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Sequential versus Concurrent Learning: Cross-Linguistic Influence from L2 English on L3 Arabic

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Abstract

This study investigated the influence of prior English (L2) instruction on the learning of Arabic (L3) among Persian-speaking adolescents. Guided by third language acquisition models, it compared sequential (L2 before L3) and concurrent (L2 and L3 simultaneously) learning approaches. Participants included a convenience sample of 64 ninth-grade students (aged 14-15; 32 per group, gender-balanced) from a private school complex in Yazd, Iran. The sequential group had pre-intermediate English proficiency, while the concurrent group was English beginners; all participants were Arabic beginners. This study utilized a quantitative research design. Data were collected using an English placement test and three Arabic tasks: a Grammaticality Judgment Task, a Gap-Filling Task, and a Sentence Unscrambling Task. The analysis involved Mann-Whitney U tests to compare groups, a two-way between-subjects ANOVA to examine the effects of gender and its interaction with group, and descriptive statistics to investigate cross-linguistic transfer. Results showed no statistically significant differences in Arabic learning between the sequential and concurrent learning groups, except for adjective-noun agreement in the Grammaticality Judgment Task, where the sequential group performed better. Furthermore, no significant effects of gender or gender-by-group interaction were observed. These findings suggest that prior L2 exposure offered minimal discernible advantage in L3 learning. This research contributes to multilingualism studies by providing empirical evidence on the role of prior language experience in L3 learning, challenging assumptions about the universal benefits of sequential learning.

1. INTRODUCTION

In linguistically diverse nations like Iran, proficiency in global and regional languages such as English (L2) and Arabic (L3) is highly valued. The Iranian educational system presents a unique context for multilingualism research, as students are routinely required to study both English and Arabic concurrently from secondary school onward. Concurrently, more and more families are investing heavily in private English classes for their young children. This creates a divergence

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between a public system designed for concurrent instruction and a private preference for sequential learning (L2 before L3), based on the assumption that prior language experience facilitates subsequent learning. The efficacy of this prior foreign language learning in facilitating third language learning, however, remains unclear.

This practical pedagogical question is deeply intertwined with theoretical debates within Third Language Acquisition (TLA). Unlike Second Language Acquisition (SLA), TLA must account for the dynamic interactions between three or more linguistic systems (Cenoz, 2003). A primary challenge in L3 acquisition research is determining the origin of initial cross-linguistic influence (CLI) (Rothman, 2015). Contemporary frameworks are largely categorized as wholesale or partial transfer models. Wholesale transfer models contrast with partial transfer models. The former, which include the L1 Privilege Model, the L2 Status Factor, and the Typological Primacy Model (TPM), predict a complete reliance on either the L1 or L2 (e.g., Rothman, 2015; Bardel & Falk, 2010; Hermas, 2014). The latter, such as the Scalpel Model, the Cumulative Enhancement Model (CEM), and the Linguistic Proximity Model (LPM), advocate for feature-specific influences from both previously acquired languages (e.g., Slabakova, 2016b; Flynn et al., 2004; Westergaard et al., 2016). Despite extensive TLA research, a significant gap exists concerning language combinations involving typologically distinct languages from Iranian, Germanic, and Semitic families. Furthermore, to the best of my knowledge, no studies have yet specifically investigated the role of English (L2) in Arabic (L3) learning within the Iranian context, nor empirically compared the outcomes of sequential versus concurrent learning pathways for this specific language triad. The common assumption among parents and educators that a sequential path offers a distinct advantage remains largely untested.

To address this gap, the present study has three primary objectives: (1) to empirically compare the effectiveness of sequential versus concurrent L2-L3 learning on the development of Arabic (L3) morphosyntax; (2) to determine the source(s) of cross-linguistic influence (from L1 Persian, L2 English, or both) in early L3 learning; and (3) to evaluate the predictions of dominant L3 acquisition models in this novel and complex typological context. By comparing sequential learners (with early L2 exposure) and concurrent learners, this study examines whether English proficiency facilitates Arabic learning and empirically tests which theoretical model best accounts for the early stages of L3 Arabic learning.

2. LITERATURE REVIEW

The domain of third language (L3) acquisition has developed numerous theoretical models to account for the influence of existing linguistic knowledge on learning an additional language. These frameworks are especially relevant for typologically distinct language combinations, such as Persian (L1), English (L2), and Arabic (L3), which originate from different language families.

Wholesale Transfer Models

Prominent among theoretical approaches are wholesale transfer models, which argue that the early phase of L3 acquisition is predominantly influenced by a single previously acquired language. The L1 Privilege Model claims that cognitive entrenchment results in the dominance of the first language. Hermas (2014) illustrates: Arabic speakers transferred null-subject structures to French (L3) even though their L2 English lacked this feature, suggesting L1 persistence. However, this model fails when the L2 is linguistically closer to the L3 or when instruction emphasizes L2-L3 connections. In contrast, the L2 Status Factor argues that the second language has a stronger impact due to heightened metalinguistic awareness, especially in formal educational contexts. Empirical

studies support this view: for instance, Swedish learners of German preferred their L2 French over their L1 Swedish for pronoun placement (Bardel & Falk, 2010). Further empirical support for the L2 Status Factor in L3 interlanguage was provided by Eibensteiner (2022), whose study on the development of perfective and imperfective aspects in L3 Spanish by L1 German-L2 English bilinguals found L2 English to be the major source of transfer due to structural similarities. For Iranian learners studying Arabic (L3) after structured English (L2) education, this suggests English may override Persian (L1) as the main source of transfer for certain grammatical structures. The Typological Primacy Model (TPM) presents another perspective, proposing that cross-linguistic transfer is driven by perceived linguistic similarity rather than order of acquisition. Learners selectively adopt features from whichever prior language they judge most similar to the L3 (Rothman, 2015). For example, in a study supporting the Typological Primacy Model (TPM), Cabrelli Amaro et al. (2015) found that Spanish was the primary source of transfer for subject-to-subject raising in L3 Brazilian Portuguese. This finding held true for learners with either L1 English/L2 Spanish or L1 Spanish/L2 English profiles, as evidenced by their grammaticality judgment task

Partial Transfer Models

In opposition to wholesale transfer models, partial transfer frameworks propose more selective cross-linguistic influences. For this linguistic triad, the adjective-noun condition might be governed by Persian (L1), while patterns of definite article marking could be influenced by English (L2). Among these frameworks, the Cumulative Enhancement Model (CEM) (Flynn et al., 2004), proposes that only beneficial linguistic features are transferred, though this view fails to explain instances where transfer is detrimental. Recent research supports the CEM, showing that prior grammatical knowledge, such as the relative clause or wh-question parameter, can neutrally or positively influence L3 acquisition (Cho & Lee, 2024). Similarly, Westergaard's (2016) Linguistic Proximity Model (LPM) characterizes L3 acquisition as a selective process where learners draw on specific elements from their existing languages. Critically, the LPM posits that transfer occurs on a property-by-property basis, largely conditioned by structural similarity; studies provide evidence that L3 learners transfer distinct features from either their L1 or L2 to different extents for different grammatical properties (Archibald, 2023).

Although typological models (e.g., TPM; Rothman, 2015) predict transfer from the 'closest' language, recent research on child L3 acquisition (Kolb et al., 2022; Westergaard et al., 2016) indicates that structural proximity can supersede typology. Hypothetically, in a Persian-English-Arabic context, one might predict that Persian (L1) has a stronger influence than English (L2) on Arabic's 'adjective-noun' structure, whereas English has a greater effect on 'article marker' structures. This is because the adjective-noun order is the same in Persian and Arabic, while the use of definite articles is shared between English and Arabic but absent in Persian. However, to our knowledge, no empirical study to date has directly tested this specific triad for these structures. Expanding on these theories, Slabakova (2016b) proposes the Scalpel Model, which suggests that L3 acquisition may involve piecemeal transfer from either L1 or L2, with both facilitative and interfering transfer occurring. This selective process is influenced by factors such as structural similarity, feature complexity, input salience, prior language proficiency and frequency of target language patterns. This means that L3 learners can access all prior linguistic knowledge, allowing for facilitative or detrimental cross-linguistic influence (CLI) from any previously acquired languages. The model further suggests that if the L3 closely resembles one of the prior languages, which language may become the primary source of transfer, with CLI occurring on a property-by-property basis (Ben Abbes, 2020).

Given these competing perspectives, the current study aligns with partial transfer models, which accommodate variable influences from both Persian (L1) and English (L2) during Arabic (L3) learning. Specifically, we evaluate how learners selectively transfer features (e.g., adjective-noun, and article marker patterns) from both languages. This is consistent with property-by-property approaches such as Scalpel Model (Slabakova, 2016b), and Linguistic Proximity Model (Westergaard et al., 2016). A comparative analysis of these models' transfer mechanisms is provided in Table 1, which informs predicted outcomes for Arabic L3 learning scenarios.

Table 1: Comparative Analysis of L3 Transfer Models

Model	Primary Transfer Determinant	Possible Source(s)	Transfer Scope	Transfer Effects
L1 Privilege Model	L1 dominance	L1 only	Wholesale	Both facilitative & non-facilitative
L2 Status Model	L2 metalinguistic salience	L2 only	Wholesale	Both facilitative & non-facilitative
Typological Primacy Model (TPM)	Perceived typological proximity	L1 or L2	Wholesale	Both facilitative & non-facilitative
Cumulative Enhancement Model (CEM)	Typological differences	L1 & L2	Feature-specific	Only facilitative
Linguistic Proximity Model (LPM)	Structural similarity	L1 & L2	Feature-specific	Both facilitative & non-facilitative
Scalpel Model	Multiple factors*	L1 & L2	Feature-specific	Both positive & non-facilitative

*Key factors in Scalpel Model: Typological proximity, grammatical complexity, input ambiguity, frequency of exposure, prior language proficiency and target language usage patterns (Slabakova, 2016a).

Cross-linguistic Variation: Persian, English, and Arabic

Persian, English, and Arabic demonstrate substantial differences in language families and typological features. Although they share certain vocabulary and aspects of their writing systems, they differ significantly in linguistic classification, grammatical structures, lexical composition, orthographic conventions, phonological systems, and syntactic patterns. These differences generate specific testable predictions for L3 acquisition models. In terms of language families, Arabic is part of the Semitic branch of Afro-Asiatic languages (Hetzron, 1997; Versteegh, 2014), while Persian is an Indo-Iranian language (Comrie, 1990; Windfuhr, 1979), and English is a Germanic language belonging to Indo-European (Crystal, 2018). Grammatically, Arabic is characterized by its triconsonantal root system (Holes, 2004), complex case marking, and grammatical gender (Ryding, 2005), with Classical Arabic following VSO word order while modern dialects tend toward SVO structures (Brustad, 2000). In contrast, Persian typically employs SOV word order (Mahootian, 2010), lacks grammatical gender and case inflections (Windfuhr, 1979), and uses the ezafe construction for nominal modification. Ezafe is a grammatical particle in Persian that connects a head noun to its modifiers, including adjectives, possessors, or nouns in genitive relationship. It is pronounced as **-e** after consonants (e.g., ketabe bozorg ' the big book') and **-ye** after vowels (e.g., khaneh-ye man ' my house'). The ezafe is not a

separate word but is obligatory in Persian for post-nominal modification, fulfilling roles that prepositions (like of), possessive markers, or word order serve in other languages (Samvelian, 2018). English predominantly follows SVO ordering (Greenberg, 1963; Dryer, 2013) and has undergone significant reduction in its inflectional systems (Crystal, 2018). Lexically, Persian has incorporated approximately 30-40% of its vocabulary from Arabic (Perry, 2005), while Arabic has borrowed comparatively less from Persian (Versteegh, 2014). Orthographically, both Persian and Arabic use right-to-left writing systems, with Persian employing a modified Arabic script containing additional letters (Windfuhr, 1979; Coulmas, 2003). Phonologically, Arabic contains distinctive pharyngeal and emphatic consonants not present in Persian (Watson, 2002). Syntactically, Persian and Arabic share post-nominal adjective placement (Greenberg, 1963), unlike English, which uses a pre-nominal pattern. However, both English and Arabic use definite articles (*the*, al-), unlike Persian (Windfuhr, 1979). Elaborating on grammatical differences, both Arabic and Persian exhibit subject-pronoun deletion (pro-drop), contrasting with English's requirement for overt subjects. In Arabic, this feature results from its rich verb conjugation system, where the verb provides sufficient information about the subject's person and number, making explicit pronouns often unnecessary (Wright, 1896; Ryding, 2005). Similarly, Persian is a null-subject language, allowing omission of personal pronouns when the subject is inferable from verb endings or discourse context (Windfuhr, 1979; Karimi, 2005). The following section will detail the specific grammatical structures examined in this study.

Adjective-Noun Condition

In Persian and Arabic, adjectives follow the nouns they modify, as seen in examples (1.a) and (1.b). English, however, places adjectives before nouns, as shown in example (1.c).

1. a. *ghazā-ye khoshmaze mi-pazam*
   food-some delicious 1st per. Sig.-cook
   I cook delicious food
   b. *aṭbukhu ṭaʿāman ladhīdhān*
   cook-I food delicious
   I cook delicious food
   c. I cook delicious food

Definite Article Condition

English and Arabic express definite articles with "the" and "al-", respectively (e.g., "the Haram," "al-ḥaram"), preceding the noun. Persian, however, lacks an overt definite article; definiteness is inferred through context, syntax, or the ezafe construction (e.g., "haram"). This creates a fundamental difference where Persian speakers must learn to use a new, separate grammatical element for definiteness when learning English or Arabic. Table 2 summarizes the critical structural contrasts between the languages for the two target conditions under investigation.

Table 2: Overview of Two Conditions

Condition	Persian(L1)	English(L2)	Arabic(L3)
Adjective-Noun	Noun + Adjective	Adjective + Noun	Noun + Adjective
Example	*ghazā-ye khoshmazeh mīpazam*	I cook delicious food.	*ʾaṭbukhu ṭaʿāman ladhīdhān*
Definite Article	-Article (Ø)	+Article (The)	+Article (ال)
Example	*key be haram mīresīm?*	When do we reach the Haram?	*matā naṣilu ʾilā al-ḥaram?*

Note: **The "Scenario" row indicates the structural relationships that predict cross-linguistic influence. "L1 = L3 # L2" means Persian (L1) and Arabic (L3) share a similar structure that is different from English (L2). "L1 # L2 = L3" means English (L2) and Arabic (L3) share a similar structure that is different from Persian (L1). This study leverages these two conflicting structural scenarios to evaluate five L3 acquisition models. The primary aim is to determine (1) which model best accounts for the initial stages of L3 Arabic learning and (2) whether learners with sequential exposure to English (L2 before L3) demonstrate a significant advantage over those who learn English and Arabic concurrently. The competing predictions of the models will be tested by examining which prior language, L1 Persian or L2 English, serves as the source of transfer for each specific structure.**

Research Questions

1. Do sequential and concurrent groups perform significantly differently in learning "adjective-noun" position in L3 Arabic?

2.Is there a significant difference in achievement between sequential and concurrent groups in learning "definite article" in L3 Arabic?

3.Is there a significant difference in L3 Arabic learning performance regarding gender in the different participant groups?

4.Does cross-linguistic influence (CLI) on L3 Arabic stem from one or all prior languages (L1 Persian or L2 English)?

5.Does language transfer from L1 Persian and L2 English facilitate or hinder L3 Arabic learning?

3. METHODOLOGY AND DESIGN

This study used a quantitative, quasi-experimental, between-subjects design. The independent variables were learning condition (sequential vs. concurrent L2-L3 learning) and gender (male vs. female). The dependent variable was accuracy on three Arabic grammar tasks (GJT, GFT, SUT). Control variables included age, grade, L1, Arabic beginner status, and pre-intermediate English proficiency. Participants were not randomly assigned but grouped based on existing English language knowledge. Task order was fixed (GJT → GFT → SUT). Non-parametric tests (Mann-Whitney U) and two-way ANOVA were used for analysis. A non-significant difference would support the null hypothesis that prior English knowledge does not affect Arabic grammar learning.

Participants

The study participants consisted of 64 ninth-grade native Persian speakers (aged 14 years) recruited via convenience sampling from a private school complex (Sayed al-Shohada) in Yazd, Iran. The participants were equally divided into two groups of 32 students each, with a balanced

gender distribution (16 boys and 16 girls per group). The sequential learning group was composed of students with pre-intermediate English proficiency, which they had acquired through classes at private language institutes starting at approximately 5–6 years of age. In contrast, the concurrent learning group had no prior formal language learning experience before beginning their education and started studying both English and Arabic simultaneously in the seventh grade. A background questionnaire and Arabic scores from grades 7–8 confirmed that all participants were beginners in formal Arabic. Therefore, Arabic was treated as an L3 in this study, which focused exclusively on classroom-based learning of Arabic grammar, with no prior academic knowledge assumed.

Instruments

Background Questionnaire:

Administered at the start of the ninth grade, this form collected information on students' personal and language-learning backgrounds to assess demographic characteristics and prior language exposure. It was used to categorize participants into sequential and concurrent learner groups based on their language learning history.

English Placement Test:

The study used a 50-item grammar test adapted from"UsingEnglish.com", employing its original five-level scoring system: Beginner (0-20%), Elementary (21-40%), Pre-intermediate (41-60%), Intermediate (61-80%), and Upper-intermediate (81-100%). The reliability and validity of the test were established through a multi-faceted process. Reliability was assessed via strong test-retest consistency over a two-week interval ($r = .82$, $n = 20$) and high internal consistency ($\alpha = .84$). Validity was established through a content validity review by three English language teaching specialists, whose feedback led to minor refinements that enhanced measurement precision. To ensure sample homogeneity for examining L2 (English) effects on L3 (Arabic) learning, only participants scoring at the pre-intermediate level were included. Score interpretation followed the original five-level system, with higher percentages indicating greater proficiency. These rigorous procedures confirm the instrument's robustness and appropriateness for the purposes of this study.

Grammaticality Judgment Task (GJT):

A 14-item task assessing Arabic sentence grammaticality, focusing on "adjective-noun and definite article" structures, with responses marked as "correct, incorrect, or I don't know". A correct judgment was scored as 1, an incorrect judgment as 2, and "I don't know" as 3 (1 = accurate judgment, 2 = inaccurate judgment, and 3 = uncertainty). Participants were required to provide brief explanations for their judgments to help identify the source of transfer.

Gap-Filling Task (GFT):

A 14-item task testing knowledge of "adjective-noun and definite article" through sentence completion, with responses analyzed for correctness. Responses were coded as 1 for correct, 2 for incorrect, and 3 for "I don't know" (1 = correct answer, 2 = incorrect answer, and 3 = non-response/uncertainty). Participants also provided short written explanations for their choices.

Sentence Unscrambling Task (SUT):

A 9-item task where participants rearranged scrambled words into correct Arabic sentences, targeting the adjective-noun and definite article structures. Scoring followed a strict rubric: 1 for correct sentences, 2 for incorrect, and 3 for blank/"I don't know" responses. (1 = fully correct sentence, 2 = incorrect sentence, and 3 = no response produced).

Task Development and Validation:

The three Arabic assessment tasks (GJT, GFT, and SUT) were developed using items from standard Iranian junior high school textbooks (grades 7-8) to ensure curricular validity. Prior to the main study, a pilot study with 15 participants (independent of the main study) established the instruments' psychometric properties, demonstrating strong test-retest reliability (GJT: r = .85; GFT: r = .83; SUT: r = .81) and excellent intra-rater agreement (κ = .89) through systematic rescoring by a native Arabic-speaking linguist. Three independent experts further validated the tasks' construct alignment with the target grammatical structures and their cultural appropriateness. This rigorous process—incorporating textbook-based items, reliability testing with a pilot cohort, and expert validation—confirms the tasks' robustness for investigating L2 transfer effects on the specified structures.

Procedure

The study selected 64 male and female EFL learners from an initial pool of 380 ninth-grade students in Yazd through a preliminary questionnaire screening. From this group, 123 participants reported beginning English instruction around age five and indicated familiarity only with Persian (their native language) and English. A standardized grammar test was administered to all participants to evaluate their knowledge of English grammar, with results classified into five proficiency levels from Beginner (0-20%) to Upper-intermediate (81-100%). A psychometric evaluation demonstrated strong test-retest reliability over two weeks (r = .82, n = 20) and high internal consistency (α = .84). Content validity was independently verified by three English language teaching specialists, whose feedback informed subsequent refinements to the measurement instrument. Analysis showed that the majority of test-takers performed at the pre-intermediate level (41-60%), leading to the exclusion of participants scoring outside this range (e.g., Beginner or Upper-intermediate). The final sample was composed of two groups: thirty-two Pre-intermediate learners (16 males, 16 females) who followed a sequential language learning path (L1 Persian→L2 English→L3 Arabic), as determined by the Background Questionnaire which confirmed that they began formal English instruction at private language institutes at approximately 5–6 years of age, and another thirty-two (16 males, 16 females) with no prior English exposure who learned English and Arabic concurrently (L1 Persian with simultaneous L2/L3 learning), as confirmed by the Background Questionnaire indicating no formal language learning before grade 7 and simultaneous initiation of English and Arabic in the seventh grade. To ensure methodological rigor through triangulation, researchers employed three assessment tools (GJT, GFT, and SUT).

The three Arabic assessment tasks (GJT, GFT, and SUT) were administered in three separate sessions (one per task), each lasting approximately two hours, over a two-week period. The Grammaticality Judgment Test (GJT) consisted of 14 Arabic language items evaluating two key structures: adjective-noun and definite article**.** The task included grammatically correct and incorrect sentences, along with distractors. Participants selected from three coded response options (1=correct, 2=incorrect, 3=I don't know) and supplied brief written justifications for their choices.

One week later, researchers administered the 14-item Gap-Filling Task (GFT) containing items targeting the adjective-noun and definite article structures, along with distractors. Participants again selected from the three coded options and provided concise written explanations. On the following day, participants completed the Sentence Unscrambling Task (SUT) comprising 9 items targeting the adjective-noun and definite article structures. Grammatical responses were scored 1, while ungrammatical and blank ones were scored 2, and 3 respectively. Notably, for the concurrent group, English-like patterns were attributed to Arabic influence rather than English transfer.

To investigate how prior language learning experience (sequential vs. concurrent) and gender influence the learning of Arabic grammar—specifically "adjective-noun position" and "definite article"—data were analyzed using SPSS (Version 26).

4. RESULTS

This study examined the learning of Arabic 'adjective-noun' position and 'definite article' by sequential and concurrent learners using three tasks: GJT, GFT, and SUT.

Adjective-Noun Condition

Descriptive analysis

To address RQ1, Table 3 below presents the descriptive statistics and Mann-Whitney U test results comparing the two groups across the three tasks.

Table 3: Results from Descriptive Statistics and the Mann-Whitney U Test.

Task	Group	*M*	*SD*	*N*	*U*	*Z*	*P*	*R*
GJT	Sequential	65.62	28.92	16	370.50	-1.98	.047	-0.24
	Concurrent	53.12	24.38	16				
GFT	Sequential	78.90	27.75	16	497.50	-0.211	.833	-0.02
	Concurrent	76.56	29.05	16				
SUT	Sequential	92.18	18.44	16	491.00	-0.430	.667	-0.05
	Concurrent	87.00	28.39	16				

As shown in the table above, the sequential group consistently achieved higher correct means for the sequential group in GJT (65.62), GFT (78.90), and SUT (92.18) compared to the concurrent group in GJT (53.12), GFT (76.56), and SUT (87.00). A Mann-Whitney U test, conducted due to non-normal variance, revealed a significant difference favoring the sequential group in GJT (U = 370.50, Z = -1.98, p = .047, r = -0.24, moderate effect). However, no significant differences were found in GFT (U = 497.50, Z = -0.211, p = .833, r = -0.02, small effect) or SUT (U = 491.00, Z = -0.430, p = .667, r = -0.05, small effect). Figures 1-3 illustrate the distribution of correct, incorrect, and 'I don't know' answers across the three tasks. As shown in these figures, the sequential group consistently achieved higher average correct response scores than the concurrent group in the GJT, GFT, and SUT.

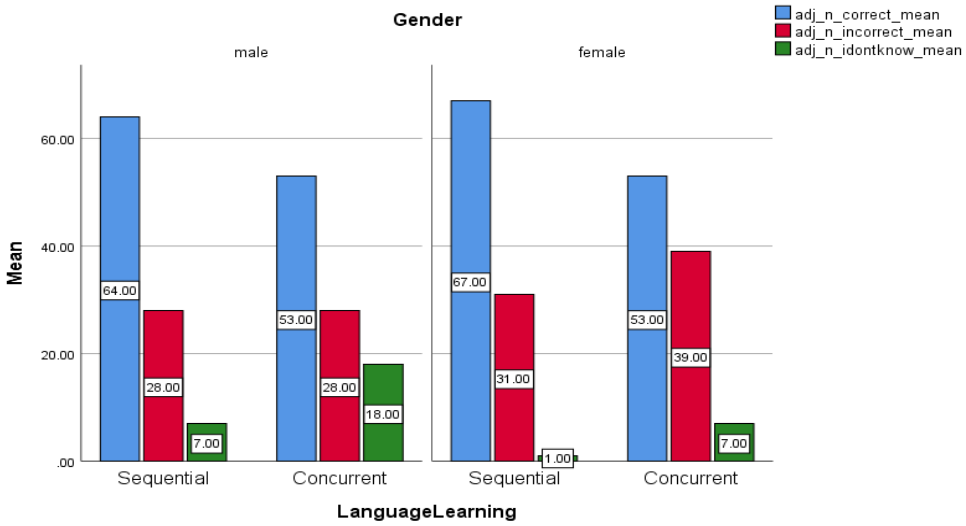

Figure1: Mean Performance of Each Group in the GJT Task, categorized by response

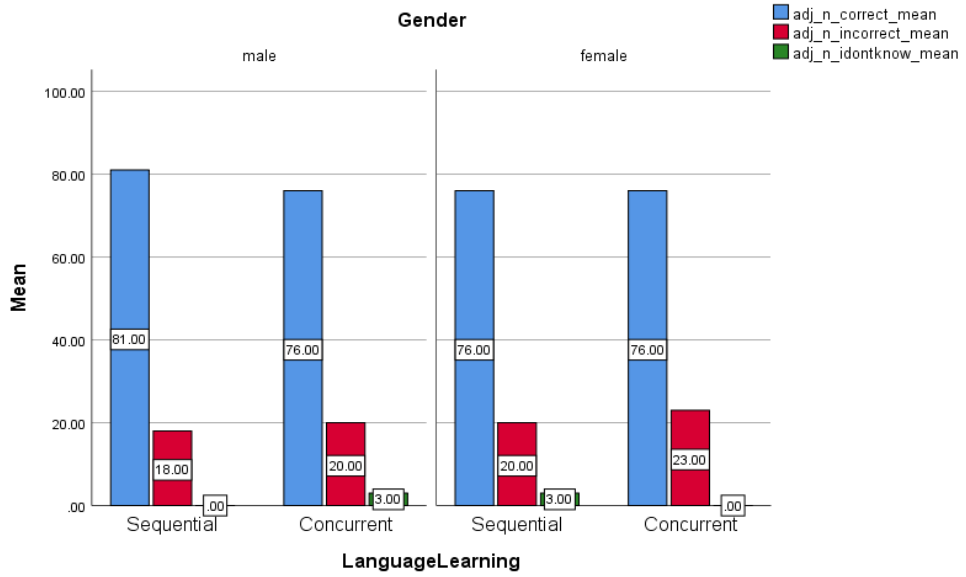

Figure2: Mean Performance of Each Group in the GFT Task, categorized by Response

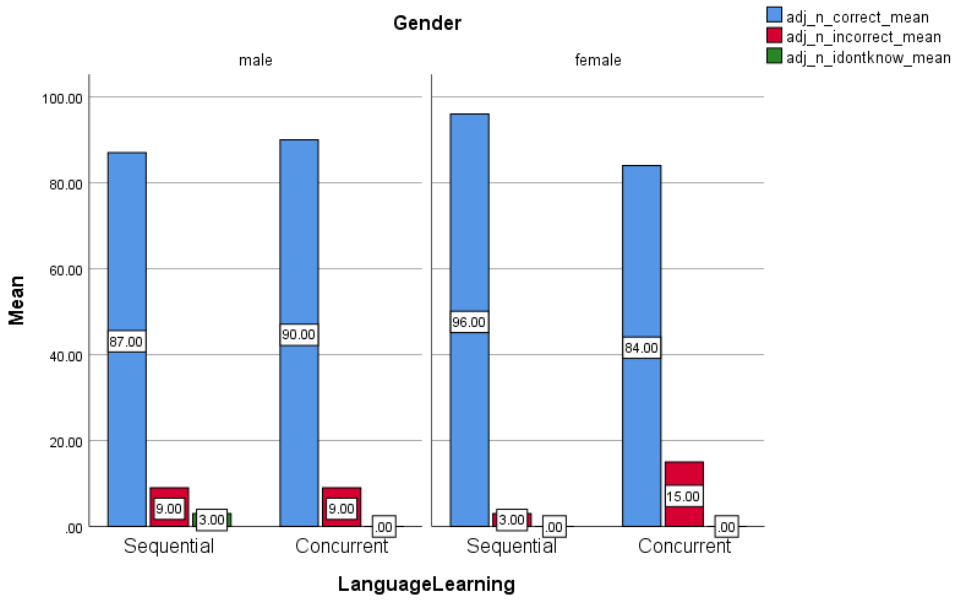

Figure3: Mean Performance of Each Group in the SUT Task, categorized by Response

Two-way Between Subjects ANOVA

To address RQ3, Table 4 and Table 5 present the descriptive statistics and two-way ANOVA results for the effects of learning group and gender on adjective-noun accuracy across the three tasks (GJT, GFT, and SUT).

Table 4: Descriptive Statistics of Task, Group, and Gender

Task	Group	Gender	*M*	*SD*	*N*
GJT	Sequential	Male	64.04	24.09	16
		Female	67.18	33.81	16
	Concurrent	Male	53.12	25.61	16
		Female	53.12	23.93	16
GFT	Sequential	Male	81.25	21.40	16
		Female	76.56	33.50	16
	Concurrent	Male	76.56	23.21	16
		Female	76.56	34.72	16
SUT	Sequential	Male	87.50	22.36	16
		Female	96.87	12.50	16
	Concurrent	Male	90.62	27.19	16
		Female	84.37	30.10	16

Note. ***M*** **=(correct) Mean;** ***SD*** **= Standard Deviation;** ***N*** **= Number.**

The descriptive statistics in Table 4 show that the sequential group consistently had higher mean scores than the concurrent group across all three tasks. In the GJT, females in the sequential group (M = 67.18) slightly outperformed males (M = 64.04), while in the concurrent group, both genders had identical means (M = 53.12). In the GFT, sequential males scored highest (M = 81.25), whereas sequential females (M = 76.56) were equal to both concurrent group genders. In the SUT, sequential females achieved the highest mean (M = 96.87), while concurrent females (M = 84.37) scored lower than concurrent males (M = 90.62).

Table 5: Two-Way Between-Subjects ANOVA Results

Task	Source of Variance	*df*	*F*	*p*	Partial η²
GJT	Language Learning (A)	1	3.38	.071	.053
	Gender (B)	1	.053	.819	.001
	A B Interaction	1	.053	.819	.001
	Residual (Error)	60			
GFT	Language Learning (A)	1	.10	.74	.00
	Gender (B)	1	.10	.74	.00
	A B Interaction	1	.10	.74	.00
	Residual (Error)	60			
SUT	Language Learning (A)	1	.61	.43	.01
	Gender (B)	1	.06	.79	.00
	A B Interaction	1	1.69	.19	.02
	Residual (Error)	60			

Note. ***df*** **= Degrees of Freedom;** ***F*** **= F-statistic;** ***p*** **= p-value; Partial η² = Partial Eta Squared**

The ANOVA results in Table 5 confirm that neither learning method, gender, nor their interaction had a statistically significant effect on adjective-noun accuracy in any of the three tasks. Levene's test indicated equal variances for all tasks (GJT: 2.110, p = .108; GFT: 0.327, p = .806; SUT: 0.792, p = .503). For the GJT, the main effect of learning method approached but did not reach significance (p = .071), while gender (p = .819) and the interaction (p = .819) were clearly non-significant. For the GFT and SUT, all p-values were well above .05, indicating no significant main effects or interactions. The partial eta squared values (η²) for all effects were small (.00 to .053), reflecting negligible effect sizes.

Source of Transfer

In response to RQ4 & 5, regarding the Adjective-Noun condition's language source, Table 6 presents the mean scores for source of transfer across the three tasks (GJT, GFT, and SUT), categorized by source language (Persian L1, English L2, Arabic L3) and language learning group (sequential vs. concurrent).

Table 6: Source of Transfer in Adjective-Noun Condition

Task	Source of Language	Language Learning Group	*M*	*SD*
GJT	Persian L1	Sequential	66.40	28.82
		Concurrent	52.34	24.06
	English L2	Sequential	28.90	24.68
		Concurrent	0.00	0.00
	Arabic L3	Sequential	0.00	0.00
		Concurrent	1.56	8.83
GFT	Persian L1	Sequential	78.90	27.75
		Concurrent	75.78	29.43
	English L2	Sequential	19.53	25.97
		Concurrent	0.00	0.00
	Arabic L3	Sequential	0.00	0.00
		Concurrent	0.00	0.00
SUT	Persian L1	Sequential	93.75	16.80
		Concurrent	89.06	24.54
	English L2	Sequential	3.12	12.29
		Concurrent	0.00	0.00
	Arabic L3	Sequential	0.00	0.00
		Concurrent	1.56	8.83

The table above provides detailed mean scores supporting the transfer patterns described. For the GJT, the sequential group showed higher Persian L1 transfer (M = 66.40) than the concurrent group (M = 52.34), as well as notable English L2 transfer (M = 28.90) compared to the concurrent group (M = 0.00). The concurrent group showed a small amount of Arabic L3 transfer (M = 1.56), while the sequential group showed none (M = 0.00). For the GFT, similar patterns emerged: the sequential group outperformed the concurrent group in both Persian L1 (78.90 vs. 75.78) and English L2 (19.53 vs. 0.00), with neither group showing Arabic L3 transfer. For the SUT, the sequential group again scored higher than the concurrent group in Persian L1 (93.75 vs. 89.06) and English L2 (3.12 vs. 0.00), while only the concurrent group showed minimal Arabic L3 transfer (M = 1.56). Figures 4-6 show sequential language learning groups had higher language transfer means (Persian, English) across the GJT, GFT, and SUT tasks compared to concurrent groups.

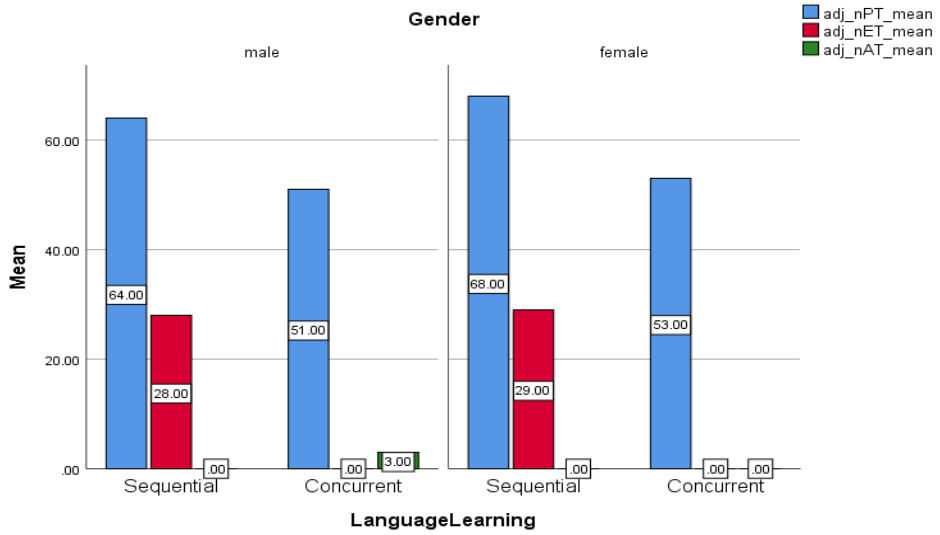

Figure 4: GJT Language Transfer Means: Sequential vs. Concurrent Groups

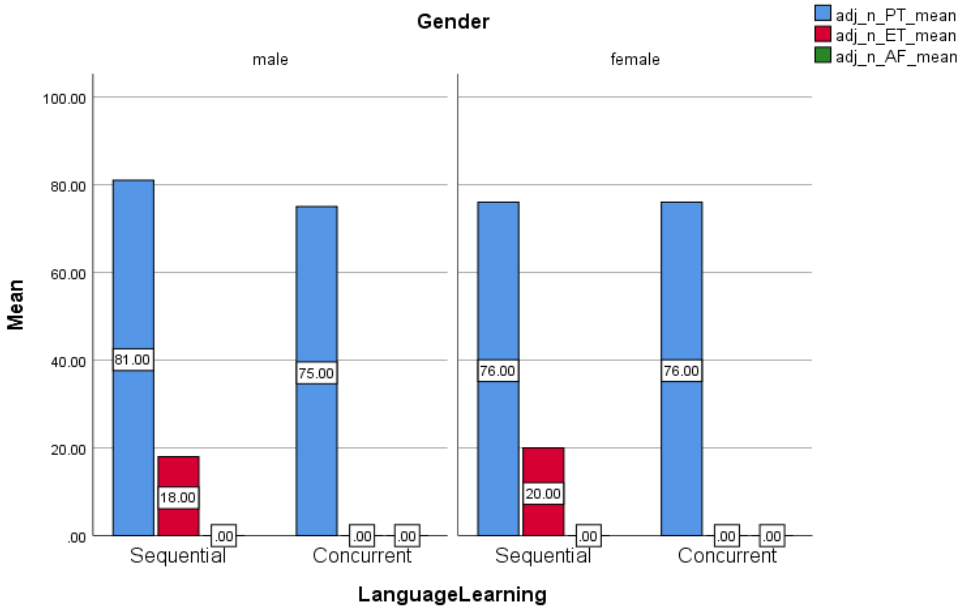

Figure5: GFT Language Transfer Means: Sequential vs. Concurrent Groups

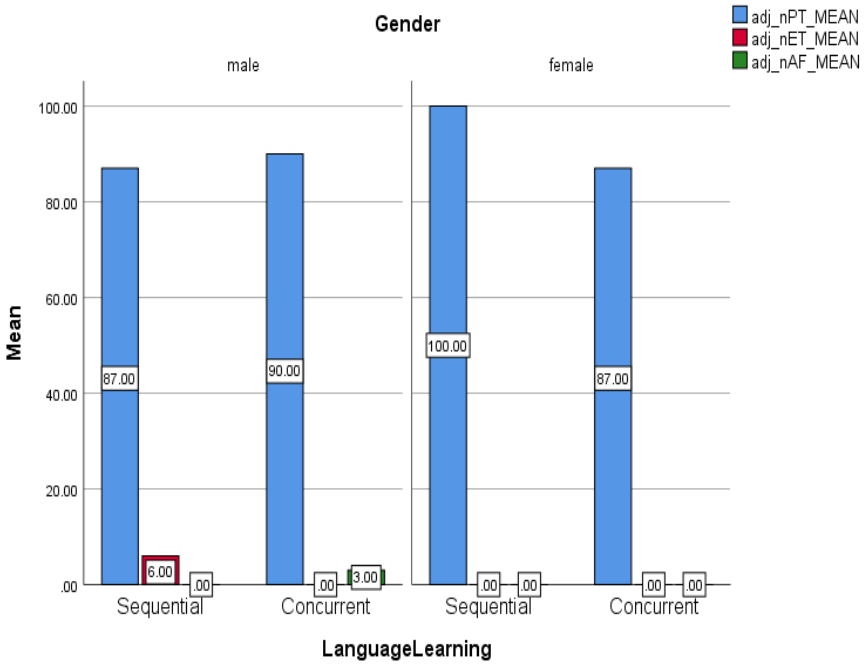

Figure6: SUT Language Transfer Means: Sequential vs. Concurrent Groups

Definite article condition

Descriptive analysis

To address RQ2, Table 7 presents the descriptive statistics and Mann-Whitney U test results for group comparisons across the three tasks. As shown in the table, the sequential group outperformed the concurrent group in all tasks, with the largest difference observed in the Sentence Unscrambling Task (SUT).

Table 7: Descriptive Statistics and the Mann-Whitney U Test Results for Group Comparisons

Task	Group	*M*(correct)	*SD*	*N*	*U*	*Z*	*p*	*r*
Grammatical	Sequential	53.12	20.81	32	427.00	-1.206	.22	-0.150
Judgment Task (GJT)	Concurrent	45.31	23.27	32				
Gap-filling Task(GFT)	Sequential	67.96	31.26	32	376.50	-1.883	.06	-0.235
	Concurrent	57.03	27.11	32				
Sentence	Sequential	31.25	35.35	32	390.00	-1.900	.05	-0.237
Unscrambling Task(SUT)	Concurrent	15.62	26.75	32				

Table 7 also shows that the groups did not differ significantly from one another in GJT (U = 427.00, Z = -1.20, p = .22, R = -0.15), GFT (U = 376.50, Z = -1.88, p = .06, R = -0.23), and SUT (U = 390.00, Z = -1.90, p = .05, R = -0.23). Figures 7-9 show group response means for the 'definite article' condition.

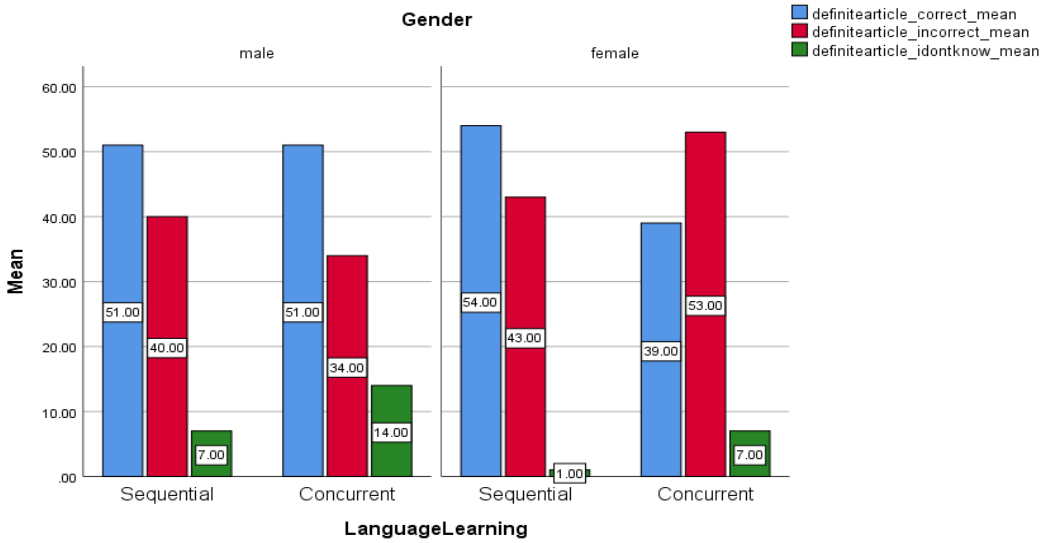

Figure 7: GJT Mean Performance by Response

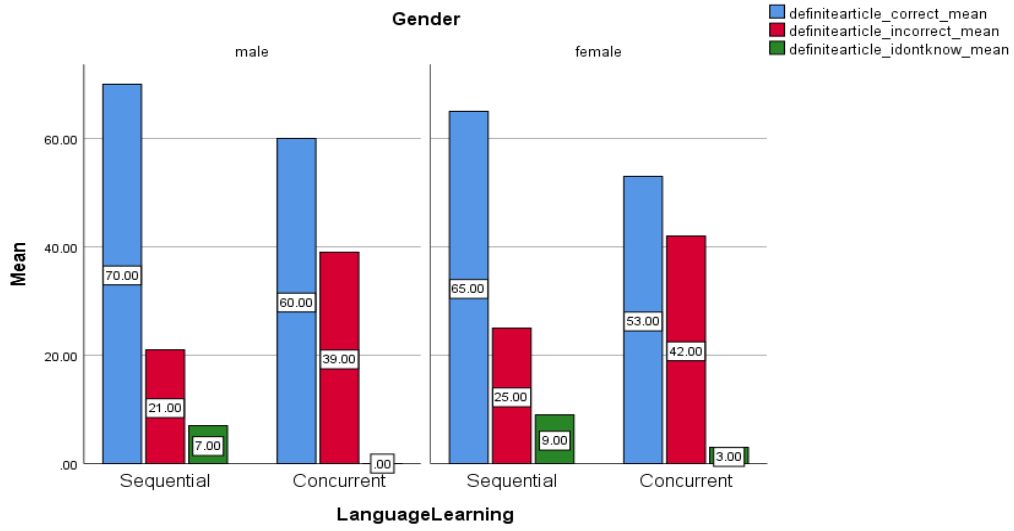

Figure 8: GFT Mean Performance by Response

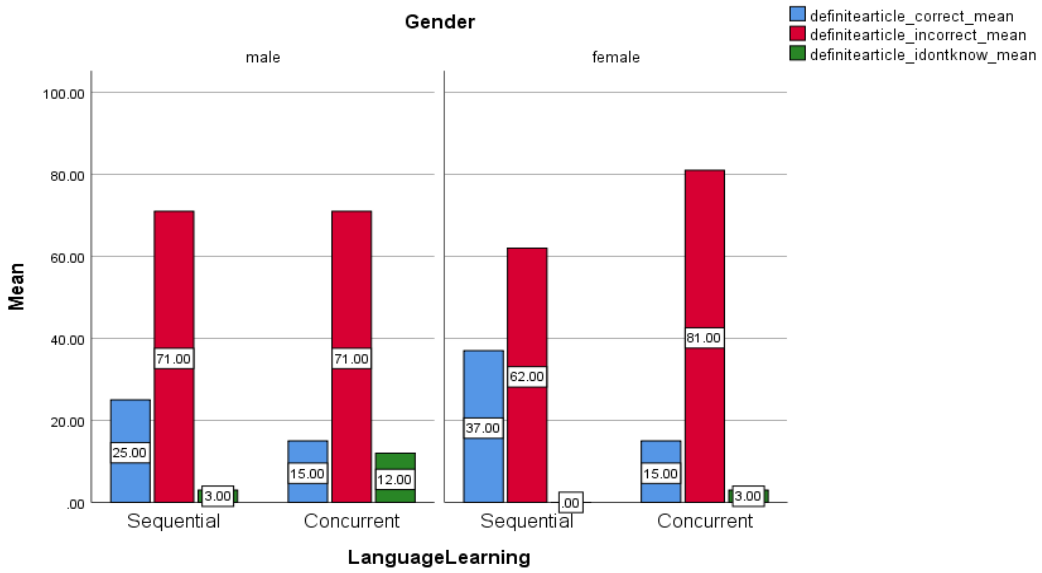

Figure 9: SUT Mean Performance by Response

Two-way ANOVA

To address RQ3, Table 8 presents the descriptive statistics for definite article accuracy across task type, gender, and learning method group (sequential vs. concurrent). As shown in the table, sequential learning groups consistently outperformed concurrent groups across all three tasks, with notable gender differences varying by task.

Table 8: Descriptive statistics of Task, Gender and Group

Task	Group	Male	Female	Male	Female	Male	Female
		M	*M*	*SD*	*SD*	*N*	*N*
GJT	Sequential	51.56	54.68	14.34	26.17	16	16
	Concurrent	51.56	39.06	24.94	20.34	16	16
GFT	Sequential	70.31	65.62	26.17	36.37	16	16
	Concurrent	60.93	53.12	24.09	30.10	16	16
SUT	Sequential	25.00	37.50	25.81	42.81	16	16
	Concurrent	15.62	15.62	30.10	23.93	16	16

***Note. M* = Mean(correct); *SD* = Standard Deviation; *N* = Number**

Table 8 also shows that within the sequential group on the SUT, females scored higher (37.50) than males (25.00), while in the concurrent group on the SUT, both genders had identical means

(15.62). On the GFT, sequential males scored the highest overall (70.31), and sequential females also outperformed their concurrent counterparts (65.62 vs. 53.12).

Table 9 summarizes the two-way between-subjects ANOVA results examining the main effects of language learning method and gender, as well as their interaction, on definite article accuracy across the three tasks.

Table 9: Two-Way Between-Subjects ANOVA Results

Task	Source of Variance	*df*	*F*	*p*	Partial η²
GJT	Language Learning (A)	1	2.02	.16	.03
	Gender (B)	1	0.73	.39	.01
	A B Interaction	1	2.02	.16	.03
	Residual (Error)	60			
GFT	Language Learning (A)	1	2.19	.14	.03
	Gender (B)	1	0.71	.40	.01
	A B Interaction	1	0.04	.83	.00
	Residual (Error)	60			
SUT	Language Learning (A)	1	3.92	.05	.06
	Gender (B)	1	0.62	.43	.01
	A B Interaction	1	0.62	.43	.01
	Residual (Error)	60			

***Note.* *df* = Degrees of Freedom; *F* = F-statistic; *p* = p-value; Partial η² = Partial Eta Squared**

Table 9 indicates that no significant main effects or interactions were found for any of the three tasks. Although Levene's test indicated unequal variances for the GJT (p = .029) and SUT (p = .021), suggesting caution in interpreting the standard ANOVA results, the overall pattern remained consistent. The marginal significance for learning method in SUT (p = .05, ηp² = .06) hints at a possible trend favoring sequential learning, though overlapping confidence intervals suggest uncertainty. Thus, neither learning method, gender, nor their interaction significantly impacted definite article accuracy in this study across all tasks.

Linguistic Transfer Sources

Table 10 addresses RQ4 and RQ5 by presenting the mean scores and standard deviations for the sequential and concurrent groups across three tasks, organized by the suspected source of language transfer (Persian L1, English L2, Arabic L3) in the definite article condition. As shown in the table, the sequential group demonstrated evidence of both non-facilitative transfer from L1 (Persian) and facilitative transfer from L2 (English), whereas the concurrent group only exhibited non-facilitative transfer from L1.

Table 10: Source of Transfer in Definite Article Condition

Task	Source of Language	Language Learning Group	*M*	*SD*
GJT	Persian L1	Sequential	42.18	21.47
		Concurrent	39.84	23.63
	English L2	Sequential	53.12	19.82
		Concurrent	0.00	0.00
	Arabic L3	Sequential	0.00	0.00
		Concurrent	39.06	23.70
GFT	Persian L1	Sequential	20.31	27.26
		Concurrent	57.81	26.51
	English L2	Sequential	56.25	33.60
		Concurrent	0.00	0.00
	Arabic L3	Sequential	0.00	0.00
		Concurrent	24.21	20.56
SUT	Persian L1	Sequential	42.18	38.33
		Concurrent	46.87	42.00
	English L2	Sequential	39.06	37.53
		Concurrent	0.00	0.00
	Arabic L3	Sequential	0.00	0.00
		Concurrent	18.75	30.45

***Note. M* = Mean(correct); *SD* = Standard Deviation**

Table 10 further details that in the GJT task with Persian as L1, the sequential group had a higher mean score (M = 42.18, SD = 21.47) than the concurrent group (M = 39.84, SD = 23.63). Furthermore, the sequential group's English score (M = 53.12, SD = 19.82) was greater than the concurrent group's (M = .000, SD = .000). These results indicate that the sequential group exhibited both non-facilitative transfer from L1 (Persian) and facilitative transfer from L2 (English). However, the concurrent group only showed non-facilitative transfer from L1. In the GFT task with Persian as L1, the sequential group scored lower (M = 20.31, SD = 27.26) than the concurrent group (M = 57.81, SD = 26.51). Additionally, the sequential group's English score (M = 56.25, SD = 33.60) was higher than the concurrent group's (M = .000, SD = .000). This suggests that the sequential group's facilitative transfer from L2, which is similar to L3 (Arabic), was stronger than its non-facilitative transfer from L1. In the SUT task, the sequential group again scored lower (M = 42.18, SD = 38.33) compared to the concurrent group (M = 46.87, SD = 42.00) in Persian transfer. In English transfer, the sequential group performed better (M = 39.06, SD = 37.53) than the concurrent group (M = .000, SD = .000), mirroring the pattern observed in the GFT task.

Figures 10-12 show language transfer means in sequential and concurrent groups across tasks. Figure 10 shows higher Persian transfer means for the sequential group in GJT, but Figures 11 and 12 show higher Persian transfer means for the concurrent group in GFT and SUT.

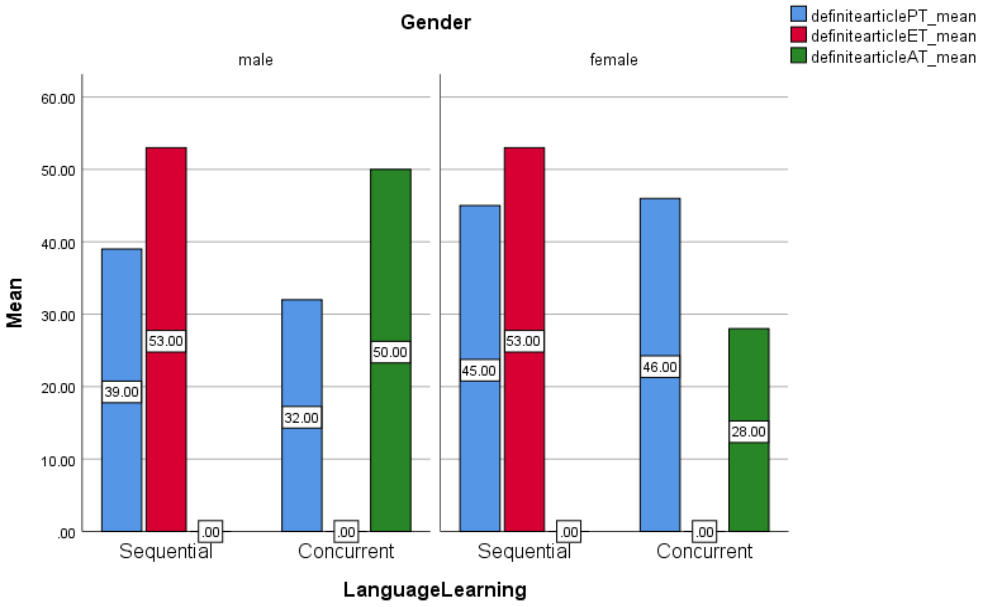

Figure 10: GJT Language Transfer Means: Sequential vs. Concurrent Groups

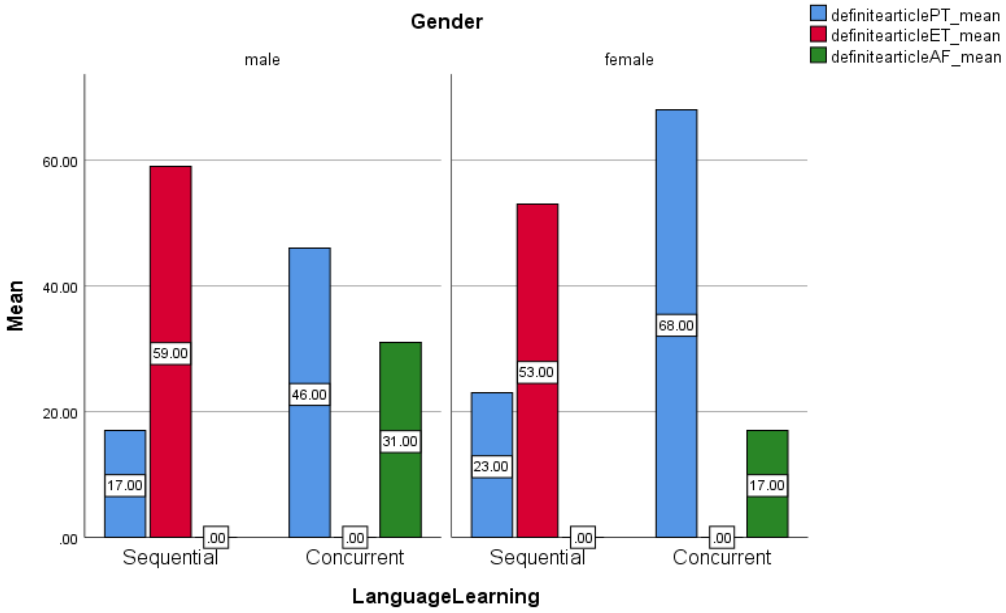

Figure 11: GFT Language Transfer Means: Sequential vs. Concurrent Groups

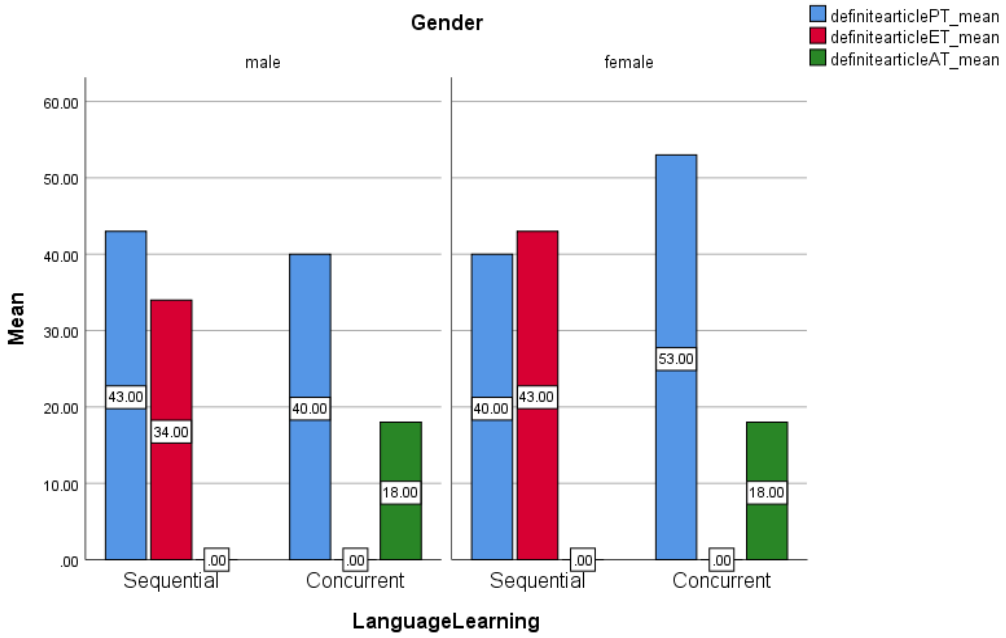

Figure 12: SUT Language Transfer Means: Sequential vs. Concurrent Groups

5. DISCUSSION

This study analyzed the learning of L3 Arabic "adjective-noun" position and "definite article" usage by sequential and concurrent learners. Despite slightly higher mean scores for the sequential group in both conditions, no statistically significant differences were found, suggesting that prior linguistic experience in sequential learning does not always guarantee an advantage.

To address the first research question, analysis showed sequential learners had higher mean scores, with only the GJT task for the adjective-noun condition reaching statistical significance, possibly due to random variation. In this condition, both positive (L1) and negative (L2) transfer occurred. The lack of significant differences between the sequential and concurrent groups implies that L2 proficiency (at a pre-intermediate level) in the sequential group might need to surpass a certain threshold for beneficial transfer to occur, aligning with the 'proficiency ceiling' hypothesis (Rothman, 2015; Jaensch, 2009).

To address the second research question, the results showed the sequential group (with L2-L3 structural alignment) had higher mean scores than the concurrent group (L1 transfer only), though this difference was non-significant. Despite predicted advantages from L2-L3 similarity, insufficient pre-intermediate L2 proficiency kept sequential learners from benefiting from shared structures, reinforcing the proficiency threshold hypothesis. While the Linguistic Proximity Model (Westergaard et al., 2016) forecasts transfer based on structural overlap, our findings show its dependency on proficiency thresholds. This aligns with the Scalpel Model's emphasis on multifactorial influences, like L2 dominance and proficiency, which can override typological proximity. These findings qualify Westergaard et al.'s (2016) claim that shared features enhance L3 acquisition, showing such facilitation requires adequate L2 proficiency, a condition not met here. Together, they reveal L3 acquisition as a process where structural similarity advantages remain latent without sufficient L2 competence, explaining why sequential learners didn't significantly outperform concurrent peers despite theoretical advantages.

To examine the third research question, analyses of both constructions (adjective-noun order and definite article marking) showed that neither males nor females in any group

outperformed the other, indicating no significant gender differences. Similarly, no significant interaction emerged between gender and learning group (sequential/concurrent). However, descriptive trends (e.g., females in the sequential group scoring slightly higher in GJT/SUT) should be interpreted with cautious interpretation due to low statistical power. These results support Ellis's (2008) conclusion that while gender may influence learning styles and motivation, it does not significantly affect language learning outcomes. This perspective finds further support in Kheder and Rouabhia's (2023) recent work, which clarifies that apparent gender differences in language learning actually reflect sociocultural influences and learning environment factors rather than essential differences in language learning capacity between genders.

To address the fourth and fifth research questions addressing differential transfer, sequential learners showed facilitative L1 and non-facilitative L2 transfer for 'adjective-noun' (L1/L3 similar, L2 different), while concurrent learners showed only facilitative L1 transfer (no L2 influence due to lack of L2 proficiency). For 'definite article' (L2/L3 similar, L1 different), sequential learners showed non-facilitative L1 and facilitative L2 transfer, whereas concurrent learners showed only non-facilitative L1 influence (no L2 effects due to lack of L2 proficiency). These results underscore the differential influences of L1 and L2 on L3 learning. L1 facilitated 'adjective-noun' learning in both groups, while the dissimilar L2 structure caused interference for sequential learners. Conversely, in the 'definite article' condition, where L1 Persian differed from L2 English and L3 Arabic, both groups experienced non-facilitative L1 transfer; however, only sequential learners benefited from L2-L3 similarities. These findings align with the Linguistic Proximity Model (Westergaard et al., 2016), which posits that language transfer, both facilitative and non-facilitative, depends on structural overlap. The results demonstrate a clear property-by-property transfer pattern, supporting partial transfer models.

Nevertheless, collectively, these results challenge key theoretical L3 acquisition models. Specifically, the L1 Transfer Hypothesis was not supported, as the expected predominant L1 influence was not observed. Instead, significant transfer from L2 to L3 occurred in both facilitative and non-facilitative contexts, a finding that aligns with Cho and Lee's (2024) work. Furthermore, the L2 Status Factor was contradicted by cross-linguistic influence stemming from both L1 and L2, consistent with Westergaard et al. (2016). The (Psycho)Typological Primacy Model was also challenged, as transfer occurred based on specific structural similarities at the featural level despite the genealogical distance between Persian (Indo-Iranian), English (Germanic), and Arabic (Semitic), supporting Giancaspro et al. (2014). The CEM was further refuted by the unambiguous evidence of non-facilitative (hindering) transfer, paralleling Flynn et al. (2004). These complex crosslinguistic interactions align with the Scalpel Model (Slabakova, 2016b), which successfully accounts for the dynamic competition between L1 and L2 systems, the critical role of proficiency, input frequency and language dominance. These claims are further substantiated by Rothman et al.'s (2019) comprehensive analysis of transfer in third language learning, which empirically validates the model's predictions regarding bidirectional crosslinguistic influence and threshold effects. Most significantly, the comparable outcomes for sequential and concurrent learners demonstrate that prior language experience alone does not guarantee an L3 learning advantage. Rather, structural similarities between languages become advantageous only when combined with sufficient proficiency in the relevant prior language(s). This represents a theoretical shift from single-factor models of L3 learning toward a more nuanced understanding of the interacting cognitive and linguistic factors in third language learning, best captured by the integrated insights of the Linguistic Proximity and Scalpel Models.

6. CONCLUSION

In conclusion, this study examined the impact of L2 English on L3 Arabic learning in Sequential (Persian L1 → English L2 → Arabic L3) versus Concurrent (Persian L1, English/Arabic L2) language learning groups. Specifically, the research examined 'Adjective-noun' structures (syntactically similar in Persian and Arabic, but different from English) and 'Definite article' structures (similar in English and Arabic, while not present in Persian) to assess cross-linguistic influence. Notably, the mean scores of the sequential learners were higher than those of the concurrent learners in both conditions. However, these differences were not statistically significant.

The Proficiency Ceiling Hypothesis suggests that the sequential group's pre-intermediate English proficiency might have limited their ability to identify and transfer similarities between English (L2) and Arabic (L3), particularly in the 'Definite article' condition, potentially causing both groups to rely more on their Persian L1. Consequently, these findings lend support to the Scalpel Model (Slabakova, 2016b), which emphasizes the importance of factors beyond structural similarity, such as input quality, L2 proficiency, and language dominance.

The results also revealed a nuanced pattern of cross-linguistic influence. For the adjective-noun structure, the sequential group demonstrated transfer from both L1 Persian (facilitative) and L2 English (non-facilitative), while the concurrent group relied primarily on facilitative L1 transfer. For the definite article, the sequential group showed evidence of both non-facilitative L1 transfer and facilitative L2 transfer, whereas the concurrent group exhibited only non-facilitative L1 influence. This property-by-property transfer supports partial transfer models and challenges wholesale transfer accounts. Furthermore, the study found no significant effects of gender or gender-by-group interaction on the learning of either structure, reinforcing that gender is not a determining factor in ultimate attainment.

It must also be noted that the study has several limitations. These included potential rater bias from using only one scorer and limited generalizability due to culture-specific and convenience sampling. Furthermore, the grammar proficiency test assessed only L2 English grammar, overlooking other skills such as speaking, listening, and writing. Additionally, the small sample size reduced statistical power. Uncontrolled confounding variables—such as unequal L2 exposure outside the classroom or individual motivation differences—were not accounted for, potentially influencing outcomes. Finally, a violation of the homogeneity of variance assumption (Levene's test) for some analyses meant the use of a standard two-way ANOVA was a limitation; robust or non-parametric methods are recommended for future research.

Despite these constraints, the findings advocate for a multilingual pedagogical approach that strategically leverages learners' existing linguistic knowledge. At the policy level, this suggests that Iran's educational framework should prioritize early L2 English instruction to cultivate the metalinguistic awareness necessary for subsequent L3 Arabic learning, thereby capitalizing on key structural relationships such as the shared adjective-noun order in Persian and Arabic and the parallel definite article system in English and Arabic. Pedagogically, this entails moving toward instruction that incorporates explicit contrastive analysis, highlighting these cross-linguistic parallels, and encourages the design of triadic tasks that actively engage learners with L1-L3 and L2-L3 structural similarities and differences. To sustainably implement this approach, teacher training programs must be redesigned to equip educators with strategies to use everything students already know about language, while curricula should be developed to provide structured input that systematically promotes positive transfer and mitigates interference. Future research must employ multiple raters and larger samples to investigate how these structural similarities interact with varied instructional methods across proficiency levels. Longitudinal studies tracking

developmental patterns will be essential to validate these evidence-based approaches to multilingual pedagogy. These evidence-based recommendations call for a paradigm shift from traditional monolingual teaching methods to an integrated multilingual pedagogy that consciously leverages the full spectrum of learners' linguistic repertoires, particularly important in the Iranian context where varying levels of L2 English proficiency may impact L3 Arabic learning outcomes.

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