *A portrait of the young in the new multilingual Spain*. Clevedon: Multilingual Matters, 220–240.
- Sanz, C. (2013). Multilingualism and Metalinguistic Awareness. *The Encyclopedia of Applied Linguistics*.
- Sanz, C. & Leow, R.P. (Eds.). (2011) *Implicit and explicit conditions, processes and knowledge in SLA and bilingualism*. Washington, DC: Georgetown University Press.
- Sanz, C., Lin, H. J., Lado, B., Bowden, H. W., & Stafford, C. A. (2009). Concurrent verbalizations, pedagogical conditions, and reactivity: Two CALL studies. *Language learning*, 59(1), 33-71.
- Sanz, C., Lin, H-J., Lado, B., Stafford, C.A., & Bowden, H.W. (2014). One size fits all? Pedagogical Conditions and Working Memory Capacity in Early Language Development. *Applied Linguistics* October 29, 2014 doi:10.1093/applin/amu058
- Sanz, C., Park, H.L., & Lado, B. (2015). A functional approach to cross-linguistic influence in ab-initio L3 acquisition. *Bilingualism: Language and Cognition*, 1-16.
- Stafford, C.A., Bowden, H. and Sanz, C. (2012). Optimizing Language Instruction: Matters of Explicitness, Practice, and Cue Learning. *Language Learning*, 62 (3): 741-768
- Stafford, C. A., Sanz, C., & Bowden, H. W. (2010). An experimental study of early L3 development: age, bilingualism and classroom exposure. *International Journal of Multilingualism*, 7(2), 162-183.
- Swain, M., S. Lapkin, N. Rowen & D. Hart (1990). The role of mother tongue literacy in third language learning. *Language, Culture and Curriculum* 3, 65–81.
- Taman, H. A. (1993). The utilization of syntactic, semantic, and pragmatic cues in the assignment of subject role in Arabic. *Applied Psycholinguistics*, 14, 299-317.
- Thomas, J. (1988). The role played by metalinguistic awareness in second and third language learning. *Journal of Multilingual & Multicultural Development*, 9(3), 235-246.
- Weinreich, U. (1953). *Languages in contact: Findings and problems*. New York, 1953. Reprint, [Mouton](#), The Hague, 1963.
- Williams, S., & Hammarberg, B. (1998). Language switches in L3 production: Implications for a polyglot speaking model. *Applied Linguistics*, 19(3), 295-333.
- Yelland, G., Pollard, J., & Mercury, A. (1993). The metalinguistic benefits of limited contact with a second language. *Applied Psycholinguistics*, 14, 423–444

Appendix A. Test of explicit knowledge

Task 1. Explicit knowledge 'free' questionnaire

1. Imagine that you are a Latin teacher and you have very little time to explain to a student how to interpret Latin sentences (like the ones you've seen in this study). What are the rules? If possible, please use a list format to list the rules one-by-one.

2. Please answer the following questions with as many details as you can.

1. Please describe any linguistic patterns you noticed in the Latin examples in this study.
2. Please describe any differences or similarities you noticed between Arabic and Latin.
3. Please describe any differences or similarities you noticed between English and Latin.
4. Please describe any strategies you used to complete the Latin exercises and find the correct answers.
5. Were any linguistic aspects (e.g., prefixes or suffixes, vocabulary, verb conjugations, word order, etc.) particularly helpful in the completion of the tasks in Latin?

---

Task 2. Error Identification, Correction and Explanation task

In this exercise you will be presented with Latin sentences and asked to decide if they are correct or incorrect. If you think that a sentence is incorrect, please make the necessary changes to make it correct and provide an explanation of your reasoning.

Example:

1. Indagat parvulos potentissimos

- 1.1. Is the sentence above correct or incorrect?
  - a. correct
  - b. incorrect
  - c. I don't know

1.2. If you think the sentence above is incorrect please make the necessary changes to make it correct and write your version of it in the space below.

1.3. Please explain in your own words why you think the sentence was incorrect and what you did to correct it.

--

## Items Task 2

	Item	Correction	Explanation
1.	Uocant sagas dei 'The gods call the fortunetellers'	—	distractor/ correct sentence
2	Indagat parvuli potentissimos looks-for Boys kings 'The boys look for the kings'	Parvuli potentissimos indagant	The subject does not agree with the verb. The subject <i>parvuli</i> is plural, so the verb should be in the third person plural, <i>indagant</i>
3	Dominum iuuat famulus 'The servant helps the master'	—	<i>distractor/ correct sentence</i>
4	Agricolas tignarios laudant farmers carpenters praise 'The carpenters praise the farmers'	Agricolas tignarii laudant	The two nouns have ACC case. One should be the subject and subjects have NOM Case in Latin. Since we are supposed to make changes to <i>tignarios</i> 'carpenters,' then we should change it to the NOM Case form, which is <i>tignarii</i>
5	Innuptas saga cogitant maidens fortuneteller think-about 'The fortuneteller thinks about the maidens'	Innuptas cogitat saga	The subject does not agree with the verb. The subject <i>saga</i> is singular, so the verb should be in the third person singular, <i>cogitat</i>
6	Indagat magistra parvulus look-for teacher boy 'The teacher looks for the boy'	Indagat magistra parvulum	The two nouns have NOM case. One should be the object and objects have ACC Case in Latin. Since we are supposed to make changes to <i>parvulus</i> 'boy,' then we should change it to the ACC Case form, which is <i>parvulum</i>
7	Medici angelos spectant 'The doctors look at the angels'	—	<i>Distractor/ correct sentence</i>

## Task 3 - Error Correction + Explanation task

Each of the following sentences contains one grammatical error. The word that makes the sentence incorrect is underlined. Make changes to the underlined word in order to make the Latin sentence correct. After writing the correct version of the sentence, please briefly explain why the underlined word made it grammatically incorrect.

Example:

1. Vetulae auscultant parvulae

a. In the space below rewrite the sentence correctly.

b. Please briefly explain what you fixed.

Items task 3

	Item	Correction	Explanation
1	Vetulae auscultant <u>parvulae</u> old-women listen-to girls 'The old women listen to the girls'	Vetulae auscultant parvulas	The two nouns have NOM case. One should be the object and objects have ACC Case in Latin. Since we are supposed to make changes to <i>parvulae</i> 'girls,' then we should change it to the ACC Case form, which is <i>parvulas</i>
2	Musicus amat POTENTISSIMOES 'The musician loves the kings'	Musicus amat potentissimos	<i>distractor/ orthographical mistake, the correct form is potentissimos</i>
3	<u>Magum</u> salutata stultos wizard greets fools 'The wizard greets the fools'	Magus salutata stultos 1.0	The two nouns have ACC case. One should be the subject and subjects have NOM Case in Latin. Since we are supposed to make changes to <i>magum</i> 'wizard,' then we should change it to the NOM Case form, which is <i>magus</i>
4	BASIAT amici musicum kisses friends musician 'The friends kiss the musician'	Basiant amici musicum	The subject does not agree with the verb. The subject <i>amicum</i> is plural, so the verb should be in the third person plural, <i>basiant</i>
5	Beluae deas AMATIS 'The monsters love the goddesses'	Beluae deas amant	<i>distractor/ incorrect verb form, amatis is the second person plural</i>
6	Larva uocat AVAA	Larva uocat avum	<i>distractor/ orthographical mistake,</i>

	'The ghost calls the grandfather'		<i>the accusative form of avus in the singular is avi</i>
7	Famulus FEMINAE amat servant women loves 'The servant loves the women'	Famulus feminas amat	The two nouns have NOM case. One should be the object and objects have ACC Case in Latin. Since we are supposed to make changes to <i>feminam</i> 'women,' then we should change it to the ACC Case form, which is <i>feminas</i>
8	Hospita UOCANT lautos guest call gentlemen 'The guest calls the gentlemen'	Hospita uocat lautos	The subject does not agree with the verb. The subject <i>hospital</i> is singular, so the verb should be in the third person singular, <i>uocat</i>

Task 4 - **Each of the following sentences contain one grammatical error. The word that makes the sentence incorrect is underlined.** Please choose the option(s) that best describe the changes that would make the sentence correct.

1. Famulos uocant DOMINUS  
servants call master  
'The master calls the servants'

- 'dominus' should be in the object form
- 'dominus' should come before the verb
- 'dominus' should be plural ✓

2. Iuuant turbam ANGELOS  
help crowd angels  
'The angels help the crowd'

- 'angelos' should come before 'iuuant'
- 'angelos' should be in the subject form ✓
- 'angelos' should be singular

3. COQUUS spectat musicus  
cook look at musician  
'The musician looks at the cook'

- 'coquus' should be in the object form ✓
- 'coquus' should come after 'spectat'
- 'coquus' should be in the plural



4. Potentissimum FEMINAE basiat

king women kiss

'The women kiss the king'

- 'feminae' should come after the verb
- 'feminae' should be singular ✓
- 'feminae' should come before 'potentissimum'

5. Amant DEAS deos

love goddesses gods

'The goddesses love the gods'

- 'deas' should be singular
- 'deas' should be in the subject form ✓
- 'deas' should come after 'deos'

6. Poetria reginam SALUTANT

poetess queen greet

'The poetess greets the queen'

- 'salutant' should agree with 'poetria' ✓
- 'salutant' should come before 'reginam'
- 'salutant' should agree with 'reginam'