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Resolving Relative Clause Ambiguity in Arabic: Evidence From Hijazi Speakers and L2 Learners of MSA

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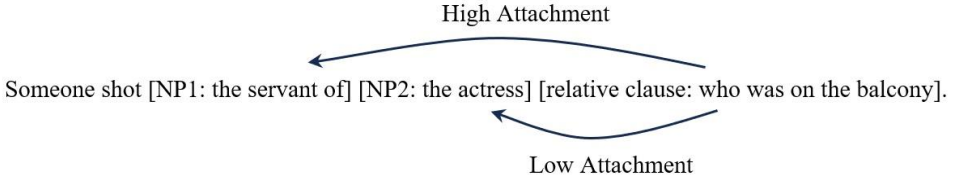
***Abstract*—This study investigates how Hijazi Arabic native speakers and second-language (L2) learners of Modern Standard Arabic (MSA) resolve relative clause attachment ambiguity. While cross-linguistic work reports both high-attachment (NP1) and low-attachment (NP2) patterns, evidence for Arabic remains mixed and the role of diglossia underexplored. Sixteen Hijazi Arabic speakers and 29 MSA learners completed a sentence-interpretation task comprising ambiguous and unambiguous relative clauses. For Hijazi Arabic speakers, a paired t-test showed no significant difference in Hijazi Arabic and MSA, indicating a stable NP1 preference across varieties. Beginning L2 learners whose first language (L1) was English preferred NP2, while advanced learners shifted to NP1. L1 French speakers learning MSA exhibited a consistent NP1 pattern among beginners and advanced learners alike. A two-way ANOVA revealed significant effects of L1 and proficiency, and a significant interaction, reflecting a developmental shift for English speakers and stable target-like performance for French speakers. These findings support predicate proximity accounts of Arabic and challenge the shallow structure hypothesis, showing that L2 learners can acquire L2 parsing preferences. The study contributes to debates on transfer, convergence, and proficiency in L2 sentence processing.**

***Index Terms*—Hijazi Arabic, L1 transfer, Modern Standard Arabic, predicate proximity, relative clause attachment**

I. Introduction

Relative clauses are a common yet structurally complex feature of human language, offering a valuable window into how speakers comprehend and produce sentence patterns. Previous research has shown that when a relative clause follows a complex noun phrase (NP), it may be structurally ambiguous about which noun in the main clause is its antecedent. The sentence in 1 showcases this ambiguity.

1.



This relative clause is ambiguous because it could be attached to the first NP (NP1, "the servant of") or the second (NP2, "the actress"). Crosslinguistic research has shown that languages differ in attachment preferences. In English (Carreiras & Clifton, 1999; Cuetos & Mitchell, 1988; Hemforth et al., 2015), Portuguese (Hernández et al., 2007), Norwegian, Swedish, Romanian (Ehrlich et al., 1999), Turkish (Akal, 2021), Mandarin (Shen, 2006), and Basque (Gutierrez-Ziardegi et al., 2004), the tendency is to attach the relative clause to NP2 (low attachment). In contrast, Spanish (Carreiras & Clifton, 1993; Cuetos & Mitchell, 1988; Ehrlich et al., 1999; Hemforth et al., 2015), German (Hemforth et al., 2015), Dutch (Brysbaert & Mitchell, 1996), French (Hemforth et al., 2015), Persian (Marefat & Meraji, 2005), Japanese (Kamide & Mitchell, 1997; Miyao & Omaki, 2006), and Greek (Papadopoulou & Clahsen, 2003) favor attachment to NP1, a pattern known as high attachment. Findings for Arabic are mixed; Bidaoui et al. (2016), Alharthy (2025) and Aldosari (2024) reported a high-attachment preference, whereas Abdelghany and Fodor (1999) found evidence for low attachment.

Research in second language (L2) acquisition has examined how learners resolve relative clause attachment ambiguity. Dussias (2003, 2004) and Dussias and Sagarra (2007) studied Spanish-speaking L2 English learners and English-speaking L2 Spanish learners, finding that both groups favored low attachment in their L2 regardless of first language (L1) preferences. Felser et al. (2003) similarly observed no clear preference in Greek- and German-speaking L2 English learners. Marefat and Farzizadeh (2018) reported that Persian-speaking L2 English learners patterned like native English speakers, preferring low attachment. In Greek as an L2, Papadopoulou and Clahsen (2003) found that learners whose L1 was German, Russian, or Spanish—high-attachment languages—showed no consistent preference. For Japanese, Miyao

and Omaki (2006) demonstrated that Korean-speaking learners preferred high attachment. Research on L2 Arabic is more limited but points in a different direction. Bidaoui et al. (2016) found English-speaking L2 Arabic learners preferred high attachment, and Aldosari (2024) reported the same pattern for Najdi Arabic speakers learning L2 English. Overall, L2 attachment preferences do not always align with learners' L1, and the L2 can influence parsing strategies.

Although only three studies—Bidaoui et al. (2016), Aldosari (2024), and Abdelghany and Fodor (1999)—have examined relative clause attachment involving Arabic as an L1 or L2, they provide important initial insights into how such ambiguity is processed. The present study extended this investigation to learners from two L1 backgrounds—English, which favors low attachment, and French, which favors high attachment—and included native speakers of Hijazi Arabic, whose judgments were elicited for sentences in both their native dialect and Modern Standard Arabic (MSA). This design allowed for a direct comparison of attachment preferences between L2 learners from different L1 backgrounds and native speakers across these two Arabic varieties.

A. Theoretical Accounts of Relative Clause Attachment

Research has generated various hypotheses for why languages prefer one attachment site over another. While some approaches propose universal parsing principles, others highlight the role of language-specific factors, such as word order and prosody. Proposals such as right association (Kimball, 1973), late closure (Frazier, 1987), and the recency principle (Gibson et al., 1996) predict that the parser attaches a relative clause to the most recently processed constituent, namely NP2. These hypotheses explain the predominance of low attachment in languages such as English, where attaching locally is thought to minimize cognitive effort and the load on working memory.

However, cross-linguistic variation has challenged the idea of low attachment as a universal principle. Gibson et al. (1996) introduced the predicate proximity principle, predicting that ambiguous relative clauses are attached to the NP closest to the main predicate. The relative strength of this principle differs across languages, depending on how much distance between the verb and its arguments is tolerated. In English, where arguments typically appear close to the verb, predicate proximity is weak and the universal tendency toward low attachment prevails. In Spanish and French, however, where longer verb-argument distances are common, predicate proximity is strong, and high attachment becomes the default interpretation in ambiguous cases. This has led to the observation that in languages that permit greater distance between verbs and their arguments, predicate proximity can outweigh universal locality-based strategies (e.g., Frazier, 1987; Gibson et al., 1996; Kimball, 1973).

Within L2 sentence processing, a central question is whether learners rely on transfer from the L1 or are guided by universal parsing principles. Substantial research supports L1 transfer of relative-clause attachment preferences. For Spanish learners of English, Ehrlich et al. (1999) found evidence of L1 transfer; Dobao (2002) replicated this with Galician/Spanish learners of English and English learners of Spanish. High-attachment preferences consistent with the L1 have also been reported for intermediate German learners of English (Rah, 2009), Korean learners of English (Kim, 2010), Chinese learners of English (Witzel et al., 2012), and Turkish learners of English (Uludağ, 2020). In L2 French—a high-attaching language—Frenck-Mestre and Pynte (1997) observed that English learners preferred low attachment, as in English, whereas Spanish learners preferred high attachment, as in Spanish. Najdi Arabic speakers learning English likewise showed a high-attachment preference in L2 English (Aldosari, 2024), Persian bilinguals preferred high attachment in L2 English (Marefat & Meraji, 2005), and Japanese speakers transferred their L1 attachment preference to L2 English (Ito et al., 2021).

However, other studies have suggested transfer has no effect. Felser et al. (2003) reported no preference for high or low attachment among German and Greek speakers learning English. Similarly, Papadopoulou and Clahsen (2003) investigated advanced German, Spanish, and Russian learners of Greek, all of whom came from high-attachment L1 backgrounds, and found no preference for high or low attachment in the L2. Instead, their results pointed to the shallow structure hypothesis (Clahsen & Felser, 2006), which claims that adult L2 learners build less detailed syntactic representations than native speakers and rely more on lexical or semantic cues. Under this hypothesis, L2 learners frequently fail to show consistent relative clause attachment preferences, particularly when no disambiguating lexical cues are available.

Other research has shown that L2 learners often align with the preferences of the target language, suggesting they can draw on universal parsing principles. For instance, Bidaoui et al. (2016) examined English native speakers learning Arabic and found they preferred high attachment, even though low attachment was favored in their L1, contradicting the notion of L1 transfer. The authors attributed this pattern to the predicate proximity principle effective in the target language. Likewise, Dussias (2003) found that Spanish learners of English—whose L1 typically favors high attachment—preferred low attachment in English, a result interpreted as reflecting reduced working memory costs. In line with these findings, Marefat and Farzizadeh (2018) reported that advanced Persian learners of English adopted the English low-attachment pattern not only in their L2 but also in judgments of L1 sentences, suggesting that L2 processing can reshape native language preferences.

Beyond these general theoretical positions, a range of additional factors has been shown to modulate attachment choices. Longer relative clauses tend to increase the likelihood of high attachment, as documented in studies of English, German, and Spanish (Hemforth et al., 2015). Task type also plays a crucial role. Offline measures such as questionnaires often elicit higher rates of high attachment, while online or computer-based measures such as self-paced reading or eye-tracking tend to reveal lower attachment, particularly in L2 learners (Dinçtopal-Deniz, 2010; Miyao & Omaki, 2006). Individual

differences in working memory capacity also matter. Swets et al. (2007) showed that participants with limited working memory tended to divide text into smaller chunks and thus preferred high attachment, whereas individuals with higher working memory capacity were more likely to maintain low attachment. Proficiency is another key factor. In a Persian study, low-proficiency learners favored NP1, while advanced learners shifted toward NP2, highlighting how developmental stages influence parsing strategies (Karimi et al., 2021). Semantic plausibility can override structural biases altogether, with the attachment site chosen according to which noun is more semantically compatible with the relative clause (Karimi et al., 2021). The structural position of the noun in relation to the main verb has been shown to affect relative clause attachment as well (Akal, 2021).

Taken together, research on relative clause attachment demonstrates that no single explanation can fully account for the variability observed across languages and learner populations. While some studies highlight robust transfer effects from the L1, others point to the influence of universal parsing principles or to the syntactic representations posited by the shallow structure hypothesis. There is evidence that L2 learners sometimes converge on target-language preferences and even, in rare cases, reshape their L1 attachment patterns. Moreover, factors such as clause length, task demands, working memory capacity, proficiency, and semantic plausibility further complicate the picture.

B. Relative Clause Attachment in Arabic

In MSA, word order is relatively flexible, with both SVO and VSO frequently attested. However, there is a debate over which should be considered the unmarked order, with some favoring SVO (e.g., Awwad, 1973; Mohammad, 1990) and others favoring VSO (e.g., Aoun et al., 2010; Bakir, 1980; Soltan, 2007). The examples in 2a and 2b show SVO and VSO, respectively. MSA is a pro-drop language as well, as shown in 2c.

2. a. saʕid-un ja-ʃrabu ʔaʃ-ʃaj-a
   Saeed-Nom 3P.Sg-drink Def-tea-Acc
   “Saeed drinks / is drinking tea”
   b. ja-ʃrabu saʕid-un ʔaʃ-ʃaj-a
   3P.Sg-drink Saeed-Nom Def-tea-Acc
   “Saeed drinks / is drinking tea”
   c. ja-ʃrabu ʔaʃ-ʃaj-a
   3P.Sg-drink Def-tea-Acc

When a sentence contains a relative clause, the relative pronoun follows the head noun it modifies and agrees with it in gender, number, and sometimes case. Ambiguity arises only when both NP1 and NP2 share the same gender. Table 1 presents the full paradigm of the different forms of relative pronouns in MSA.

TABLE 1
RELATIVE PRONOUN FORMS

Gender	Case	Number		
		Singular	Dual	Plural
Masculine	Nominative	ʔallaði	ʔallaðani	ʔallaðina
	Accusative-Genitive	ʔallaði	ʔallaðajni	ʔallaðina
Feminine	Nominative	ʔallati	ʔallatani	ʔallaati
	Accusative-Genitive	ʔallati	ʔallatajni	ʔallaati / allawati

Word order in relative clauses is restricted to SVO, as shown in 3. This sentence offers a typical case of ambiguity; the relative clause can attach to sˤadiq-a “friend” (NP1, high attachment) or ʔar-radʒul-i “the man” (NP2, low attachment).

3. raʔajtu sˤadiq-a ʔar-radʒul-i ʔallaði ja-skunu fi
   1P.M-see.Perf friend.M.Sg-Acc Def-man-Acc who.M.Sg.Nom 3P.M-live in
   ʔal-bajt-I ʔal-kabir-i
   Def-house.Sg.M-Gen Def-big.Sg.M-Gen
   “I saw the friend of the man who lives in the next house”

Hijazi Arabic also allows flexible word order, but unlike MSA, has only a single relative pronoun form, ʔalli. The Hijazi Arabic example in 4 exhibits a similar ambiguity to that shown in 3, as the relative clause can attach to sˤaħib “friend” (NP1, high attachment) or ʔar-riʒal “man” (NP2, low attachment).

4. ʃift sˤaħib ʔar-riʒal ʔalli sakin ʒanb bətəana
   1P.see.Perf friend.M.Sg Def-man who live.M.Sg next house.1P
   “I saw the friend of the man who lives next to us”

C. Research Gap, Questions, and Hypotheses

Only three studies have investigated relative clause attachment in MSA and its varieties, yielding conflicting results. For Arabic as an L1, Abdelghany and Fodor (1999) reported that native speakers preferred low attachment, linking the ambiguous relative clause to NP2. In contrast, Aldosari (2024) found that Najdi Arabic speakers favored high attachment (NP1). Bidaoui et al. (2016) observed that L2 learners of Arabic also preferred high attachment. Building on these findings, the present study examined the attachment preferences of Hijazi Arabic speakers in their native dialect and MSA, as well as those of English and French native speakers learning MSA as an L2. Furthermore, it explored whether proficiency

played a role in shaping attachment preferences among L2 learners of Arabic. Thus, it sought to address the following research questions and hypotheses.

Research Question 1: What is the relative clause attachment preference of native Hijazi Arabic speakers when processing ambiguous structures in their Arabic dialect?

Hypothesis 1: The predicate proximity hypothesis posits that languages permitting greater distance between the predicate and its arguments favor high attachment in cases of relative clause ambiguity. Thus, it was hypothesized that Hijazi Arabic speakers—given the scrambling possibilities in their dialect—would exhibit a preference for attaching ambiguous relative clauses to NP1 (high attachment).

Research Question 2: What is the relative clause attachment preference of L2 learners of MSA whose L1 is English or French when encountering ambiguous Arabic structures?

Hypothesis 2: The shallow structure hypothesis predicts that L2 learners will not demonstrate a systematic attachment preference in the absence of semantic cues. By contrast, an L1 transfer account predicts that learners' choices will reflect the attachment patterns of their native language. Thus, participants whose L1 favored low attachment (NP2) were expected to transfer this preference to MSA, while those whose L1 favored high attachment (NP1) were expected to display a corresponding high-attachment preference in MSA. This means that English native speakers learning Arabic as an L2 were expected to show a low-attachment preference at the initial stages of acquisition. In contrast, French native speakers were expected to maintain a high-attachment preference throughout the process of language acquisition.

Research Question 3: Do Hijazi Arabic speakers differ in their relative clause attachment preferences when processing ambiguous structures in their dialect compared to MSA?

Hypothesis 3: MSA is typically acquired through formal education rather than home or community use and thus is not the dominant language among Hijazi speakers. It was therefore hypothesized that their judgments about MSA would not differ significantly from those about Hijazi Arabic. This expectation followed from the predicate proximity hypothesis, which applies to MSA as well, and from possible transfer effects, insofar as speakers may transfer their dialectal preference to MSA if it is treated as an L2. However, if the shallow structure hypothesis were correct, and MSA would be processed as an L2, then it was predicted that speakers would not display a clear attachment preference in the absence of semantic cues.

Research Question 4: Does relative clause attachment preference among L2 learners of MSA vary according to proficiency level?

Hypothesis 4: Proficiency was expected to influence relative clause attachment. Beginning L2 learners of Arabic whose L1 exhibited a different attachment preference were likely to transfer their L1 strategy in the early stages. In contrast, advanced learners were predicted to align with the target language's preference. This developmental trajectory was supported by a number of empirical studies (Cheng et al., 2021; Dekydtspotter et al., 2008; Frenck-Mestre, 1997; Karimi et al., 2021; Miyao & Omaki, 2006). However, according to the shallow structure hypothesis, L2 learners were predicted not to develop a stable attachment preference, regardless of their proficiency level (Clahsen & Felser, 2006).

II. Methods

A. Participants

Participants consisted of 16 native speakers of Hijazi Arabic and 29 L2 learners of MSA. The latter were enrolled in the TASOL Institute or regular classes at the Islamic University. All participants were between 18 and 35 years of age (see Table 2).

TABLE 2
PARTICIPANT BACKGROUND INFORMATION

L1 Group	Proficiency	N	Mean Age (SD)
English	Beginner	8	25.4 (3.6)
	Advanced	8	26.6 (4.7)
French	Beginner	7	23.7 (1.4)
	Advanced	6	26.7 (3.4)
Hijazi Arabic	Native	16	27.6 (2.7)

For Hijazi Arabic speakers, exposure to MSA occurred primarily in formal settings such as schools and universities. Although they were familiar with MSA, it was not the language of daily communication in their community. In contrast, L2 learners' first exposure to Arabic was through the TASOL Institute, a language institute offering a four-level program, with each level lasting approximately four months. Completion of this program typically precedes enrollment in graduate or undergraduate programs at the Islamic University.

B. Materials

This study's sentence interpretation task had been employed in previous studies (e.g., Akal, 2021; Aldosari, 2024; Bidaoui et al., 2016; Cheng et al., 2021; Uludağ, 2020). For Hijazi Arabic speakers, it consisted of 45 sentences that included relative clauses in their dialect, of which 30 were experimental sentences that contained ambiguous relative clauses and 15 were fillers that contained unambiguous relative clauses. L2 learners and Hijazi Arabic speakers were also

presented with 45 sentences in MSA. Of these, 30 sentences contained an ambiguous relative clause, while the remaining 15 were unambiguous. The task was administered through Google Forms. Each sentence was presented with two possible interpretations, and participants were instructed to select the option that best reflected their interpretation of the relative clause. The example in 5a, repeated from 3, presents an ambiguous sentence in MSA, while 5b shows an unambiguous sentence. Similarly, 6a, repeated from 4, presents an ambiguous sentence in Hijazi Arabic, while 6b presents an unambiguous sentence in Hijazi Arabic.

5. a. raʔajtu sˤadiq-a ʔar-radʒul-i ʔallaði ja-skunu fi
1P.M-see.Perf friend.M.Sg-Acc Def-man-Acc who.M.Sg.Nom 3P.M-live in
ʔal-bajt-i ʔal-kabir-i
Def-house.Sg.M-Gen Def-big.Sg.M-Gen
"I saw the (male) friend of the man who lives in the next house"

b. raʔajtu sˤadiq-at-a ʔar-radʒul-I ʔallaði ja-skunu
1P.M-see.Perf friend.M.Sg-Fem-Acc Def-man-Acc who.M.Sg.Nom 3P.M-live
fi ʔal-bajt-i ʔal-kabir-i
in Def-house.Sg.M-Gen Def-big.Sg.M-Gen
"I saw the (female) friend of the man who lives in the next house"

6. a. ʃift sˤaħib ʔar-riʒal ʔalli sakin ʒanb bətəana
1P.see.Perf friend.M.Sg Def-man who live.M.Sg next house.1P
"I saw the (male) friend of the man who lives next to us"

b. ʃift sˤaħib-at ʔar-riʒal ʔalli sakin-ah ʒanb bətəana
1P.see.Perf friend.M.Sg-Fem Def-man who live.M.Sg-Fem next house.1P
"I saw the (female) friend of the man who lives next to us"

With regard to 5b, the sentence is no longer ambiguous because NP1 and NP2 do not share the same gender. Since the verb in the relative clause must agree with the relativized NP, it is clear that it agrees with NP2. A similar situation applies to the Hijazi Arabic example in 6b; the verb within the relative clause must agree with the relativized NP, and here the agreement is with NP1. Consequently, the relative clause is unambiguously attached to NP1.

C. Procedure

Hijazi Arabic speakers were recruited from the researcher's community via word of mouth and flyers that included the researcher's contact information. L2 learners of Arabic were contacted through an email sent by their teachers, which contained the researcher's contact information. Interested individuals were asked to contact the researcher directly.

Hijazi Arabic speakers had to be monolingual, at least 18 years old at the time of data collection, and have completed their public school education in Saudi Arabia. For L2 learners, the same age requirement applied, and they were required to be enrolled in classes at the TASOL Institute or at the university, with their initial exposure to Arabic having occurred at the TASOL Institute to ensure consistency across participants. Once eligibility was confirmed, participants received an email with a link to the researcher's Calendly page, where they could book a date and time for the study session.

Participants met with the researcher in an office designated for the study. After the researcher explained the procedures, participants signed an informed consent form. The task then began and participants were seated in front of a monitor, where they read a sentence presented on the screen accompanied by a question and two possible interpretations, for example, "John shot the servant of the actor who was on the balcony." Who was on the balcony, the servant or the actor? The task was to select the NP that best matched participant's interpretation of the sentence and then proceed to the next item. Upon completion of the task, the researcher thanked participants.

D. Analysis

Each response in the sentence interpretation task was coded as either NP1 (high attachment, coded as 1) or NP2 (low attachment, coded as 0). This binary coding enabled the calculation of mean attachment preferences for each participant across the 30 experimental sentences. Mean scores thus represented the proportion of high-attachment (NP1) and low-attachment (NP2) choices. The structured dataset was then analyzed in SPSS to determine how attachment preferences varied according to language background and proficiency.

The analysis began with descriptive statistics to summarize attachment choices across groups. For the native Hijazi Arabic speakers, means and standard deviations were calculated separately for judgments made in their native dialect (Hijazi Arabic) and in MSA. This made it possible to assess whether attachment preferences remained stable across the two varieties. For the L2 learners of MSA, group means and standard deviations were computed for each combination of L1 background (English, French) and proficiency level (beginner, advanced), providing an overview of whether learners tended to favor high vs. low attachment and how such tendencies were modulated by L1 background and L2 proficiency.

For Hijazi Arabic speakers, a paired-samples t-test was conducted to compare mean NP1 proportions in Hijazi Arabic and MSA, testing whether speakers exhibited the same attachment preference across varieties. For L2 learners, a two-way ANOVA was conducted with L1 background (English vs. French) and proficiency level (beginner vs. advanced) as between-subjects factors. The dependent variable in this model was the proportion of NP1 (high-attachment) responses. Using this data, the researcher evaluated (a) whether learners with different L1 backgrounds patterned differently in their L2 Arabic attachment choices, (b) whether proficiency level influenced attachment preferences, and (c) whether the effect

of proficiency differed between English and French speakers. Where significant main effects or interactions were found, Bonferroni-adjusted pairwise comparisons of estimated marginal means were conducted to identify the source of the differences.

III. Results

Participants judged 2,025 sentences, with 1,350 retained for analysis. The other items were excluded because they were unambiguous filler sentences. Mean scores and standard deviations for Hijazi Arabic speakers in both their native dialect and MSA are shown in Table 3.

Table 3
Hijazi Arabic Speaker Results

Variety	NP1 (M, SD)	NP2 (M, SD)
Hijazi Arabic	0.75 (0.15)	0.25 (0.15)
MSA	0.76 (0.13)	0.24 (0.13)

Hijazi Arabic speakers showed a clear preference for high attachment (NP1) in both varieties of Arabic. In Hijazi Arabic, participants selected NP1 75% of the time (M=0.75, SD=0.15), vs. 25% for NP2 (M=0.25, SD=0.15). A similar pattern was observed in MSA, where NP1 was chosen 76% of the time (M=0.76, SD=0.13) and NP2 24% (M=0.24, SD=0.13). A paired-samples t-test comparing NP1 rates in Hijazi Arabic and MSA showed no significant difference, $t(15)=0.55$, $p=.589$, $d_z=0.14$. This indicated that Hijazi Arabic speakers maintained a stable high-attachment preference across both varieties, with the increase from Hijazi Arabic (0.75) to MSA (0.76) being negligible.

L2 learners' mean scores and standard deviations are presented in Table 4.

Table 4
Learner Results

L1	Proficiency	NP1 (M, SD)	NP1 (M, SD)
English	Beginner	0.42 (0.14)	0.58 (0.14)
	Advanced	0.77 (0.07)	0.23 (0.07)
French	Beginner	0.76 (0.07)	0.24 (0.07)
	Advanced	0.79 (0.07)	0.21 (0.07)

For L2 learners, attachment preferences varied according to L1 background and L2 proficiency. English speakers at the beginner stage displayed a low-attachment tendency, selecting NP1 in only 42% of cases (M=0.42, SD=0.14), while advanced learners shifted toward a clear high-attachment preference, with NP1 chosen 77% of the time (M=0.77, SD=0.07). French speakers, whose L1 favors high attachment, showed a consistent pattern across both levels. Beginners selected NP1 in 76% of trials (M=0.76, SD=0.07), and advanced learners did so in 79% of trials (M=0.79, SD=0.07). Taken together, these results suggest a developmental effect for English speakers, who transitioned from low to high attachment with increasing proficiency, while French speakers exhibited a stable high-attachment preference regardless of MSA proficiency level.

A two-way ANOVA was conducted with L1 (English, French) and proficiency level (beginner, advanced) as between-subjects factors. The analysis revealed a significant main effect from L1, $F(1, 25)=27.94$, $p<.001$, partial $\eta^2=.53$, indicating that French speakers selected NP1 more frequently than English speakers. There was also a significant main effect from proficiency level, $F(1, 25)=30.94$, $p<.001$, partial $\eta^2=.55$, showing that advanced learners selected NP1 more often than beginners. The interaction between L1 and proficiency level was significant, $F(1, 25)=20.08$, $p<.001$, partial $\eta^2=.45$. Follow-up comparisons indicated that English-speaking L2 beginners showed significantly lower NP1 attachment than English-speaking advanced L2 learners, reflecting a developmental shift from low to high attachment. French speakers, by contrast, showed no significant difference across proficiency levels, maintaining a stable high-attachment preference. At the beginner level, they selected NP1 significantly more often than English speakers, whereas the two groups did not differ significantly at the advanced level.

IV. Discussion

This study examined how native speakers of Hijazi Arabic and L2 learners of MSA resolved ambiguous relative clause attachment. By testing both native and non-native groups across different levels of proficiency, the study aimed to clarify whether attachment preferences in Arabic aligned with cross-linguistic tendencies observed in other languages and to evaluate how proficiency and diglossia influenced parsing strategies.

Native speakers of Hijazi Arabic showed a robust high-attachment preference, selecting NP1 in 75% of cases in their dialect and 76% of cases in MSA. Among native English speakers, L2 beginners selected NP1 in 42% of cases, and advanced learners showed an NP1 preference of 77%. French speakers exhibited a consistently high-attachment pattern at both proficiency levels, with beginners choosing NP1 in 76% of trials and advanced learners in 79%. These results indicated (a) stable high attachment for native speakers across Hijazi Arabic and MSA, (b) clear evidence of L1-based low-attachment transfer at the earliest stages for English speakers learning MSA, followed by convergence on the high-

attachment pattern with increased proficiency, and (c) immediate target-like performance for French speakers whose L1 already favors high attachment. Based on these findings, the research questions and hypotheses are addressed below.

The first research question and hypothesis were based on the proximity principle's claim that in languages where core arguments can appear at a distance from verbs, high attachment is preferred in the absence of disambiguating cues (Gibson et al., 1996). Given that Arabic falls within this category, it was predicted that native speakers would favor NP1 attachment. The results corroborated this prediction, as Hijazi Arabic speakers consistently demonstrated a significant high-attachment preference, selecting NP1 in 75% of cases. To the best of my knowledge, this study represents the first investigation of relative clause attachment in Hijazi Arabic. Nevertheless, its findings converged with prior research on Najdi Arabic speakers, who selected NP1 in 68.1% of cases (Aldosari, 2024).

The second research question and hypothesis concerned L2 learners of MSA. Previous studies have identified two main patterns in how L2 learners handle relative clause ambiguity. Learners may transfer their L1 preferences to the L2, regardless of the target language's attachment bias (Aldosari, 2024; Frenck-Mestre & Pynte, 1997; Ito et al., 2021; Kim, 2010; Marefat & Meraji, 2005; Rah, 2009; Uludağ, 2020; Witzel et al., 2012). Other learners may show no consistent preference in the absence of disambiguating cues (Felser et al., 2003; Papadopoulou & Clahsen, 2003). A third possibility is convergence toward the target language's attachment preference, even when it contradicts that of the L1 (Bidaoui et al., 2016; Dussias, 2003; Marefat & Farzizadeh, 2018). The findings of this study supported the transfer account, as shown by English speakers who were beginning L2 learners of Arabic. They exhibited a non-target-like pattern, selecting low attachment in 58% of cases, which reflected clear transfer from their L1. In contrast, French speakers learning Arabic demonstrated a target-like preference, as their L1 already aligned with the high-attachment preference of Arabic.

The third research question and hypothesis examined whether Hijazi Arabic speakers' attachment preferences in MSA differed from those observed in their native dialect. As no prior studies had investigated this issue, the current data provide novel evidence of Hijazi speakers demonstrating high attachment in their dialect (75%) and MSA (76%). The interpretation of these results must be approached with caution, however, given the complex relationship between Hijazi Arabic and MSA. This outcome contradicted the shallow structure hypothesis, which would expect no consistent preference if MSA were processed as an L2. Instead, the results suggested that Hijazi speakers either transferred their native preference to MSA—if it was treated as an L2, similar to French learners of MSA—or that their judgments were guided by the predicate proximity principle in cases where MSA was considered their L1.

The fourth research question and hypothesis addressed the effect of proficiency on attachment preference. Advanced L2 learners of MSA who were native speakers of English showed a clear alignment with the high-attachment (NP1) preference of the L2, despite their L1 favoring low attachment. The contrast between beginner and advanced learners suggested a developmental trajectory in which learners gradually shifted from an L1-based low-attachment (NP2) preference toward the high-attachment (NP1) pattern of the L2. These findings were consistent with previous studies examining the influence of proficiency on relative clause attachment in L2 learners (Cheng et al., 2021; Dekydtspotter et al., 2008; Frenck-Mestre, 2002; Karimi et al., 2021; Miyao & Omaki, 2006).

The consistent high-attachment preference observed in Hijazi Arabic and MSA speakers lends support to the predicate proximity principle (Gibson et al., 1996) over prosodic-based accounts (Abdelghany & Fodor, 1999), which predicted low attachment for Arabic. The findings also pose challenges to the shallow structure hypothesis (Clahsen & Felser, 2006), which would expect no stable preference in MSA as an L2. Instead, the data suggest that L2 learners can, over time, acquire target-like parsing strategies. The convergence of English and French speakers underscored the critical role of L1 background and L2 proficiency in shaping L2 learners' parsing strategies.

V. Conclusion

This study represents the first empirical investigation of relative clause attachment in Hijazi Arabic. By directly comparing Hijazi Arabic and MSA, the study adds to discussions of diglossia, showing that attachment preferences remain stable across varieties. By including English and French speakers learning Arabic at different L2 proficiency levels, the study provides evidence of how L1 background and L2 proficiency interact to shape L2 attachment preferences. Future research could build on these findings with online or computer-based methods facilitating eye-tracking or self-paced reading to explore real-time parsing strategies underlying relative clause attachment, addressing a limitation of this study. Expanding the range of L1 learner groups could also help disentangle the role of L1 bias from general L2 developmental processes.

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