

The D-Linking Effect on Wh-Extractions from Islands and Non-Islands in L1 Speakers and L2 Learners of English

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الملخص

تبحث هذه الدراسة تأثير عبارات الاستفهام الانجليزية المرتبطة بالسياق على قبولية الأسئلة التي انتقلت فيها عبارات الاستفهام من بنية تركيبية (جزيرة) لا تسمح بنقل جزء منها، كما هو في المثال:

*what_i/*which movie_i does she wonder [_{island} why he might hate ___]?

شارك في الدراسة سبعة وعشرون شخصاً وكانت لغتهم الأم هي الانجليزية، وواحد وثلاثون متعلماً للانجليزية لغتهم الأم العربية النجدية. قام المشاركون في الدراسة بالحكم نحوياً على صحة أسئلة انتقلت عبارات الاستفهام فيها من بنية تركيبية لا تسمح بنقل جزء منها وأسئلة أخرى انتقلت عبارات الاستفهام فيها من بنية تركيبية تسمح بنقل جزء منها، وذلك باستخدام مقياس تقييم يتراوح بين 1 (الجملة غير طبيعية تماماً) و7 (الجملة طبيعية تماماً). وأوضحت الدراسة أن متحدثي الانجليزية الأصليين والمتعلمين حكموا على الأسئلة التي انتقلت عبارات الاستفهام فيها من بنية تركيبية لا تسمح بنقل جزء منها بأنها غير صحيحة بينما حكموا على الأسئلة التي انتقلت عبارات الاستفهام فيها من بنية تركيبية لا تسمح بنقل جزء منها بأنها صحيحة. كما أوضحت النتائج أن عبارات الاستفهام المرتبطة بالسياق حسنت من قبول الأسئلة التي انتقلت فيها عبارات الاستفهام من بنية تركيبية لا تسمح بنقل جزء منها، ويعود سبب ذلك إلى أن عبارات الاستفهام المرتبطة بالسياق تشير إلى أفراد يمكن أن تشارك في عمليات جبرية رياضية.

Abstract

This study examines the effect of discourse-linked (d-linked) *wh*-phrases on acceptability of *wh*-extractions from islands and non-islands. Native speakers of English ($n = 27$) and Najdi Arabic learners of English ($n = 31$) rated on a 7-point scale their acceptability of *wh*-questions with bare and d-linked *wh*-extractions from islands and non-islands (e.g., **what_i* /**which* movie_i does she wonder [why he might hate ___i]?). Learners, like native speakers, showed sensitivity to island constraints as reflected in their low acceptability ratings of *wh*-extractions from islands. Learners, like native speakers, were also more sensitive to strong (universal constraints) than to weak islands (language-specific constraints), as predicted by Belikova and White's (2009) proposal. Moreover, both native speakers and learners exhibited a d-linking effect on *wh*-extractions from *wh*-islands, rating d-linked higher than bare *wh*-extractions. As for the source of this d-linking effect, the results of native speakers rather than learners, who could have been misled by the semantic cues of d-linked *wh*-phrases, suggest that this d-linking effect is more likely caused by the d-linked *wh*-phrase's denotation of discrete individuals as claimed by the semantic account of d-linking effect.

Keywords: L2 learners, syntax, island constraints, d-linking, Najdi Arabic

Sensitivity to island constraints on *wh*-movement is a topic of interest in second language acquisition and native psycholinguistics literature. In English, for example, *wh*-questions involve *wh*-movement (Chomsky, 1981, 1986). In (1), the *wh*-phrase (“what”) originates in the object position after the verb (“see”) and moves to the beginning of the sentence, leaving a trace.

(1) **What_i** did you see ____i?

However, *wh*-phrases cannot move from certain syntactic constituents, which are called *islands* (Ross, 1967). These islands include adjunct clauses (2a), relative clauses (RCs; 2b), complex NPs (2c), and *wh*-islands (2d).

(2)

- | | |
|--|-----------------|
| a. * What_i did she clean the room [after he took ___ _i]? | ADJUNCT CLAUSE |
| b. * What_i did she see [the author who wrote ___ _i]? | RELATIVE CLAUSE |
| c. * What_i did she deny [the fact that he stole ___ _i]? | COMPLEX NP |
| d. * What_i did she wonder [where he found ___ _i]? | WH-ISLAND |

English native speakers give low acceptability judgments to ungrammatical sentences that violate island constraints as in (2), suggesting sensitivity to island constraints (e.g., Sprouse et al., 2012).

Second language (L2) research has focused on the acquisition of island constraints to argue for or against L2 learners’ access to Universal Grammar (UG). Previous studies that tested L2 acquisition of island constraints did not show consistent results. Some studies argued that sensitivity to island constraints is possible for L2 learners regardless of L1 (e.g., Li, 1998; Martohardjono, 1993). Other studies argued that sensitivity to island constraints is possible only for L2 learners whose L1 instantiates overt *wh*-movement (e.g., Hawkins & Chan, 1997; Johnson & Newport, 1991). Belikova and White (2009) pointed out that, although previous studies argued for or against island sensitivity, further examination of their results by island type showed that L2 learners were more sensitive to specific types of islands (i.e., adjunct clauses, RCs, sentential subjects) than others (i.e., complex NPs, *wh*-islands). To account for variations in L2 learners’ sensitivity to island types, Belikova and White (2009) proposed, based on Huang’s (1982) revised Condition on Extraction Domains, that L2 learners are expected to be more sensitive to strong islands (universal constraints) than to weak islands (language-specific constraints) if they have access to UG.

Although native speakers of English are sensitive to islands, their sensitivity is affected by the linguistic properties of the extracted *wh*-phrase. Following terminology introduced in Pesetsky (1987), discourse-linked (d-linked) *wh*-phrases (e.g., “which movie”) arguably weaken island effects and increase the acceptability of *wh*-extractions from islands (e.g., Hofmeister & Sag, 2010). In (3a), the extracted *wh*-phrase (e.g., “what”) is a bare *wh*-phrase, and the sentence is expected to receive low acceptability.

(3)

- a. ***What** does he wonder [why she might hate ___]?
- b. ***Which movie** does he wonder [why she might hate ___]?

However, when the bare *wh*-phrase (e.g., “what”) is replaced by a d-linked *wh*-phrase (e.g., “which movie”) as in (3b), the sentence is expected to receive higher acceptability. The d-linking effect on acceptability of *wh*-extractions from islands is surprising, and there is currently debate in psycholinguistics about the source of this d-linking effect (e.g., Alexopoulou & Keller, 2013; Goodall, 2015; Hofmeister & Sag, 2010). Under the complexity account (e.g., Hofmeister & Sag, 2010), this d-linking effect is caused by the semantic and

structural complexity of the d-linked *wh*-phrase. Under the semantic account (e.g., Szabolcsi & Zwarts, 1993, 1997), however, this d-linking effect is caused by the d-linked *wh*-phrase's semantic denotation of discrete individuals.

To further investigate island sensitivity and d-linking effect on *wh*-extractions from islands, in the present study I tested English native speakers and Najdi Arabic learners of English to answer four questions. The first question is whether Najdi learners can show sensitivity to island constraints on *wh*-movement in English. If so, are they more sensitive to strong (universal constraints) than to weak islands (language-specific constraints), as predicted by Belikova and White (2009)? If L2 learners show island sensitivity as English natives do, this introduces the third question: Is this island sensitivity weakened by d-linking? If so, this raises the fourth question: Is this d-linking effect caused by the complexity of the d-linked *wh*-phrase as claimed by the complexity account or by the d-linked *wh*-phrase's denotation of discrete individuals as claimed by the semantic account.

Literature Review

I first give an overview of *wh*-movement and its island constraints in Najdi Arabic. Next, I review acceptability studies that examined L2 acquisition of island constraints. Then, I review two accounts of d-linking effect and the studies that tested the d-linking effect on *wh*-extractions. Finally, I discuss the details of the present study.

Linguistic Facts in Najdi Arabic

Wh-questions in Arabic dialects are formed via a variety of strategies. In Modern Standard Arabic, for example, *wh*-questions can be formed by moving the *wh*-phrase to the beginning of the sentence (4) or by a strategy of resumption (5)¹ (e.g., Alotaibi & Borsley, 2013; Aoun et al., 2010).

(4) **man_i** zaarat ___i naadia?
 who visited.3fs Nadia
 'Who did Nadia visit?'

(5) man zaarat-**hu** naadia?
 who visited.3fs-him Nadia
 'Who did Nadia visit?'

Tucker et al. (2019) conducted systematic experimental research and showed that *wh*-movement in Modern Standard Arabic is sensitive to adjunct islands (6)², complex NP islands and *wh*-islands.

(6) *ʔajja haqiiba_i taqlaqu [ʔiðaa nasiija ___i ʔal-muħaamii fii-l-maktab]?
 which briefcase worry.2ms [if forgot.3ms the-lawyer at-the-office]
 'Which briefcase_i do you worry [if the lawyer forgot ___i at the office]?'

In Palestinian Arabic, *wh*-questions can be formed via *wh*-movement, which is sensitive to island constraints (e.g., Shlonsky, 2002). Similarly, *wh*-questions in Lebanese Arabic can be formed via *wh*-movement, which is also sensitive to island constraints (e.g., Aoun et al., 2010). Like many dialects of Arabic, Najdi Arabic forms *wh*-questions via *wh*-movement (7) and makes use of the in-situ strategy (8) and resumption strategy (9)³ (e.g., Albaty, 2013).

¹The examples in (4) and (5) are from Aoun et al. (2010), p. 132.

²The example in (6) is from Tucker et al. (2019), p. 54.

³The examples in (7), (8) and (9) are from Albaty (2013), p. 1.

- (7) **min_i** kalam Ahmad ___i il-yum?
 who called Ahmad the-day
 ‘Who(m) did Ahmad call yesterday?’
- (8) kalam-t ams miin?
 called-2ms yesterday who
 ‘Who(m) did you call yesterday?’
- (9) min illi kalam-t-h ams?
 who that called-2ms -3ms yesterday
 ‘Who(m) did you call yesterday?’

In Najdi Arabic, *wh*-movement is sensitive to island constraints. The *wh*-questions in (10) and (11)⁴ are ungrammatical because of a violation of a *wh*-island constraint and a violation of a RC island constraint respectively.

- (10) ***ayy rjal_i** 9alima-ni Ali [**mita zar** ___i]
 which man told.3ms-me Ali [when visited.3ms]
 ‘Which man_i did Ali tell me [when he visited ___i]?’
- (11) ***ayy rsalah_i** shakr ar-rjal [**al-bint alli kitab-t** ___i]
 which letter thanked.3ms the-man [the-girl that wrote-3fs]
 ‘Which letter_i did the man thank [the girl who wrote ___i]?’

Studies of Island Constraints in L2 Acquisition

Chomsky (1973) proposed the *subjacency principle* to account for all types of island constraints, which states that a *wh*-phrase cannot cross more than one bounding node, IP or DP, in each single movement. In (12), the *wh*-questions are ungrammatical because the *wh*-phrase “what” crosses more than one bounding node, DP, or IP in each movement.

- (12)
- | | |
|--|-----------------|
| a. *What _i did [IP she clean the room [PP after [IP he took __ _i]]]? | ADJUNCT CLAUSE |
| b. *What _i did [IP she see [DP the author [CP who wrote __ _i]]]? | RELATIVE CLAUSE |
| c. *What _i did [IP she deny [DP the fact [CP that [IP he stole __ _i]]]]? | COMPLEX NP |
| d. *What _i did [IP she wonder [CP where [IP he found __ _i]]]? | WH-ISLAND |

Under this version of island constraints, L2 learners are expected to treat all types of islands similarly if they have access to UG. However, previous L2 studies (e.g., Johnson & Newport, 1991; Li, 1998; Schachter, 1990) that adopted this version of island constraints showed that learners were more sensitive to specific types of islands (i.e., adjunct clauses, RCs, sentential subjects) than others (i.e., complex NPs, *wh*-islands).

Martohardjono (1993), for example, examined sensitivity to island constraints by testing Italian learners of English. In Italian, as in Najdi Arabic, *wh*-questions are formed via *wh*-movement, which is sensitive to island constraints. The results showed that Italian learners, like English native speakers, treated island types differently, being more sensitive to adjunct islands and RC islands than to complex NP islands and *wh*-islands.

To account for variations in L2 learners’ performance on types of islands, Belikova and White (2009) adopted an alternate version of island constraints. This version is a revised version of Huang’s (1982) Condition on Extraction Domains (CED), under which extraction from non-complements is universally impossible. Therefore, extraction from strong islands

⁴The judgments provided for (10) and (11) come from native speakers’ intuitions and not from systematic experimental investigation.

(i.e., adjunct clauses, RCs, and sentential subjects) is not possible universally because strong islands are non-complements. However, this entails that the ungrammaticality of extraction from weak islands (e.g., *wh*-islands, complex NPs) can be attributed to parametric variation. Based on Huang’s revised CED, Belikova and White (2009) proposed that learners should be more sensitive to strong than to weak islands because strong islands are universal constraints on extraction while weak islands are language-specific constraints.

Although native speakers of English are sensitive to islands, sensitivity is affected by the type of extracted *wh*-phrase. For example, d-linked *wh*-phrases (e.g., “which movie”) as in (13b) compared to bare *wh*-phrases (e.g., “what”) as in (13a) have been argued to weaken island effects and increase the acceptability of *wh*-extractions from islands (e.g., Hofmeister & Sag, 2010).

(13)

- a. ***What** does he wonder [why she might hate ___]?
- b. ***Which movie** does he wonder [why she might hate ___]?

In (13a), the *wh*-phrase (“what”) that is extracted from a *wh*-island is a bare *wh*-phrase and the sentence is expected to receive low acceptability. However, when the bare *wh*-phrase is replaced by a d-linked *wh*-phrase (“which movie”) that prompts an answer that can be inferred from referents already introduced into the discourse as in (13b), the sentence is expected to receive higher acceptability. The d-linking effect on *wh*-extractions from islands presents an interesting puzzle, and it is not clear how d-linking interacts with syntactic constraints and increases acceptability of *wh*-extractions from islands. Many accounts have been proposed to explain the source of d-linking effect on *wh*-extractions from islands. The next section reviews two accounts of d-linking effect on *wh*-extractions from islands and the studies that tested these two accounts.

Accounts of D-Linking Effect on *Wh*-Extractions

Under the complexity account (e.g., Hofmeister & Sag, 2010), the d-linking effect on *wh*-extractions from islands is caused by the complexity of the extracted *wh*-phrase. This account claims that semantically and structurally more complex *wh*-phrases (e.g., “which movie”) have stronger mental representations compared to bare *wh*-phrases (e.g., “what”) and are thus easier to retrieve from working memory at the gap site (the subcategorizing verb). This ease of processing is claimed to result in higher acceptability.

To support the complexity view of d-linking effect, Hofmeister and Sag (2010) manipulated the type of *wh*-phrase in a self-paced reading task to show that complex *wh*-phrases compared to bare *wh*-phrases can facilitate processing of *wh*-extractions from *wh*-islands and improve their acceptability. Native speakers of English first read a declarative background sentence, and then read either a question with a bare *wh*-extraction from a *wh*-island (14a), a question with a d-linked *wh*-extraction from a *wh*-island (14b), or a baseline question with a bare *wh*-extraction from a *that*-clause (14c)⁵.

(14) BACKGROUND SENTENCE

Albert learned that the managers dismissed the employee with poor sales after the annual performance review.

BARE CONDITION

- a. ***Who** did Albert learn whether they **dismissed** ___ after the annual performance review?

⁵The example in (14) is from Hofmeister & Sag (2010), p. 394.

WHICH CONDITION

- b. ***Which employee** did Albert learn whether they **dismissed** ___ after the annual performance review?

BASELINE CONDITION

- c. Who did Albert learn that they dismissed after the annual performance review?

The results showed faster reading times for the complex *wh*-phrase condition (14b) than for the bare *wh*-phrase condition (14a) at the three regions (e.g., “after the annual”) that follow the embedded verb (e.g., “dismissed”) inside the island, where the retrieval of *wh*-phrase from working memory is expected to take place. Hofmeister and Sag (2010) argued that this suggests that processing of *wh*-extractions from *wh*-islands can be facilitated when the complexity of *wh*-phrase is increased.

Like Hofmeister and Sag (2010), Goodall (2015) also claimed the d-linking effect is caused by the complexity of the extracted *wh*-phrase. Goodall tested the d-linking effect on *wh*-extractions from islands and non-islands by manipulating the type of *wh*-phrase (bare vs. complex) and the type of the structure in which the gap was located (complex NP vs. *wh*-clause vs. *that*-clause) in six conditions using a 2 × 3 design, as in (15)⁶.

(15) UNGRAMMATICAL / COMPLEX NP ISLAND

- a. ***What / *Which of the cars** do you believe the claim that he might buy ___?

UNGRAMMATICAL / WH-ISLAND

- b. ***What / *Which of the cars** do you wonder who might buy ___?

GRAMMATICAL / NON-ISLAND

- c. **What / Which of the cars** do you believe that he might buy ___?

Goodall (2015) tested the complexity account, which claims that complex *wh*-phrases increase the acceptability because they are easier to retrieve at the gap site regardless of whether the gap was located inside an island or non-island structure. If this claim is right, there should be an increase in acceptability of d-linked *wh*-extractions from both islands (i.e., complex NP islands, *wh*-islands) and non-islands (*that*-clauses) as compared to their bare counterparts. Using a 7-point rating scale, with 7 being *very good*, English native speakers, as predicted, rated d-linked *wh*-extractions from both islands and non-islands higher than their bare counterparts, supporting the complexity account of d-linking effect.

Unlike Hofmeister and Sag (2010) and Goodall (2015), Alexopoulou and Keller (2013) argued the d-linking effect is driven by semantic factors. Under the semantic account (Szabolcsi & Zwarts, 1993, 1997), which views sensitivity to weak islands as a semantic phenomenon, d-linked *wh*-phrases increase the acceptability of *wh*-extractions from weak islands because they denote discrete individuals that can participate in the semantic Boolean operations (e.g., intersection, union, complementation) necessary for the interpretation of weak islands. However, bare *wh*-phrases are not good extractors because they usually denote kinds that cannot be collected into sets that form the semantic Boolean operations.

To support the semantic view of d-linking effect, Alexopoulou and Keller (2013) examined the d-linking effect on *wh*-extractions from islands and non-islands as in (16)⁷.

(16) WHETHER ISLAND EXTRACTION

- a. ***What/*What movie/*Which movie/*Which of the movies** does Jean wonder whether they will watch ___ at the cinema?

⁶The example in (15) is from Goodall (2015), p. 4.

⁷The example in (16) is from Alexopoulou & Keller (2013), p. 18.

MAIN CLAUSE EXTRACTION

- b. **What/What movie/Which movie/Which of the movies** will they watch ___ at the cinema?

THAT-CLAUSE EXTRACTION

- c. **What/What movie/Which movie/Which of the movies** does Mary think they will watch ___ at the cinema?

Alexopoulou and Keller (2013) tested native speakers of English who exhibited a d-linking effect on *wh*-extractions from *whether* islands (16a), with *which N* condition (e.g., “which movie”), being rated higher than *what* condition (e.g., “what”). They attributed this d-linking effect to the critical property of the distinction between kind denoting *wh*-phrases (e.g., “what”) and individual denoting *wh*-phrases (e.g., “which movie”). They argued that d-linked *wh*-phrases facilitate processing of *wh*-extractions from weak islands because they denote discrete individuals that can participate in the semantic Boolean operations necessary for the interpretation of weak islands as proposed by Szabolcsi and Zwarts (1993). However, they did not find a d-linking effect on *wh*-extractions from non-island structures, namely main clauses (16b) and embedded *that*-clauses (16c) because these structures do not involve a scope island for which the denotation of the d-linked *wh*-phrase is crucial for its interpretation. They argued that these results support the semantic account of d-linking effect.

Goodall (2015) and Hofmeister and Sag (2010) claimed the d-linking effect is caused by the complexity of d-linked *wh*-phrase, while Alexopoulou and Keller (2013) argued this effect is caused by the d-linked *wh*-phrase’s denotation of discrete individuals as claimed by the semantic account. The source of d-linking effect is still a controversial issue, and this study further investigates the issue by testing the predictions of the complexity account and semantic account of the d-linking effect.

The Present Study

Unlike previous studies (e.g., Alexopoulou & Keller, 2013; Goodall, 2015; Hofmeister & Sag, 2010) that tested only English native speakers to examine island sensitivity and the d-linking effect on *wh*-extractions, this study also tests L2 learners, a population that is particularly interesting to examine from this perspective, to shed light on whether island sensitivity and d-linking effect are similar in the two populations.

Research Questions

The primary goal of this study is to examine whether island sensitivity and the d-linking effect on *wh*-extractions are similar in nature in L2 learners and native speakers. The first step is to examine whether Najdi Arabic learners of English show sensitivity to island constraints on *wh*-movement in English. If Najdi Arabic learners, like native speakers, show sensitivity to islands, this prompts the second question of whether they are more sensitive to strong islands (universal constraints) than to weak islands (language-specific constraints) as predicted by Belikova and White (2009). A third question can also be raised of whether this island sensitivity exhibited by natives and learners is weakened by d-linking effect. If so, this raises the fourth question of whether this d-linking effect is caused by the complexity of the d-linked *wh*-phrase as claimed by the complexity account or caused by the d-linked *wh*-phrase’s denotation of discrete individuals as claimed by the semantic account.

Method

Participants

Thirty-one Najdi Arabic learners of English voluntarily participated in the study. The Arabic learners (30 males, mean age = 27.4) started learning English as adults in public schools. All learners completed the Michigan Listening Comprehension Test to assess their English proficiency. The test consisted of 45 listening comprehension questions that targeted various grammatical constructions. The learners' scores ranged from 37 to 44 out of 45 possible correct answers ($M = 40.05$, $SD = 2.31$). They were all tested at Imam University, Riyadh, Saudi Arabia. Twenty-seven monolingual native speakers of English (13 females, 14 males; mean age = 40.3) also participated in the study. Twenty-four of them were from the United States and were tested at the University of Kansas, USA, and three participants were from the United Kingdom and were tested at Imam University. Each participant was paid \$15 for participating.

Materials

The stimuli in this study were designed to test the effects of two island types: *wh*-islands (weak islands) and RC islands (strong islands). To test each of the two island types, the *wh*-extraction site and the *wh*-phrase type were manipulated in four conditions as in (17).

(17) WH-ISLAND

- | | |
|--|---------------------|
| a. * What does he wonder why she might hate ___? | ISLAND/BARE |
| b. * Which movie does he wonder why she might hate ___? | ISLAND/D-LINKED |
| c. What does he think that she might hate ___? | NON-ISLAND/BARE |
| d. Which movie does he think that she might hate ___? | NON-ISLAND/D-LINKED |

The *wh*-extraction is either from an island structure, as in (17a) and (17b), or from a non-island structure, as in (17c) and (17d). The *wh*-phrase is either a bare *wh*-phrase (e.g., *what*), as in (17a) and (17c), or a d-linked *wh*-phrase (e.g., *which movie*), as in (17b) and (17d). The first two conditions are ungrammatical because of *wh*-extraction from an island, while the last two conditions are grammatical because of *wh*-extraction from a non-island structure and they serve as controls. An example of one set to test the effects of RC islands is shown in (18)⁸.

(18) RC ISLAND

- | | |
|---|---------------------|
| a. * What did the author who wrote ___ win the prize? | ISLAND/BARE |
| b. * Which article did the author who wrote ___ win the prize? | ISLAND/D-LINKED |
| c. What did the author who wrote the article win ___? | NON-ISLAND/BARE |
| d. Which prize did the author who wrote the article win ___? | NON-ISLAND/D-LINKED |

To test *wh*-islands, I used 16 sets of sentences. They included four sets with the *wh*-word *why*, four sets with the *wh*-word "how," four sets with the *wh*-word "where" and four sets with the *wh*-word "when" heading the subordinate clause. To test RC islands, I also used 16 sets of sentences: eight sets with the head of the RC in subject position (four sets with the relative pronoun "who," four sets using "that") and eight sets with the head of the RC in object position (four sets with the relative pronoun "who," four sets using "that").

The sentences from the 32 sets were distributed among four lists using a Latin square design, such that every participant was presented with only one sentence from every set. Each list had 32 sentences that included four sentences for each of the four conditions in *wh*-

⁸The experimental sentences were created by the author, while the fillers were taken from Hawkins & Chan (1997) with some modification.

islands and RC islands. Because all experimental sentences were *wh*-questions, 32 declarative filler sentences were added to each list. Thus, the total number of sentences in each list was 64, including 32 experimental sentences (half grammatical, half ungrammatical) and 32 filler sentences (half grammatical, half ungrammatical). The sentences in each list were presented in four blocks. Each block included eight experimental sentences (four grammatical, four ungrammatical) and eight filler sentences (four grammatical, four ungrammatical). The sentences were randomized in each block. All experimental materials are in Appendix A.

Acceptability Judgment Task

I conducted an acceptability judgment task (AJT), using the experimental control software Paradigm (Tagliaferri, 2005). In each experimental trial, a sentence appeared on the computer screen. The participant then judged, with no time limits, whether the sentence sounded natural or unnatural in English, using a 7-point rating scale displayed underneath the sentence. The rating scale ranged from *totally unnatural* to *perfectly natural*. The participants could choose *I do not know* if they could not make a judgment. The test began with six practice trials to familiarize participants with the task.

Procedure

Native speakers and Najdi learners were tested individually, using a computer. They signed a consent form and completed a background questionnaire. Before Najdi learners took the AJT, they were asked to complete the Michigan Listening Comprehension Test to assess their English proficiency.

Predictions

Sensitivity to island constraints on *wh*-movement

As shown in the literature review, *wh*-questions in Najdi Arabic can be formed via *wh*-movement, which is sensitive to islands, as is the case in English. This suggests that Najdi Arabic learners have *wh*-movement and island sensitivity in their L1. Therefore, Najdi Arabic learners, like English native speakers, are predicted to make a distinction between ungrammatical and grammatical *wh*-extractions, rating ungrammatical *wh*-extractions from islands lower than grammatical *wh*-extractions from non-islands.

Belikova and White's (2009) Proposal

Belikova and White (2009) claimed that L2 learners, like native speakers, are expected to be more sensitive to strong (universal constraints) than to weak islands (language-specific constraints) if they have access to UG. If this claim is right, Najdi learners will rate *wh*-extractions from RC islands (strong islands) lower than *wh*-extractions from *wh*-islands (weak islands).

D-Linking Effect and Its Source

Much of the literature on d-linking (e.g., Phillips, 2013; Szabolcsi, 2006) claims that d-linking has a greater effect on *wh*-extractions from weak islands than on *wh*-extractions from strong islands. If correct, native speakers and learners will exhibit a greater d-linking effect on *wh*-extractions from *wh*-islands (weak islands) than on *wh*-extractions from RC islands (strong islands).

As for the source of d-linking effect, the complexity account argues the d-linking effect is caused by the semantic and structural complexity of the d-linked *wh*-phrase. This account claims that d-linked *wh*-phrases, which are complex, are easy to retrieve from working memory at the gap site and this ease of processing leads to an increase in acceptability regardless of whether the *wh*-extraction is from an island or non-island

structure. If correct, native speakers and learners will show an increase in acceptability of d-linked *wh*-extractions from both island and non-island structures.

However, the semantic account that is relevant only for weak islands argues the d-linking effect is caused by semantic factors⁹. This account claims that d-linked *wh*-phrases increase acceptability of *wh*-extractions from weak islands because they denote discrete individuals that can participate in the semantic Boolean operations necessary for the interpretation of weak islands. If correct, native speakers and learners will show an increase in acceptability of d-linked *wh*-extractions from *wh*-islands (weak islands) but not of d-linked *wh*-extractions from RC islands (strong islands) or non-islands because the denotation of the d-linked *wh*-phrase is not crucial for the interpretation of strong island and non-island structures.

Results

In this section, I first present the results of whether native speakers and learners distinguished ungrammatical from grammatical *wh*-extractions. Then I present the results of whether native speakers and learners are more sensitive to strong than to weak islands and the results of the d-linking effect on *wh*-extractions from islands. Finally, I present the results of the d-linking effect on *wh*-extractions from non-islands. Before analysis, each participant's acceptability ratings were converted into *z* scores to eliminate the possibility that participants may vary in their use of the range of the 7-point rating scale used in the AJT.

Ungrammatical vs. Grammatical Wh-extractions

To examine whether native speakers and learners distinguished ungrammatical from grammatical *wh*-extractions and whether the distinction is affected by *wh*-phrase type and island type, I conducted a mixed four-way repeated measures ANOVA for acceptability ratings with Grammaticality (grammatical vs. ungrammatical *wh*-extraction), *Wh*-Phrase Type (bare vs. d-linked) and Island Type (*wh*-island vs. RC island) as within-subjects factors and Group (native speakers vs. learners) as the between-subjects factor. Figure 1 summarizes the results for native speakers; Figure 2 summarizes the results for learners.

ANOVA results revealed a main effect of Grammaticality [$F(1,56) = 497.860, p = .000$], indicating that ungrammatical *wh*-extractions were distinguished from grammatical ones. The analysis did not reveal a main effect of Group [$F(1,56) = .124, p = .726$] but revealed an interaction between Grammaticality and Group [$F(1,56) = 17.379, p = .000$], indicating that native speakers were better than learners in distinguishing ungrammatical *wh*-extractions ($M = -0.98$) from grammatical ones ($M = 0.58$) overall. However, follow-up statistical analysis showed that learners also distinguished ungrammatical *wh*-extractions ($M = -0.75$) from grammatical ones ($M = 0.32$) [$t(30) = -12.079, p = .000$].

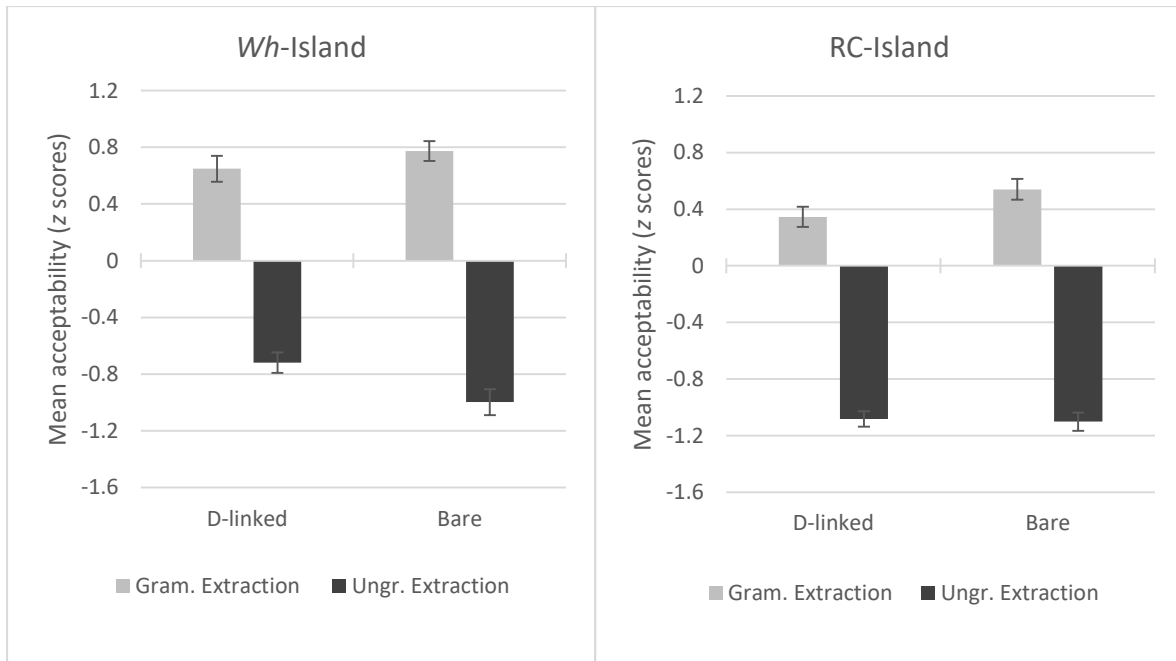
The analysis showed a main effect of *Wh*-Phrase Type [$F(1,56) = 9.067, p = .004$] and an interaction between *Wh*-Phrase Type and Group [$F(1,56) = 9.995, p = .003$]. There was also an interaction between Grammaticality and *Wh*-Phrase Type [$F(1,56) = 7.716, p = .007$] and no three-way interaction with Group [$F(1,56) = 2.251, p = .139$]. This indicates that the distinction in grammaticality is more pronounced in bare than in d-linked *wh*-extractions for both native speakers and learners and no difference between the two groups.

⁹The semantic account is relevant for weak islands because it views them as a semantic phenomenon. The semantic account, however, is not relevant for strong islands because they are typically taken to be a syntactic phenomenon, and the semantic denotation of the extracted *wh*-phrase is not crucial for their interpretation.

The analysis also showed a main effect of Island Type [$F(1,56) = 37.011, p = .000$] but did not show an interaction between Island Type and Group [$F(1,56) = 0.001, p = .974$]. Moreover, there was not an interaction between Grammaticality and Island Type [$F(1,56) = .553, p = .460$] and no three-way interaction with Group [$F(1,56) = 1.442, p = .235$]. This indicates that the distinction in grammaticality was the same in *wh*-island and RC island sentences for both native speakers and learners, with no difference between the two groups.

Figure 1

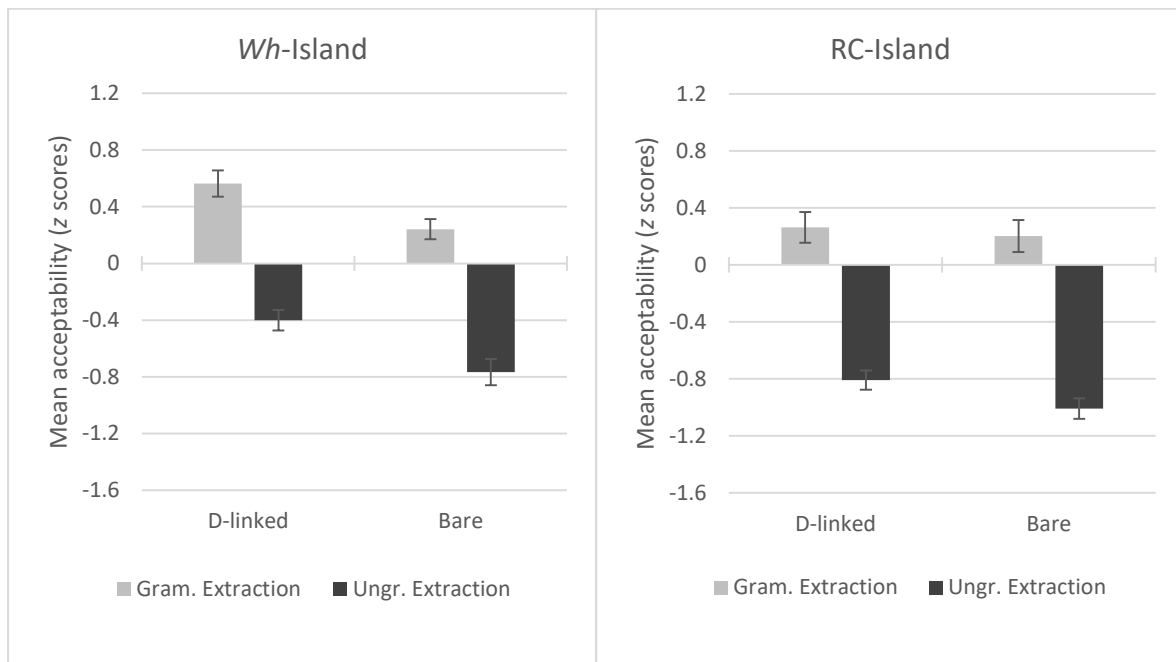
Native Speakers' Mean Acceptability of Experimental Conditions



Note. Error bars indicate standard error.

Figure 2

L2 Learners' Mean Acceptability of Experimental Conditions



Note. Error bars indicate standard error.

There was an interaction between Island Type and *Wh*-Phrase Type [$F(1,56) = 11.772, p = .001$], but there was no three-way interaction with Group [$F(1,56) = 1.442, p = .235$]. There was no three-way interaction among Grammaticality, Island Type, and *Wh*-Phrase Type [$F(1,56) = .137, p = .713$] and no four-way interaction with Group [$F(1,56) = 1.186, p = .281$]. This indicates that the distinction in grammaticality for bare and d-linked *wh*-extractions was the same in *wh*-island and RC island sentences for both native speakers and learners, with no difference between the two groups.

Ungrammatical Wh-extractions From Islands

In this section, I present the results of whether native speakers and learners are more sensitive to strong than to weak islands and the results of the d-linking effect on *wh*-extractions from islands. I conducted a mixed three-way repeated measures ANOVA for acceptability ratings of *wh*-extractions from islands with *Wh*-Phrase Type (bare vs. d-linked) and Island Type (*wh*-island vs. RC island) as within-subjects factors and Group (native speakers vs. learners) as the between-subjects factor.

The results of ANOVA revealed a main effect of Island Type [$F(1,56) = 30.754, p = .000$] but no interaction between Island Type and Group [$F(1,56) = .859, p = .358$]. This indicates that both native speakers and learners rated *wh*-extractions from RC islands ($M = -1.00$) lower than *wh*-extractions from *wh*-islands ($M = -0.72$) and no difference between the two groups, being more sensitive to strong islands (universal constraints) than to weak islands (language-specific constraints). To examine whether native speakers and learners were more sensitive to strong than to weak islands for both d-linked and bare *wh*-phrases, I conducted pairwise comparisons between the *wh*-island/d-linked condition and the RC-island/d-linked condition (Natives: $t(26) = 4.555, p = .000$; Learners: $t(30) = 3.257, p = .003$) and between the *wh*-island/bare condition and the RC-island/bare condition (Natives: $t(26) = 1.822, p = .080$; Learners: $t(30) = 3.148, p = .004$). The pairwise comparisons indicate that learners

were more sensitive to strong than to weak islands for both d-linked and bare *wh*-phrases. Native speakers were also more sensitive to strong than to weak islands for d-linked *wh*-phrases. In the case of bare *wh*-phrases, they tended to show a similar pattern of results and this was marginally significant.

There was a main effect of Group [$F(1,56) = 13.136, p = .001$], which indicates that native speakers ($M = -0.98$) rated *wh*-extractions from islands lower than learners ($M = -0.75$). There was also a main effect of *Wh*-Phrase Type [$F(1,56) = 24.011, p = .000$] but no interaction between *Wh*-Phrase Type and Group [$F(1,56) = 2.337, p = .132$]. This indicates that both native speakers and learners exhibited a d-linking effect on *wh*-extractions from islands and no difference between the two groups, rating d-linked *wh*-extractions ($M = -0.75$) higher than bare *wh*-extractions ($M = -0.97$).

Crucially, there was an interaction between *Wh*-Phrase Type and Island Type [$F(1,56) = 6.974, p = .011$] but no three-way interaction with Group [$F(1,56) = .331, p = .567$]. This suggests that the d-linking effect is greater on *wh*-extractions from *wh*-islands than on *wh*-extractions from RC islands for both native speakers and learners and no difference between the two groups.

Grammatical Wh-extractions From Non-Islands

In this section, I present the results of the d-linking effect on *wh*-extractions from non-islands. Because native speakers patterned differently from learners with respect to the d-linking effect on *wh*-extractions from non-islands as shown in Figure 1 and Figure 2, I conducted a separate analysis for each group to examine whether d-linking increases acceptability of *wh*-extractions from non-islands and whether this is affected by Structure Type. For native speakers, I conducted a two-way repeated measures ANOVA for ratings of *wh*-extractions from non-islands with *Wh*-Phrase Type (bare vs. d-linked) and Structure Type (*that*-clause vs. main RC) as within-subjects factors.

The results of ANOVA revealed a main effect of *Wh*-Phrase Type [$F(1,26) = 7.919, p = .009$], which indicates that native speakers did not exhibit a d-linking effect on *wh*-extractions from non-islands, rating bare *wh*-extractions ($M = 0.65$) higher than d-linked *wh*-extractions ($M = 0.49$). The analysis also showed a main effect of Structure Type [$F(1,26) = 8.032, p = .009$], which indicates that native speakers rated *wh*-extractions from *that*-clauses ($M = 0.71$) higher than *wh*-extractions from main RCs ($M = 0.44$). There was no interaction between *Wh*-Phrase Type and Structure Type [$F(1,26) = .451, p = .508$], indicating that d-linking effect is the same in *wh*-extractions from *that*-clauses and *wh*-extractions from main RCs.

For learners, the results of ANOVA revealed a marginally significant main effect of *Wh*-Phrase Type [$F(1,26) = 3.610, p = .067$], which indicates that learners, unlike native speakers, tended to exhibit a d-linking effect on *wh*-extractions from non-islands, rating d-linked *wh*-extractions ($M = 0.41$) higher than bare *wh*-extractions ($M = 0.22$). The analysis also showed a marginally main effect of Structure Type [$F(1,26) = 4.037, p = .054$], which indicates that learners tended to rate *wh*-extractions from *that*-clauses ($M = 0.40$) higher than *wh*-extractions from main RCs ($M = 0.23$). There was also a marginally significant interaction between *Wh*-Phrase Type and Structure Type [$F(1,26) = 3.465, p = .073$], which suggests that the d-linking effect was greater on *wh*-extractions from *that*-clauses than on *wh*-extractions from main RCs.

Discussion

The first question tested in this study is whether Najdi learners can show sensitivity to island constraints on English *wh*-movement. This study showed that Najdi learners, like English natives, correctly made a distinction between ungrammatical and grammatical *wh*-extractions, and this distinction in grammaticality was more pronounced with bare than with d-linked *wh*-extractions as shown in Figures 1 and 2. This suggests that *wh*-dependencies in both L1 and L2 grammars are similarly constrained by syntax. To conclude, then, and in answer to the first question of this study, Najdi learners did, in fact, show sensitivity to island constraints on *wh*-movement, just as English natives did.

The second question tested in this study is whether Najdi learners are more sensitive to strong (universal constraints) than to weak islands (language-specific constraints), as predicted by Belikova and White (2009). The results showed that Najdi learners, like English natives, rated *wh*-extractions from RC islands (strong islands) lower than *wh*-extractions from *wh*-islands (weak islands), being more sensitive to strong than to weak islands, as shown in Figures 1 and 2. This was reflected in the main effect of island type in the statistical analysis run on acceptability ratings of *wh*-extractions from islands. This pattern of results was more pronounced with d-linked *wh*-extractions than with bare *wh*-extractions. These results are consistent with Belikova and White (2009), which argued that L2 learners are expected to be more sensitive to strong than to weak islands if they have access to UG.

Although previous studies that tested L2 sensitivity to island constraints did not agree on the issue of whether L2 learners have access to UG, the results of many studies along with the results of this study are consistent under Belikova and White (2009). Both Najdi learners in this study and Italian, Indonesian and Chinese learners in Martohardjono (1993) rated *wh*-extractions from RC islands (strong islands) lower than *wh*-extractions from *wh*-islands (i.e., weak islands). Although Johnson and Newport (1991) and Schachter (1990) argued that UG is inaccessible for L2 learners, learners in these studies were similar to the learners in the current study in that they were more sensitive to strong than to weak islands. To conclude, then, and in answer to the second question of this study, Najdi learners were more sensitive to strong than to weak islands, suggesting that Belikova and White's (2009) proposal is on the right track.

The third question in this study tested whether d-linking weakens island effects and increases the acceptability of *wh*-extractions from islands. Based on previous literature on d-linking (e.g., Szabolcsi, 2006), I predicted that d-linking would have a greater effect on *wh*-extractions from weak islands than on *wh*-extractions from strong islands. As predicted, both natives and learners showed a d-linking effect that was greater on *wh*-extractions from *wh*-islands (weak islands) than on *wh*-extractions from RC islands (strong islands) as shown in Figures 1 and 2. This was reflected in the interaction between *Wh*-Phrase Type and Island Type in the statistical analysis run on acceptability ratings of *wh*-extractions from islands.

Unlike previous studies (e.g., Alexopoulou & Keller, 2013; Goodall, 2015; Hofmeister & Sag, 2010) which tested only weak islands to examine the d-linking effect on *wh*-extractions from islands, the present study tested also strong islands (RC islands) and showed that d-linking did not uniformly affect island types, having a noticeable effect on weak islands (*wh*-islands) and a less obvious effect on strong islands (RC islands) as noted by Phillips (2013).

However, it should be noted that although d-linking increased the acceptability of *wh*-extractions from *wh*-islands, the acceptability of these *wh*-extractions remained less acceptable than grammatical *wh*-extractions. That is, d-linking could not completely

eliminate island effects and restore the questions with *wh*-extractions from islands to full acceptability. Interestingly, similar results were found in Alexopoulou and Keller (2013), Goodall (2015), and Sprouse et al. (2016). To conclude, then, and in answer to the third question of this study, d-linking weakened island effects, and its effect was greater on *wh*-extractions from *wh*-islands (weak islands) than on *wh*-extractions from RC islands (strong islands).

The fourth study question explored whether this d-linking effect on *wh*-extractions from *wh*-islands is caused by the complexity of the d-linked *wh*-phrase (e.g., Hofmeister & Sag, 2010) or by the d-linked *wh*-phrase's denotation of discrete individuals (Szabolcsi & Zwarts, 1993, 1997). The complexity account claims that d-linked *wh*-phrases, which are semantically and structurally complex, are easy to retrieve from working memory at the gap site, and this ease of processing leads to an increase in acceptability. If this claim is correct, then I would expect an increase in acceptability regardless of whether the *wh*-extraction is from an island or non-island structure. However, the semantic account, which is relevant only for weak islands, claims that d-linked *wh*-phrases increase the acceptability of *wh*-extractions from weak islands because they denote discrete individuals that can participate in the semantic operations necessary for the interpretation of weak islands. If this claim is correct, then I would expect an increase in acceptability of *wh*-extractions from *wh*-islands (weak islands). However, I would not expect an increase in acceptability of *wh*-extractions from RC islands (strong islands) or non-island structures because the denotation of the extracted *wh*-phrase does not matter for the interpretation of RC islands and non-island structures.

Consistent with the predictions of the semantic account, native speakers' results showed that d-linked *wh*-phrases increased the acceptability of *wh*-extractions from *wh*-islands but not of *wh*-extractions from RC islands or non-island structures (main RCs and *that*-clauses). These results support the semantic account of d-linking effect. Both Alexopoulou and Keller (2013) and Sprouse et al. (2016) found similar results, showing a d-linking effect on *wh*-extractions from weak islands (*whether* islands, complex NP islands) but no d-linking effect on *wh*-extractions from strong islands (subject and adjunct islands) or non-island structures (main RCs and *that*-clauses).

However, Goodall (2015) found a d-linking effect not only on *wh*-extractions from islands, but also on *wh*-extractions from non-island structures (*that*-clauses). Goodall (2015) criticized the results of Alexopoulou and Keller (2013) that showed no d-linking effect on *wh*-extractions from non-island structures, arguing that Alexopoulou and Keller did not detect a d-linking effect because their experiment could not distinguish among sentences at the very high end of the acceptability scale. Specifically, Goodall (2015) claimed that Alexopoulou and Keller's (2013) results suggest the presence of a ceiling effect because they could not show a difference even in acceptability between sentences with short *wh*-dependencies and sentences with long *wh*-dependencies, for which many studies found a very clear difference in acceptability.

In this study, however, the non-effect of d-linking on *wh*-extractions from non-islands cannot be attributable to a ceiling effect in the scale. Interestingly, two conditions of grammatical filler sentences were rated higher by native speakers than the four experimental conditions of *wh*-extractions from non-island structures. These fillers were declarative sentences including a RC with a gap in subject position ($M = 1.15$) as in (19), or with a gap in object position ($M = 1.03$) as in (20).

(19) The young man who ___ was driving fast had an accident.

(20) The patient who I visited ___ yesterday was very sick.

If there were indeed a d-linking effect on *wh*-extractions from non-island structures, no ceiling effect in the current experiment would affect the ability to detect it. The criticisms of Goodall (2015) against Alexopoulou and Keller (2013) cannot be raised against this study. However, it is not clear why Goodall (2015) found a d-linking effect on *wh*-extractions from *that*-clause structure as in (21) while this study that tested the same structure as in (22) did not¹⁰. It is noteworthy that there is no difference in terms of structure between Goodall's stimuli and the stimuli of this study, and neither was preceded by a context. Goodall observed a d-linking effect on *wh*-extractions from non-islands probably because he used a different type of d-linked *wh*-phrase (*which of the N*).

(21) **What / which of the cars** do you believe that he might buy ___?

(22) **What / which movie** does he think that she might hate ___?

In the case of Najdi learners, d-linked *wh*-phrases increased the acceptability of *wh*-extractions from *wh*-islands and RC islands. They also increased the acceptability of *wh*-extractions from one non-island structure (i.e., *that*-clause structure) but not the acceptability of *wh*-extractions from the other non-island structure (i.e., main RC structure). Except for *wh*-extractions from main RC structure, these results support the complexity account, which claims that d-linking increases not only the acceptability of *wh*-extractions from islands but also the acceptability of *wh*-extractions from non-islands.

However, I believe this pattern of results is not driven by the complexity of d-linked *wh*-phrases because Najdi learners showed two unusual findings related to d-linking. The first is the increase in acceptability of d-linked *wh*-extractions from RC islands (strong islands). If complexity of d-linked *wh*-phrases led to an increase in acceptability of these *wh*-extractions, why didn't native speakers show an increase in acceptability of these *wh*-extractions? Interestingly, native speakers rated both bare and d-linked *wh*-extractions from RC islands almost the same, suggesting no d-linking effect on *wh*-extractions from strong islands as shown by Sprouse et al. (2016), who also found no d-linking effect on *wh*-extractions from subject and adjunct clause islands (strong islands).

I believe learners exhibited this pattern of results because some were affected by the semantic cues of d-linked *wh*-phrases that misled them when they were processing *wh*-questions with *wh*-extractions from RC islands. Specifically, the semantic cues of d-linked *wh*-phrases initially misled learners by making them tend to incorrectly associate the *wh*-phrase (e.g., *which article*), which was ungrammatically moved from the RC island, with the verb (e.g., *wrote*) as its argument because of the semantic plausibility match between the *wh*-phrase and the verb as shown in (23).

(23) ***Which article** did the author who wrote ___ win the prize?

However, after learners unconsciously felt that it was not grammatically possible to associate the *wh*-phrase ("which article"), which was moved from the island, with the verb ("wrote"), they realized that they needed to revise their initial analysis of the structure and consequently

¹⁰The example in (21) is from Goodall (2015), p. 4.

rejected the sentence. Thus, the increase in acceptability of d-linked *wh*-extractions from RC islands is more likely caused by learners' initial misanalysis of the sentence structure¹¹.

The second unusual finding shown by learners is that d-linking increased the acceptability of *wh*-extractions from *that*-clause structure but not the acceptability of *wh*-extractions from the main RC structure. Again, I believe these results are driven by the effect of semantic cues of d-linked *wh*-phrases. D-linking increased acceptability of *wh*-extractions from *that*-clause structure because d-linked *wh*-phrases (e.g., "which movie"), as opposed to bare *wh*-phrases (e.g., "what"), are semantically more plausible arguments of the verb (e.g., "hate") in the embedded *that*-clause as shown in (24) and (25).

(24) **What** does he think that she might hate ___?

(25) **Which movie** does he think that she might hate ___?

For *wh*-extractions from the main RC structure, I believe the semantic plausibility match between the extracted *wh*-phrase and the main clause verb did not help increase acceptability due to processing difficulty. Processing of *wh*-extractions from the main RC structure is more difficult than processing of *wh*-extractions from *that*-clause structure (e.g., Kluender & Kutas, 1993).

To answer the fourth question in this study, my conclusion is based on the results of native speakers rather than the results of learners who could have been misled by the semantic cues of d-linked *wh*-phrases at their initial processing of *wh*-dependencies. To conclude, then, and in answer to the fourth question, the d-linking effect on *wh*-extractions from *wh*-islands is more likely caused by the d-linked *wh*-phrase's denotation of discrete individuals that can facilitate the semantic operations necessary for the interpretation of weak islands, as claimed by the semantic account of d-linking effect. However, one must be cautious about generalizing the results of the d-linking effect in this study because only one type of d-linked *wh*-phrase (*which* N) was tested, and other types of d-linked *wh*-phrases (e.g., *what* N or *which of the* N) could also be tested.

Conclusion

This study makes two important contributions to the L2 literature on island sensitivity and d-linking effect on *wh*-extractions. First, this study provides further evidence that island sensitivity is similar in nature in L2 learners and native speakers. Najdi learners patterned similarly to English natives in terms of the strength of their sensitivity to strong versus weak islands, suggesting that Belikova and White's 2009 proposal is on the right track. Second, this study provides evidence that the d-linking effect on *wh*-extractions from islands is also similar in nature in L2 learners and native speakers. Consistent with previous research on d-linking, both natives and learners exhibited a greater d-linking effect on *wh*-extractions from *wh*-islands (weak islands) than on *wh*-extractions from RC islands (strong islands), and this d-linking effect is more likely caused by the d-linked *wh*-phrase's denotation of discrete individuals as claimed by the semantic account of the d-linking effect (Szabolcsi & Zwarts, 1993, 1997).

¹¹ Although the semantic information of d-linked *wh*-phrases led to an increase in acceptability of *wh*-extractions from RC islands, these *wh*-extractions were still rated very low ($M = -0.80$) compared to grammatical control *wh*-extractions ($M = 0.26$). Interestingly, no one could argue that learners' distinction between grammatical and ungrammatical *wh*-extractions in this study is driven by semantic rather than syntactic cues because reliance on semantic cues cannot help learners to correctly reject ungrammatical *wh*-extractions from islands, as explained in example (23).

Bio

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