

Bilingual knowledge of wh-in situ and island violations

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Abstract. Research on bilingual sentence processing has argued that structures which fully overlap in surface word order across two languages do not distinctly belong to either one of a bilingual's languages but are instead shared across both. However, it is unclear to what extent the derivational properties of these structures play a role in this *sharedness*. In this paper we investigate bilinguals' sensitivity to two structures that ultimately result in overlapping word orders across their two languages but are argued to be licensed under different pragmatic contexts. We focus on wh-in situ structures in Egyptian Arabic, a language where wh-in situ serves as a canonical wh-question formation structure in out-of-the-blue questions, and English, where (single) wh-in situ structures have been argued to be pragmatically licensed in contexts where common ground requirements are fulfilled. Using data from Egyptian Arabic and English wh-structures, we show that even in situations where the wh-in situ structures are presented without pragmatic licensing, bilinguals accept them as out-of-the-blue interrogatives. Taken together, these results suggest that wh-in situ is a common structure across Egyptian Arabic and English for this population of bilinguals, despite its restricted pragmatic conditions in English.

Keywords. wh-in situ; experimental syntax; English; Egyptian Arabic

1. Introduction. Research on bilingual sentence processing has argued that structures which fully overlap in surface word order across two languages do not distinctly belong to either one of a bilingual's languages but are instead shared as a common structure across both, regardless of differences in pragmatic felicity (see Hartsuiker et al. 2016, and references therein). In this paper we investigate bilinguals' sensitivity to two structures that ultimately result in overlapping word orders across their two languages but are argued to be licensed under different pragmatic contexts. We focus on wh-in situ structures in Egyptian Arabic, a language where wh-in situ serves as a canonical wh-question formation structure in out-of-the-blue questions (e.g. Soltan 2010), and English, where (single) wh-in situ structures have been argued to be pragmatically licensed in contexts where common ground requirements are fulfilled (e.g. Postal 1972; Ginzberg & Sag 2001; Pires & Taylor 2007; among others). The structure of this paper is as follows: In section 2, we show that while the wh-in situ structure exists in both Egyptian Arabic and English, in Egyptian Arabic it is felicitous in out-of-the-blue contexts, but in English it is restricted to specific discourse-pragmatic contexts. In section 3, we outline our experimental methodology in which we use factorial designs to test participants' sensitivity to island structures in both Egyptian Arabic and in English. Here, we also discuss the rationale for testing participants' acceptability of wh-dislocation with gap (wh-gap) structures in addition to wh-in situ structures, since wh-gap structures are unacceptable in Egyptian Arabic regardless of pragmatic contexts but canonical in out-of-the-blue contexts in English. In section 4 we present our results. We show that in

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Egyptian Arabic participants accepted wh-in situ structures both within and outside of island contexts but rejected wh-gap structures in these same contexts. We also show that, in English, although participants preferred the wh-gap structures over the wh-in situ outside of an island context, the presence of wh-in situ was preferred to wh-gap structures in island structures, even without the pragmatic contexts in which the in-situ constituent is predicted to be licensed in English. In section 5 we suggest that, first, the results measuring participants' sensitivity to wh-gap structures in Egyptian Arabic and English indicate that participants rated the acceptability of these structures based on language specific sensitivities. We make similar observations regarding wh-in situ structures, even though our results measuring participants' sensitivity to wh-in situ structures in English indicate that they accepted these structures without requiring pragmatically licensed contexts for their use. Section 6 concludes the paper emphasizing our main observations.

2. Wh-in situ in Egyptian Arabic and English. In the wh-in situ structure the wh-element remains in its canonical position, as seen in (1). The wh-in situ structure serves as the canonical wh-question formation structure in Egyptian Arabic out-of-the-blue questions, but in English it is restricted to wh-questions with specific pragmatic contexts in which common ground requirements are fulfilled (e.g. Postal 1972; Ginzberg & Sag 2001; Pires & Taylor 2007; among others), or to multiple wh-question structures.

- (1) Masnoti shaafit **miin** fil-mat'am?
 Masnoti saw **who** in.the-restaurant?
 'Who did Masnoti see at the restaurant?'

In languages where the wh-phrase appears clause initially, the scopal properties of the wh-phrase have been argued to be a byproduct of the fact that the wh-phrase already appears in a structurally higher position. In wh-in situ languages, as the wh-phrase is not pronounced in a structurally higher position, the issue of scope has led some to assume a covert movement approach to wh-in situ questions (Huang 1982). Specific to Egyptian Arabic, Soltan (2011) rejects an analysis whereby the wh-in situ structures in Egyptian Arabic are derived via movement, either covertly or overtly, due mainly to the fact that wh-in situ structures are island insensitive, as seen in (2).

- (2) Mona mishyit ba'd maa Masnoti ablit **miin**?
 Mona left after Masnoti met **who**?
 'Who did Mona leave after Masnoti met ____?'

Soltan instead assumes that there is no movement and proposes that wh-in situ structures in Egyptian Arabic get their scopal properties licensed through the mechanism of *unselective binding* (Pesetsky 1987). In these contexts, the wh-phrase remains in-situ and is bound by a null operator in the structurally higher Spec, CP position. Embedded scope is reached if this operator is in the specifier position of the embedded CP, while matrix scope is reached if the operator is in the specifier position of the matrix CP. This can be seen in (3).

- (3) a. Embedded scope: $[_{CP} \dots [_{TP} \dots [_{CP} OP_i C [_{TP} \dots WH_i \dots]]]]$
 b. Matrix scope: $[_{CP} OP_i C [_{TP} \dots [_{CP} \dots [_{TP} \dots WH_i \dots]]]]$

With respect to English, the canonical structure for wh-question formation involves a clause initial wh-element that corefers with a gap or trace in its canonical base position, as seen in (4a). For the purposes of convenience, we will refer to this structure as the *wh-gap structure*

throughout this paper. Due to sensitivity to constraints on movement, such as island sensitivities as seen in (4b), the wh-gap structure in English is assumed to be derived via movement from a structurally lower position to a structurally higher position.

- (4) a. **Who**_i did Masnoti say that she saw ____i?
 b. ***Who**_i did Mona leave after Masnoti saw ____i?

In English, it is pointed out that the wh-in situ structure is not freely licensed where the gap structure is considered canonical (i.e. in out-of-the-blue questions), especially with single wh-questions. Although English wh-phrases typically take the gap structure to get these scopal properties, Pires and Taylor (2007) present various contexts beyond echo-questions where a wh-phrase can stay in-situ in questions with a single wh-phrase, as seen in (5).

- (5) Person A: I painted a cute clown.
 Specific Question: Cool, and you used what colors for that?

Pires and Taylor (2007) propose that English has two null [+wh, +Q] complementizers: one that forces wh-questions to move overtly, possibly by encoding an EPP feature, and another that is specified for a *common ground* discourse-pragmatic requirement and does not trigger overt wh-movement. The authors propose that the common ground requirement is satisfied in contexts where information is either shared or assumed by the speaker to be shared between the speaker and hearer. The authors show that contexts where the null complementizer is specified for common ground and the wh-word remains in-situ are also insensitive to island constraints, as seen in (6), and so they argue that no movement, either overt or covert, is present.

- (6) I chose the writer who wrote *Hamlet*. And you, you chose the writer who wrote *what*?
 Taken from Pires and Taylor (2007, p.12)

Although Egyptian Arabic and English both employ the wh-in situ structure, where the wh-constituent remains in its original position without overt or covert movement, there is a difference in productivity. Egyptian Arabic exhibits a more widespread use of the wh-in situ structure, particularly in out-of-the-blue wh-questions. In contrast, English confines the use of the wh-in situ structure to the kinds of discourse-pragmatic contexts indicated above. Despite this difference, the wh-in situ structure has been argued to be formed with similar derivation in both languages, as both have been argued not to be formed by either a covert or overt movement operation (see Sedarous 2022). For this reason, we chose wh-in situ structures as an empirically relevant domain to test the sharedness of a structure that has been argued to share a similar derivation across both languages.

3. Methods. We conducted a two-block experiment in which we asked Egyptian Arabic/English bilinguals to listen to a sentence and rate its acceptability. The first block tested acceptability of wh-questions in Egyptian Arabic Island/Non-island contexts, while the second block tested similar structures in English. In each block we also tested acceptability of wh-dislocation with gap (wh-gap) structures. This is because wh-gap structures with nominal antecedents are unacceptable in Egyptian Arabic regardless of pragmatic contexts, as seen in (7), but serve as the default structure in English as discussed section 2.

- (7) ***miin** Mona ‘aalit inn Masnoti ablit _____?
who Mona said that Masnoti met _____?
 ‘Who did Mona say that Masnoti met _____?’

3.1. MATERIALS. Each block used the same 2X3 factorial design crossing *island presence* (present vs. absent) and *clause type* (matrix, embedded: in situ, embedded: gap) (see Sprouse, Wagers & Philips 2012, for initial logic and Lu, Thompson & Yoshida 2020, for similar design for wh-in situ structures).

The materials used in block 1 tested participants sensitivities to these structures in unilingual Egyptian Arabic contexts, while the materials tested in block 2 tested participants sensitivities to these structures in unilingual English contexts. In both blocks, we focused only on temporal adjunct islands headed by *when* as the island domain of study, to retain consistency. Sample stimuli can be seen in the Appendix.

All the sentences in both blocks of this experiment were recorded through Praat by the same speaker, the first author of this paper who is bilingual in both Egyptian Arabic and English. Recordings were then distributed via a Qualtrics survey (see Sedarous & Namboodiripad 2020, for best practices in conducting acceptability judgments with audio stimuli). For all sentences, the speaker used natural intonation and took care to produce a similar intonational contour across conditions.

3.2. PARTICIPANTS. 40 self-reported Egyptian-Arabic/English bilinguals living in the U.S. were recruited. This experiment was approved by the University of Michigan’s Institutional Review Board (HUM00142209) and all participants provided informed consent. Participants ranged from the ages of 18-47. All participants had been exposed to Egyptian Arabic before the age of five, English before the age of twelve. Participants were also asked to indicate how often they used both languages to *speak, listen, read, and write* within the past six months. Most participants reported *speaking in* and *listening to* Egyptian Arabic every day (N=26 and 27) while the rest reported that they did so at least 3-4 times a week (N=14 and 13). Details of participants' self-reported language use can be found in Table 1 for the Egyptian Arabic usage.

<i>Egyptian Arabic</i>	Everyday	3-4 times a week	At most twice a week	Once a week	Never	Total
Speaking	26	14	0	0	0	40
Listening	27	13	0	0	0	40
Reading	7	12	6	6	9	40
Writing	5	3	15	5	12	40

Table 1. Participants’ usage of Egyptian Arabic within the last six months

Details of participants' self-reported language use can be found in Table 2 for the English usage. All participants reported *speaking in* and *listening to* English every day.

In addition, when asked to self-report their proficiency levels of *speaking, listening, reading, and writing* in both languages on a scale of 1-7, participants reported higher averages for English proficiency (*speaking* = 6.68, *listening* = 6.68, *reading* = 6.7, *writing* = 6.54) than for Egyptian Arabic proficiency (*speaking* = 5.63, *listening* = 5.95, *reading* = 3.32, *writing* = 2.97). All together this demographic information indicates that this pool of participants was more dominant in English than in Egyptian Arabic.

<i>English</i>	Everyday	3-4 times a week	At most twice a week	Once a week	Never	Total
Speaking	40	0	0	0	0	40
Listening	40	0	0	0	0	40
Reading	40	0	0	0	0	40
Writing	39	1	0	0	0	40

Table 2. Participants' usage of English within the last six months

3.3. PROCEDURE. Participants were instructed to listen to a sentence and rate its acceptability on a seven-point Likert scale, where “1” indicated totally unacceptable and “7” indicated totally acceptable. Before beginning the experiment, participants were provided with detailed instructions and examples to illustrate that the task was not about prescriptive norms, or the plausibility of the event described. This was followed by additional examples with varying degrees of acceptability to illustrate what kinds of sentences corresponded to different parts of the scale. Since the experimental sentences were presented aurally to participants, these training sentences were also presented aurally. None of the example sentences used the same structure as the target, critical stimuli sentences. After completing the experiment, participants filled out the questionnaire about their language use and background of both Egyptian Arabic and English (results reported in Tables 1 and 2).

3.4. DATA ANALYSIS. Raw judgment ratings, including both target and filler items, were converted to within-participant z-scores (Schütze & Sprouse 2013), to control for individual variation in how the scale was used (e.g. since some participants might use one side of the scale more than the other). Two linear mixed effects models were constructed using *island presence* and *clause type* as fixed effects and *participant* and *item* as random intercepts for each clause type, using the lme4 package in R (Bates et al. 2015). We refer to our two models as *wh-in situ* model and *wh-gap* model: (i) *wh-in situ* model: island presence (present vs. absent) X clause type (matrix vs. in situ). (ii) *wh-gap* model: island presence (present vs. absent) X clause type (matrix vs. gap).

4. Results. Overall, participants consistently rated structures where the wh-phrase served as the subject of the matrix CP (the *matrix* conditions) as more acceptable compared to structures where the clause-initial wh-constituent pertained to the object of the verb in the embedded CP (the *gap* condition) and to structures where the wh-constituent remained in situ in the embedded CP (the *in-situ* conditions). In the case of Egyptian Arabic, participants consistently rated the wh-in situ structures as more acceptable than the wh-gap structures, both within and outside islands. However, in English, participants exhibited a distinction in preference. Mainly, they rated wh-gap structures as more acceptable than wh-in situ structures outside an island context, while wh-in situ structures were rated as being more acceptable than wh-gap structures within an island context. A summary of these results is presented in Table 3.

Island Presence	Clause Type	Block 1: Egyptian Arabic		Block 2: English	
		Average raw score	Average z-score	Average raw score	Average z-score
Absent	Matrix	6.53	1.16	6.23	0.96
Absent	Embedded: In situ	4.93	0.42	5.07	0.46
Absent	Embedded: Gap	4.07	0.03	5.8	0.78
Present	Matrix	6.65	1.22	6.13	0.93
Present	Embedded: In situ	5.2	0.51	4.38	0.15
Present	Embedded: Gap	3.7	-0.08	3.4	-0.24

Table 3. Average ratings (raw judgements and z-scores) for each condition testing bilinguals' acceptability of wh-structures in Egyptian Arabic (block 1) and English (block 2) contexts.

Concerning our statistical models (the *wh-gap* model and the *wh-in situ* model) we found the following.

The *wh-gap* model: In Block 1, where we tested participants' sensitivity to wh-gap structures in Egyptian Arabic, our model revealed a significant main effect for *clause type* ($p < .001$). This indicates that structures where the clause-initial wh-constituent co-referred with a gap in the canonical position (the *embedded: gap* conditions) were rated as significantly less acceptable than structures where the wh-phrase served as the subject of the matrix CP (the *matrix* conditions). However, our model found no effect for the presence of an island, suggesting that participants did not rate sentences with an island (the *present* conditions) as significantly better or worse than sentences without an adjunct island (the *absent* conditions). Additionally, there was no effect for the interaction between *clause type* and *island presence*. These results suggest a general unacceptability of wh-gap structures in Egyptian Arabic, aligning with the assumption that wh-gap structures with nominal antecedents are not considered acceptable in Egyptian Arabic.

In Block 2, focusing on participants' sensitivity to wh-gap structures in English, our model revealed significant main effects for *clause type* ($p < .001$), *island presence* ($p < .001$), and the interaction of *clause type* and *island presence* ($p < .001$). Participants rated sentences where the clause-initial wh-constituent was the subject of the matrix CP (the *matrix* conditions) as significantly more acceptable than sentences where the clause-initial wh-constituent co-referred with the gap in the embedded CP (the *embedded: gap* conditions). Additionally, sentences were rated as significantly more acceptable when an adjunct island was absent (the *absent* conditions) compared to when an adjunct island was present (the *present* conditions). Collectively, these results indicate participants' acceptance of the wh-gap structure outside of an island context, coupled

with sensitivity to the island effect (i.e. rejection of wh-gap structures with wh-phrase linking to a gap within the island context). The summarized results can be found in Table 4.

	Block 1: Egyptian Arabic				Block 2: English			
	Estimate	SE	<i>t</i> -value	<i>p</i> -value	Estimate	SE	<i>t</i> -value	<i>p</i> -value
Intercept	0.57312	0.06565	8.73	<.001	0.60677	0.06741	9.001	< .001
Clause Type Matrix vs Gap	0.61141	0.04369	13.995	<.001	0.3434	0.0432	7.949	< .001
Island Presence Present vs. Absent	0.01149	0.04386	0.262	.79	0.26324	0.04303	6.117	< .001
Interaction	-0.042	0.04366	-0.962	.34	-0.25026	0.04312	-5.805	< .001

Table 4. Estimated coefficients and t-values for the linear mixed effects model with clause type (matrix vs. gap) and island presence (present vs. absent) as fixed effects in the Egyptian Arabic (block 1) and English (block 2) sentences. Significant effects are shown by p-values.

The *wh-in situ* model: In both blocks the *wh-in situ* model revealed a significant main effect for *clause type* ($p < .001$), while showing no effect for *island presence* (block 1: $p = .32$; block 2: $p = .08$) or the interaction of *clause type* and *island presence* (block 1: $p = .62$; block 2: $p = .15$). Collectively, these findings suggest that participants exhibited a preference for structures where the wh-phrase served as the subject of the matrix CP (the *matrix* conditions) over structures where the wh-constituent in the embedded clause remained in its in-situ canonical position (the *embedded: in situ* conditions). However, participants appeared insensitive to the presence or absence of an island in these ratings. Given the generally high scores for wh-in situ structures, as illustrated in Table 5, these results indicate that English-Egyptian Arabic bilinguals treat wh-in situ structures in Egyptian Arabic and in English as unaffected by constraints on movement such as syntactic islands. This aligns with previous proposals regarding Egyptian Arabic, which assert that in wh-in situ structures, the wh-phrase does not undergo either overt or covert movement. These results indicate that participants not only recognized the in-situ structures as interrogative structures in English, despite their presentation in an out-of-the-blue context, but that they also demonstrated an insensitivity to the presence of an island context when the wh-phrase remained in situ.

	Block 1: Egyptian Arabic				Block 2: English			
	Estimate	SE	<i>t</i> -value	<i>p</i> -value	Estimate	SE	<i>t</i> -value	<i>p</i> -value
Intercept	0.82783	0.07274	11.38	<.001	0.62628	0.0565	11.085	<.001
Clause Type Matrix vs In situ	0.35435	0.039	9.086	<.001	0.31848	0.04694	6.785	<.001
Island Presence Present vs. Absent	-0.03877	0.03879	-1	.32	0.0826	0.04693	1.76	.08
Interaction	0.01935	0.03898	0.496	.62	-0.06662	0.04693	-1.419	.15

Table 5. Estimated coefficients and t-values for the linear mixed effects model with clause type (matrix vs. in situ) and island presence (present vs. absent) as fixed effects in the Egyptian Arabic (block 1) and English (block 2) sentences. Significant effects are shown by p-values.

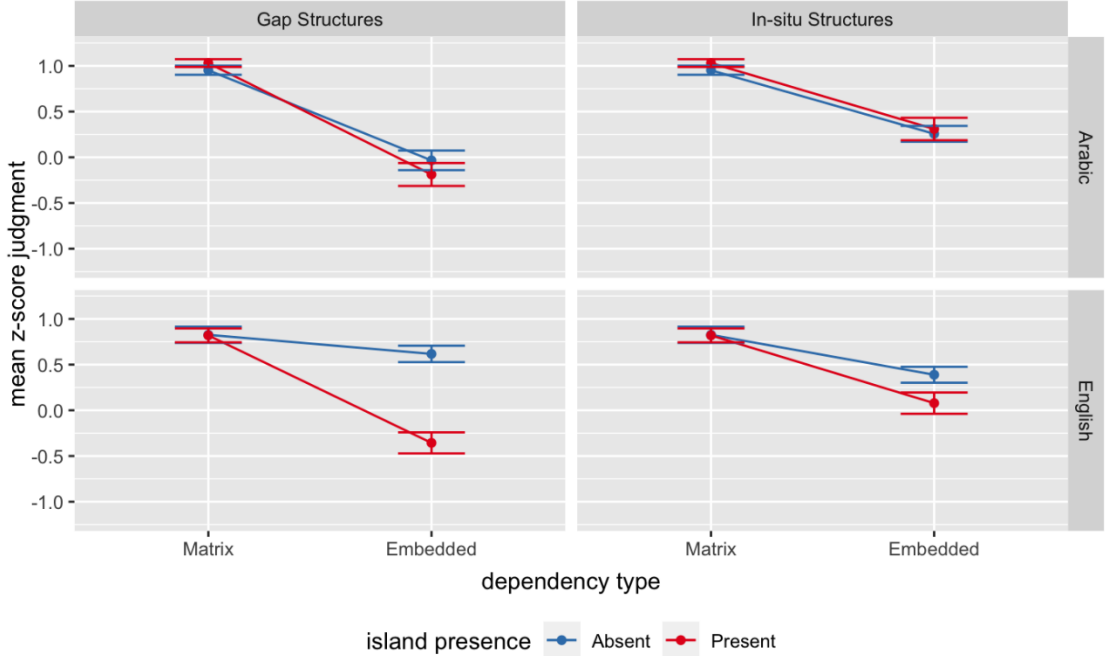


Figure 1. Interaction plot output for the factors tested in the *wh-gap model*, which we label here as *Gap Structures*, and the *wh-in situ model*, which we label here as *In-situ Structures*. Results represent judgments from both blocks tested in this experiment. Block 1 assesses acceptability of Egyptian Arabic interrogatives (labeled *Arabic*), and block 2 assesses acceptability of English interrogatives (labeled *English*).

5. Discussion. Wh-gap results provide evidence that the bilingual participants in this study rated the acceptability of these structures based on language specific sensitivities, rather than being affected by their other language. That is, speakers showed lower acceptability of wh-gap structures linked to an embedded clause gap in Arabic, offering equally low ratings to embedded clause wh-gap structures in island and non-island contexts, reflecting what would be expected in

Egyptian Arabic, where nominal wh-gap structures are supposed to be ungrammatical, independently of whether the extraction is from island or non-island structures, as discussed in section 3. Similarly, in English, where wh-gap structures are instead expected to be rejected only with islands, the bilinguals show significantly distinctive acceptability ratings, giving preference to wh-gap structures in non-island structures, as opposed to islands. These results are restricted to adjunct islands, although we expect similar results to arise with other island structures as well.

The wh-insitu results also support the observations that participants rated the acceptability of these structures based on language specific sensitivities. The results indicate that English-Egyptian Arabic bilinguals treat wh-in situ structures in Egyptian Arabic and in English as unaffected by constraints on movement, as expected from both grammars. First, regarding Egyptian Arabic, wh-in situ structures have been argued to be grammatical independently of whether they occur in island structures, as discussed in section 2. The Egyptian Arabic wh-in situ results from the bilinguals indicate show that they equally accept wh-in situ structures in island and non-island structures, reflecting the expectations regarding Egyptian Arabic. In English, wh-in situ structures have been argued to be grammatical in island structures, if they are licensed under common ground pragmatic conditions (e.g. Postal 1972; Ginzberg & Sag 2001; Pires & Taylor 2007; a.o.) The English wh-in situ results from the Egyptian Arabic-English bilinguals suggest that even in situations where the wh-in situ structure is presented without pragmatic licensing, bilinguals accept these structures, also without showing a significant difference between island and non-island contexts. Taken together, these results indicate that the bilinguals maintain the separation between their two grammars in the domain of wh-in situ vs. wh-gap structures, reflecting what would be expected of monolingual speakers of the two languages. This is especially relevant regarding Egyptian Arabic, which was identified as the non-dominant language for most of the bilinguals tested in this study, based on their language background and language usage responses.

It remains to be seen whether the lack of sensitivity to islands with wh-in situ structures in English would also be present with monolingual English speakers in the same testing conditions, in which the subjects did not require common ground pragmatic conditions to accept the wh-in situ structures in islands as well as in non-island structures.

6. Conclusion. This paper tested bilinguals' sensitivity to two structures that have overlapping word orders in Egyptian Arabic and English but are argued to have either similar or different derivational properties in their formation. We tested on wh-in situ structures in Egyptian Arabic, a language where wh-in situ serves as a canonical wh-question formation structure in out-of-the-blue questions, and English, where (single) wh-in situ structures have been argued to be pragmatically licensed in contexts where common ground requirements are fulfilled. We tested wh-in situ structures in contrast to wh-gap structures, in which wh-movement would be argued to apply in both languages. The results from acceptability tasks on these wh-structures, carried out with Egyptian Arabic-English bilinguals, showed that even in situations where the wh-in situ structure is presented without pragmatic licensing, bilinguals accept wh-in situ structures in English as out-of-the blue interrogatives, besides accepting them as canonical in Egyptian Arabic. These results indicate that wh-in situ is a common structure across Egyptian Arabic and English for this population of bilinguals, despite its restricted pragmatic conditions in English. However, these bilinguals also maintain a clear separation in their grammars regarding wh-gap structures, which are canonical in non-island contexts in English, but are ungrammatical across the board in Arabic. These results are particularly relevant given that the bilingual participants tested here offer evidence that English, and not Arabic, is their dominant language.

Appendix

Island Presence	Clause Type	Block	Examples
Absent	Matrix	Egyptian Arabic	miin laaHiz inn el-muHamii nisee el-shanta? who realized that the-lawyer forgot the-bag? “Who realized that the lawyer forgot the bag?”
		English	Who claimed that the school raised the budget?
Absent	Embedded: In situ	Egyptian Arabic	el-qaadi laaHiz inn el-muHamii nisee anhii shanta ? the judge realized that the-lawyer forgot which bag ? “The judge realized that the lawyer forgot which bag?”
		English	The superintendent claimed that the school raised which budget ?
Absent	Embedded: Gap	Egyptian Arabic	anhii shanta el-qaadi laaHiz inn el-muHamii nisee ___? which bag the judge realized that the-lawyer forgot ? “Which bag did the judge realize that the lawyer forgot?”
		English	Which budget did the superintendent claim that the school raised ___?
Present	Matrix	Egyptian Arabic	miin zi’il lamma el-muHamii nisee el-shanta? who was.upset when the-lawyer forgot the-bag? Who was upset when the lawyer forgot the bag?”
		English	Who complained when the school raised the budget?
Present	Embedded: In situ	Egyptian Arabic	el-qaadi zi’il lamma el-muHamii nisee anhii shanta ? the judge was.upset when the-lawyer forgot which bag ? “The judge was upset when the lawyer forgot which bag?”
		English	The superintendent complained when the school raised which budget ?
Present	Embedded: Gap	Egyptian Arabic	anhii shanta el-qaadi zi’il lamma el-muHamii nisee ___? which bag the judge was.upset when the-lawyer forgot ___? “Which bag was the judge upset when the lawyer forgot ___?”
		English	Which budget did the superintendent complain when the school raised ___?

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