

Evidence for a Discourse Account of Manner-of-Speaking Islands

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Abstract

Sentences with syntactic movement out of sentential complements of manner-of-speaking (MoS) verbs (e.g., *whisper*, *shout*) are degraded in acceptability, an effect called the “manner-of-speaking (MoS) island effect”. Accounts variably attribute the MoS island effect to the violation of the subjacency condition, to the low frequency of MoS verbs taking sentential complements, or to a general information structural constraint that discourse-backgrounded constituents cannot be extracted. In three acceptability judgment experiments, we find that the MoS island effect can be modulated by foregrounding or backgrounding the extracted constituent, suggesting a causal relationship between discourse backgroundedness and the MoS island effect. Our findings challenge syntactic and frequency accounts of the MoS island effect.

1 Introduction

The degradedness of sentences like those in (1) has traditionally been attributed to the inability of syntactic movement to cross certain structural domains, a phenomenon called “island effects” (Ross, 1967). Examples of such structural domains include complex noun phrases, clausal adjuncts, and conjuncts.

- (1) a. Extraction from a complex noun phrase
*What_{*i*} does John know the fact that Mary ate *t_i*?
- b. Extraction from a clausal adjunct
*Who_{*i*} did John have lunch after he talked to *t_i*?
- c. Extraction from a conjunct
*Who_{*i*} does John like Mary and hate *t_i*?

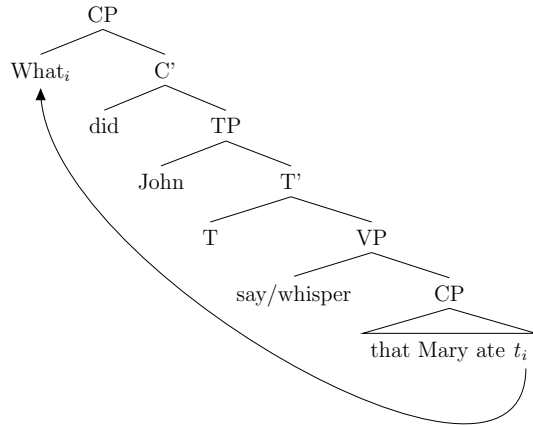
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Traditionally, island effects have been considered to arise due to the constraints that particular structures impose on syntactic dependencies (Bresnan, 1976; Chomsky, 1977, 1986; Ross, 1967; Sag, 1976), or the cyclic phase-by-phase manner in which syntactic derivations proceed (Fox and Pesetsky, 2005; Nunes and Uriagereka, 2000). Syntactic approaches to island effects face a challenge in explaining a particular type of island, namely those that are sentential complement clauses. Sentential complement clauses are generally permeable to movement, as shown in example (2a). However, complements of certain verbs behave like islands. For example, the complements of manner-of-speaking (MoS) verbs (e.g., *whisper*) resist movement from within (Ambridge and Goldberg, 2008; Erteschik-Shir, 2006, 2007; Goldberg, 2013; Richter and Chaves, 2020; Snyder, 1992, *inter alia*), as shown in example (2b). The degraded status of sentence (2b) is called the “manner-of-speaking (MoS) island effect.”

- (2) a. What_{*i*} did John say that Mary ate *t_i*?
b. *What_{*i*} did John whisper that Mary ate *t_i*?

On the surface, the two sentences in (2) are identical except for the matrix verb. If we assume that (2a) and (2b) have the same canonical sentential complement structure, shown in (3), the contrast in their acceptability cannot be attributed to a structural difference, thereby posing a challenge to syntactic accounts of MoS island effects.

- (3) Sentential complement structure of (2)

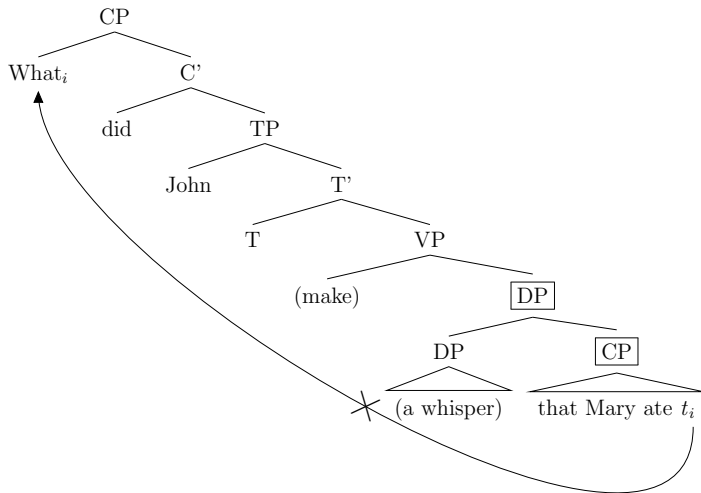


Several proposals have been made to explain this MoS island puzzle. The “Subjacency Account” proposes that (2a) and (2b) are in fact structurally distinct, and (2b) involves violation of a syntactic subjacency condition (Snyder, 1992; Stowell, 1981). According to this account, a sentence like (2b) has the syntactic structure in (4). The matrix verb *make* takes a DP complement *a whisper*, and the sequence *make a whisper* has the option of being realized as *whisper* in PF. The embedded clause is adjoined to the DP node, creating a complex-NP structure with two bounding nodes (CP and DP, boxed in (4)) intervening on the wh-movement step.¹ The resulting sentence is thus ungrammatical because it violates

¹In the structure in (4), we adopt the DP hypothesis, which is the dominant analysis of nominal structures in generative syntax (Abney, 1987). Therefore, the island structure in (4) should be more accurately described as a complex-DP, rather than a complex-NP. However, we follow the notational tradition in the literature on island effects, and label such structures as complex-NP structures.

the subjacency condition, which states that no movement step can cross more than one bounding node.

(4) Reducing MoS island to subjacency structure of (2b)



Other accounts of the MoS island effect maintain the syntactic structure in (3) and propose a non-syntactic source of unacceptability. Under the “Verb-Frame Frequency Account,” the MoS island effect is due to the low frequency with which MoS verbs take complement clauses Kothari (2008); Liu et al. (2019, 2022b). When comprehenders read a sentence with an MoS verb that takes a clausal complement, the low expectedness (high surprisal) of the complement clause is taken to lead to higher processing cost and hence lower acceptability ratings, giving rise to the MoS island effect. Evidence for this account comes from an observed negative correlation between the corpus frequency of MoS verbs taking complement clauses and the acceptability rating of sentences showing the MoS island effect (Kothari, 2008; Liu et al., 2019, 2022b) ²

Under another non-syntactic account of the MoS island effect, the “Backgroundedness Account,” extraction from within MoS verb complements is unacceptable because the complement clauses of MoS verbs are by default discourse backgrounded (Ambridge and Goldberg, 2008; Goldberg, 2013). This backgroundedness is taken to be the result of MoS verbs’ lexical properties. We follow Erteschik-Shir (2007) and assume that MoS verbs are manner verbs, and can be lexically decomposed into a “light verb” *say* and a manner component.³ MoS verbs are lexically heavy due to the additional manner component, and thus the information structural focus falls on the MoS verb rather than the complement clause. Since syntactic movement has a discourse foregrounding function (moved elements are focused), any movement out of backgrounded constituents results in an information structural clash. It is this clash that is taken to lead to the observed unacceptability. In contrast, verbs that do not restrict syntactic movement (“bridge verbs” like *say* and *think*) are lexically light and thus do not bear information structural focus. Focus instead falls

²But see Richter and Chaves (2020) for a similar study that did not find such a correlation.

³Some other studies assume that MoS verbs are verbs of implicit creation, and a MoS verb can be decomposed into a light verb *make* and a nominal cognate (Snyder, 1992; Stoica, 2020). We will return to this alternative in the General Discussion.

on the complement clause (Erteschik-Shir, 2007). The resulting foregrounding of the complement clause is compatible with the foregrounding associated with syntactic movement, and movement therefore does not lead to an information structural clash and associated unacceptability. The Backgroundedness Account thus captures the contrast in (2).⁴

Note that discourse backgroundedness is not a binary concept. The degree of backgroundedness of MoS complements may vary depending on the context and the specific MoS verb used in the sentence. One way in which backgroundedness has been operationalized is via the “negation test”, which is motivated by the generalization that only foregrounded contents are affected by sentential negation (Erteschik-Shir, 1979; Takami, 1988; Van Valin, 1998). The negation test captures that more backgrounded constituents are less likely to be interpreted as negated by a matrix sentential negation (Ambridge and Goldberg, 2008; Cuneo and Goldberg, 2023; Goldberg, 2006; Namboodiripad et al., 2022). For example, in sentence (5a), comprehenders are more likely to rate the embedded clause *Mary was in the courtyard* as true (i.e., unaffected by the matrix negation) compared to sentence (5b), suggesting that the embedded clause is more backgrounded in (5a) than in (5b).

- (5) a. John didn’t whisper that Mary was in the courtyard.
- b. John didn’t say that Mary was in the courtyard.

Using the negation test, previous experimental studies have shown a positive correlation between the degree of backgroundedness of MoS complements and the magnitude of sentence acceptability degradation due to extraction from MoS complements (Ambridge and Goldberg, 2008; Goldberg, 2013).⁵ These results suggest that backgroundedness predicts MoS islandhood, and provide support for the Backgroundedness Account of MoS islands.⁶

But there is a caveat to these correlational studies: correlation does not imply causation. A proponent of the Subjacency Account might argue that it is the structural difference between (3) and (4) that gives rise to the difference in acceptability and—independently—to the difference in discourse backgroundedness. The syntactic account is thus not ruled out by the observations made by Ambridge and Goldberg (2008) and Goldberg (2013). In this study, we test whether the relationship between discourse backgroundedness and the MoS island effect is causal. If such a causal relation exists, MoS islandhood should

⁴This account builds on the “Dominance Condition on Extraction” (Erteschik-Shir, 1973), which states that movements out of constituents that are considered dominant in the context are degraded. Here, the term “dominant” refers to the same concept that has been given different names in the literature: “focus” (Chomsky, 1969, 1972), “topic” (Kuno, 1976, 1987), “foreground” (Hopper, 1979; Jones and Jones, 1979; Tomlin, 1985), and “at-issue” (Potts, 2005, 2007). For consistency, we adopt the term “foregrounded” to describe constituents that are the topic, dominant, focused, or at-issue, and the term “backgrounded” to describe constituents that are not. Generalizations equivalent to Erteschik-Shir (1973)’s Dominance Condition on Extraction have also been proposed under the name “Topichood Condition on Extraction” (Kuno, 1987), and the “Backgroundedness Constituents are Islands Generalization” (Ambridge and Goldberg, 2008; Goldberg, 2006, 2013).

⁵Backgroundedness can also be measured by other tests in addition to the negation test. For example, Cuneo and Goldberg (2022) and Cuneo and Goldberg (2023) used the “appropriate answer discourse task” to operationalize backgroundedness.

⁶For similar correlational results for a wider range of island effects, see Goldberg (2013), Cuneo and Goldberg (2022), Namboodiripad et al. (2022), and Cuneo and Goldberg (2023).

change in response to changes in discourse backgroundedness of the extracted constituent through non-syntactic means (e.g., prosodic manipulations), while holding the syntactic structure and the lexical items of the sentence constant. Neither the Subjacency Account nor the Verb-Frame Frequency Account predicts a change in MoS islandhood in response to such a manipulation, because MoS islandhood is considered causally dependent on the syntactic structure or the choice of the complement-taking verbs, respectively, but not on the discourse backgroundedness of the extracted constituents.

In Experiment 1 we test whether the MoS island effect can be ameliorated by discourse foregrounding the MoS complement; in Experiments 2 and 3 we test whether the MoS island effect can be replicated in sentences with the bridge verb *say* by adding lexical weight to the matrix predicate using manner adverbs. These experiments directly test whether the backgrounded status of MoS complements gives rise to the MoS island effect.

2 Experiment 1: Discourse Effects on MoS Islands

In this acceptability judgment experiment, we tested whether the MoS island effect is modulated by discourse backgroundedness, by prosodically manipulating the backgroundedness of MoS complements. The Backgroundedness Account predicts that extraction from inside the MoS complement should be rated as more acceptable when the complement is prosodically foregrounded compared to when it is backgrounded. In contrast, neither the Subjacency Account nor the Verb-Frame Frequency Account predicts an effect of prosodic foregrounding on acceptability.

2.1 Methods

2.1.1 Participants

We recruited 100 participants through the online crowd-sourcing platform Prolific to complete the experiment. Based on the preregistered exclusion criteria, responses from 6 participants were excluded, either because they did not self-report as native monolingual English speakers or because their ratings for unacceptable fillers were on average higher than those for acceptable fillers.⁷

2.1.2 Materials

Example critical and filler items are shown in (6). Each item consisted of a two-sentence written dialog. On critical trials, the first utterance was a declarative sentence with an MoS verb taking a complement clause. The second utterance was a wh-interrogative with the embedded object extracted from within the MoS complement. There were two focus conditions: in the Verb Focus condition, the matrix verb of the first utterance was capitalized and bolded, representing a prosodic focus that foregrounds the matrix verb and hence

⁷The pre-registration is available at <https://osf.io/rsza5>. All data, materials, and analysis scripts for each experiment can be accessed at https://github.com/pennydy/MOS_Island.

backgrounds the embedded constituents. In the Embedded Focus condition, the embedded object of the first utterance was capitalized and bolded, representing a prosodic focus that foregrounds the embedded object. The second utterance was identical across focus conditions.

- (6) Example critical items in Experiment 1
 - a. Verb Focus condition
Hanako said: John didn't **WHISPER** that Mary met with the lawyer.
Scott said: Then who did John whisper that Mary met with?
 - b. Embedded Focus condition
Hanako said: John didn't whisper that Mary met with the **LAWYER**.
Scott said: Then who did John whisper that Mary met with?
- (7) Example filler items in Experiment 1
 - a. Grammatical filler
Hanako said: **RONALD** didn't imply that Jacy rented the truck.
Scott said: Then who implied that Jacy rented the truck?
 - b. Ungrammatical filler
Hanako said: Tony didn't suggest that Frank and **LISA** were in the office.
Scott said: Then who did Tony suggest that Frank and were in the office?

Each participant completed 12 critical trials and 24 filler trials. For each participant, half of the 12 critical items were randomly assigned to the Verb Focus condition and the other half to the Embedded Focus condition. No participant saw an item in both the Verb and Embedded Focus condition. All participants were presented with the same set of 24 filler items, half of which were grammatical and the other half ungrammatical.

2.1.3 Procedure

After reading each dialog, participants completed either an acceptability judgment task (main task) or a backgroundedness task (manipulation check). On acceptability judgment trials, they rated the acceptability of the second utterance (Scott's utterance in Fig. 1) on a sliding scale with endpoints labeled "completely unacceptable" (coded as 0 for analysis) and "completely acceptable" (coded as 1 for analysis). Fig. 1a shows an example trial that probes the acceptability judgment.

On backgroundedness trials, participants answered a forced-choice question that probed the backgroundedness of the embedded object. An example of the backgroundedness task is shown in Fig. 1b. The first option represents an interpretation of the polar interrogative under which the embedded object (i.e., "the lawyer") is foregrounded, and the second option represents one under which the embedded object is backgrounded and the MoS verb (i.e., "whisper") is foregrounded.⁸ The order of the two choices was randomized across trials.

⁸We deviate from Ambridge and Goldberg (2008) and Goldberg (2013) in our choice of backgroundedness diagnostic for two reasons. First, the task we used directly probes whether the embedded object (i.e., the DP that would be extracted in the second utterance) is backgrounded, as opposed to the negation test that probes whether the whole complement clause is backgrounded. Therefore, this task serves as a better

<p>Hanako said: John didn't whisper that Mary met with the LAWYER.</p> <p>Scott said: Then who did John whisper that Mary met with?</p> <p>How natural/acceptable does <u>Scott's</u> question sound?</p> <div style="display: flex; align-items: center;"> <div style="text-align: right; margin-right: 10px;">completely unacceptable</div> <div style="flex-grow: 1; border: 1px solid #ccc; position: relative;"> <div style="position: absolute; top: -10px; left: 0; right: 0; height: 2px; background: linear-gradient(to right, #ccc, #ccc);"></div> </div> <div style="text-align: left; margin-left: 10px;">completely acceptable</div> </div> <div style="text-align: center; margin-top: 5px;"> Continue </div> <p>(a) Acceptability judgment task.</p>	<p>Hanako said: John didn't WHISPER that Mary met with the lawyer.</p> <p>Scott said: Then who did John whisper that Mary met with?</p> <p>What was <u>Hanako</u> talking about?</p> <div style="margin-left: 20px;"> <input type="radio"/> Who Mary met with, according to John. <input type="radio"/> The way John said that Mary met with the lawyer. </div> <div style="text-align: center; margin-top: 5px;"> Continue </div> <p>(b) Backgroundedness task.</p>
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Figure 1: Examples of the two tasks in the experiment.

For each participant, the 36 trials were divided into 6 blocks. Each block contained 2 randomly sampled critical items (one in each focus condition), 2 randomly sampled acceptable fillers, and 2 randomly sampled unacceptable fillers, in random order. In addition, regardless of the focus condition, half of the trials within each block occurred with the comprehension task and half with the rating task. Task order was randomized.

There were 4 practice trials at the beginning of the experiment, 2 acceptable and 2 unacceptable practice items. One of each was followed by an acceptability judgment task, and the other by a forced-choice comprehension question, just as on experimental trials.

2.2 Results

The results of Experiment 1 are visualized in Fig. 2. We begin by reporting the manipulation check (Fig. 2a), followed by the effect of focus on acceptability ratings (Fig. 2b).

If the manipulation of embedded content backgroundedness via capitalization (prosodic focus) of verb or object succeeded, then the embedded content in the Embedded Focus condition should have resulted in fewer backgrounded interpretations than in the Verb Focus condition. To test this, we fit a logistic mixed-effects regression model predicting backgrounded interpretation from a dummy-coded fixed effect of focus condition (reference level: Verb Focus), as well as by-item and by-participant random intercepts and slopes for the fixed effect.⁹ There were fewer backgrounded responses in the Embedded Focus condition ($\beta = -2.46, SE = 0.40, p < 0.001$), suggesting that the focus manipulation changed the backgroundedness of the embedded content in the expected way.

To test our main question of interest, whether embedded focus leads to higher acceptability, we fit a linear mixed-effects regression predicting acceptability from a fixed effect of focus condition (reference level: Verb Focus) and the maximal random effects structure that allowed the model to converge: by-item and by-participant intercepts and by-participant

manipulation check for our design. Second, the negation test is arguably a test of projection (i.e., whether certain content is presupposed). Discourse backgroundedness and projection, albeit correlated, are not the same concept (Beaver et al., 2017; Tonhauser et al., 2018). Therefore, our backgroundedness task is a more direct measurement of discourse backgroundedness than the negation test.

⁹All models were run using the `lmer4` package (Bates et al., 2015) in R (R Core Team, 2022). All p-values are obtained using the Satterthwaite's method using the `lmerTest` package (Kuznetsova et al., 2017).

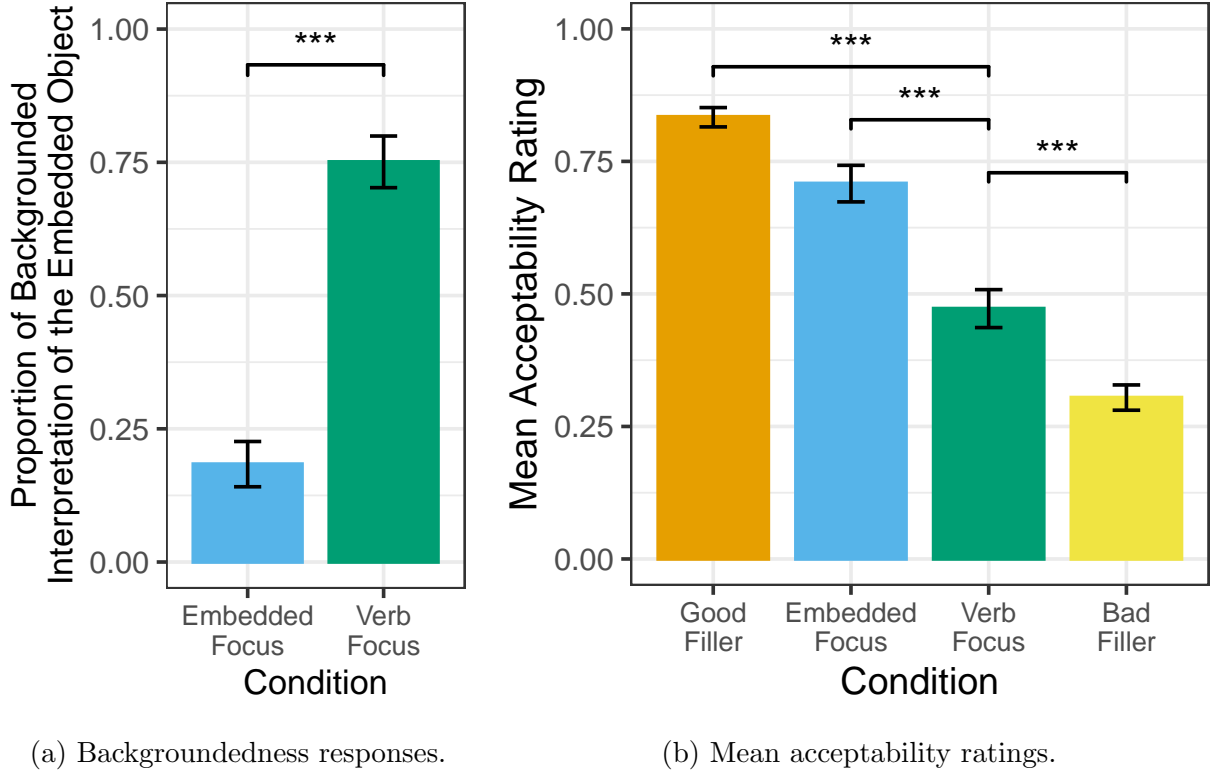


Figure 2: Results of Experiment 1 across focus condition. Error bars indicate 95% bootstrapped confidence intervals.

random slopes for the fixed effect of condition. There was a significant main effect of focus condition, such that sentence acceptability was higher in the Embedded Focus condition than in the Verb Focus condition ($\beta = 0.23, SE = 0.03, t = 7.10, p < 0.001$). In addition, in comparison to sentences in the Verb Focus condition, grammatical fillers were rated to be more acceptable ($\beta = 0.37, SE = 0.04, t = 9.46, p < 0.001$) and ungrammatical fillers were less acceptable ($\beta = -0.16, SE = 0.04, t = -3.62, p < 0.001$). This suggests that foregrounding the embedded content via prosodic focus in the context sentence attenuates the MoS island effect.

In addition, we conducted two post-hoc analyses to assess the Frequency Account of the MoS island effect. Under the Frequency Account, MoS island sentences should be more acceptable with verbs that are more likely to take a sentential complement (SC). We considered two different SC frequency measures from the previous literature.

First, Liu et al. (2019, 2022a) measure the verb-frame frequency using the joint probability of the verb taking an SC with the complementizer *that*, as defined in Equation (1). The estimates they used were collected from the Google books corpus since the year 2000 (Davies, 2011).

$$P(\text{verb}_{lemma}, SC) = P(\text{verb}_{lemma}) * P(SC | \text{verb}_{lemma}) \quad (1)$$

Fig. 3 shows the acceptability ratings in the two conditions against the log-transformed

verb-frame frequency scores as reported in Liu et al. (2022a).¹⁰ We added the mean-centered verb-frame frequency predictor and its interaction with focus condition to the above reported linear mixed effects model for the main analysis. The effect of focus condition remained robust ($\beta = 0.12$, $SE = 0.02$, $t = 6.71$, $p < 0.001$), but neither the main effect of verb-frame frequency ($\beta = -0.003$, $SE = 0.02$, $t = -0.16$, $p = 0.874$) nor the interaction between frequency and focus condition ($\beta = -0.004$, $SE = 0.01$, $t = -0.26$, $p = 0.796$) reached significance.

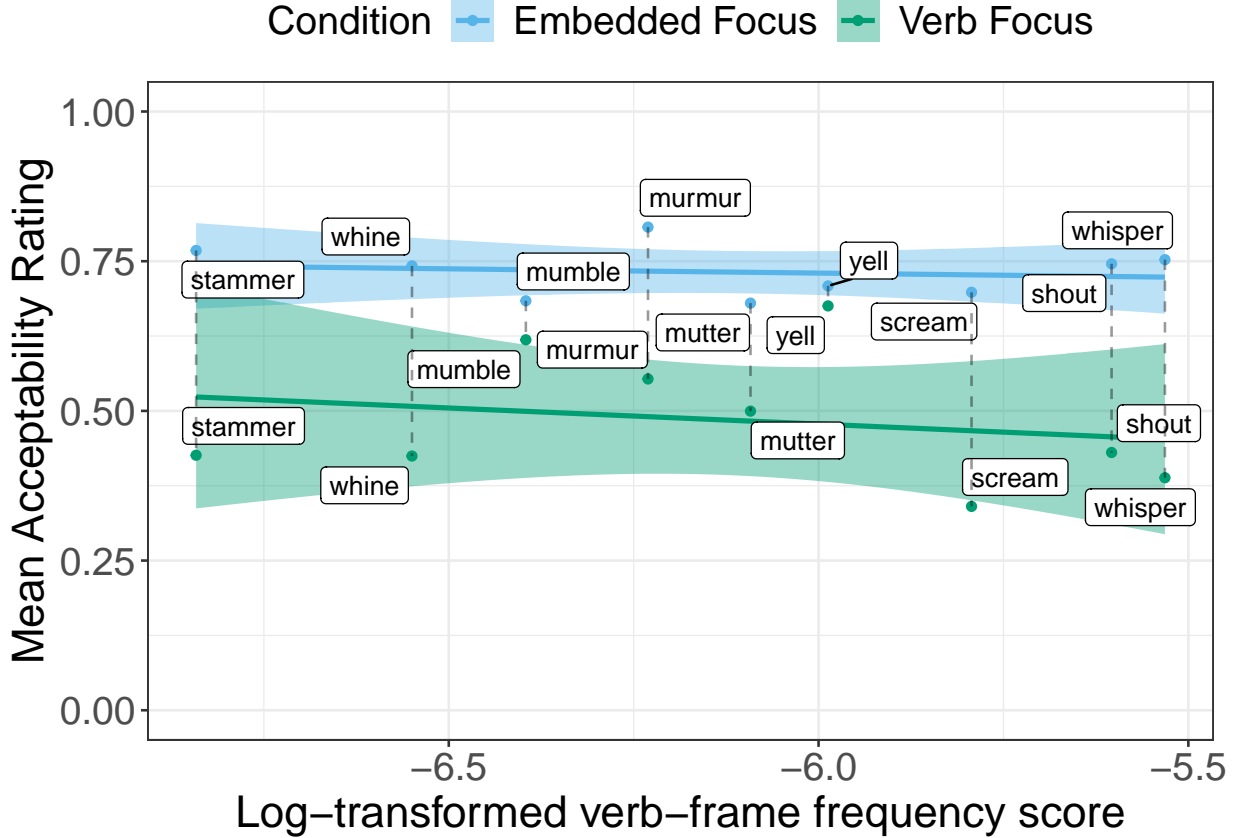


Figure 3: Mean acceptability ratings in the Verb Focus condition and the Embedded Focus condition against the log-transformed verb-frame frequency. The values are directly taken from Liu et al. (2022a). The shaded ribbons represent bootstrapped 95% confidence intervals.

As opposed to the joint probability of a verb lemma and the SC in Liu et al. (2019, 2022a), Richter and Chaves (2020) used the conditional probability of an SC given a verb lemma as the measure for verb-frame frequency, which they referred to as the *Sentence*

¹⁰Since we could not replicate the values reported by Liu et al. (2022a) using the methods provided by the original paper, we directly used the reported verb-frame frequency estimates provided at <https://osf.io/g38rj> for analysis. Three verbs that were not included in Liu et al. (2022b) (“shriek”, “moan”, and “groan”) were therefore excluded from this analysis.

Complement Ratio (SCR). They obtained the estimates from a random sample of the Corpus of Contemporary American English (COCA) (Davies, 2008) using the formula shown in 2.

$$SCR_{lemma} = \frac{\# (\text{verb lemma used with SC})}{\#(\text{verb lemma})} \quad (2)$$

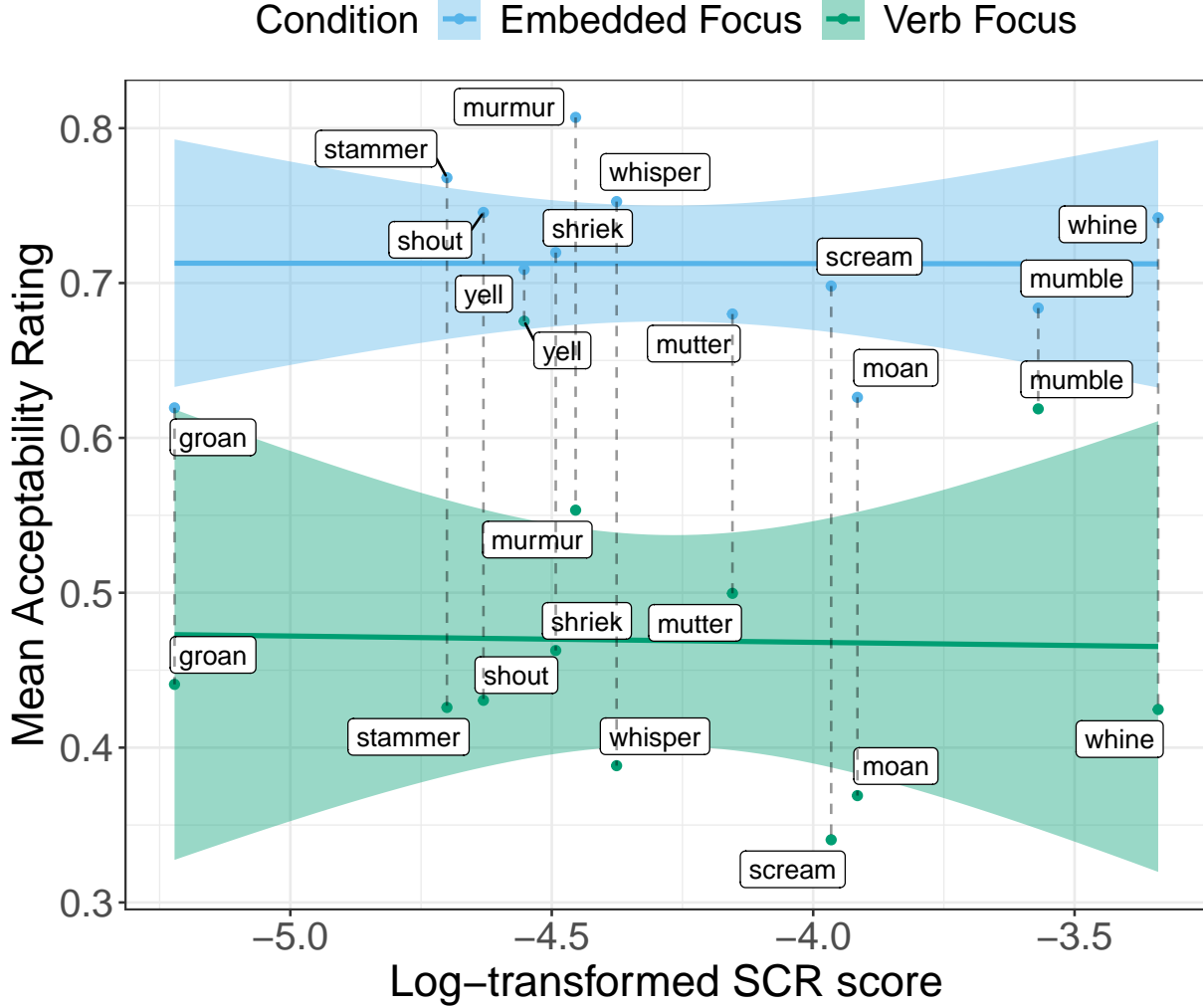


Figure 4: Mean acceptability ratings in the Verb Focus condition and the Embedded Focus condition against the log-transformed sentence complement ratio (SCR) scores. The shaded ribbons represent bootstrapped 95% confidence intervals.

Fig. 4 shows the acceptability ratings in the two conditions against the log-transformed SCR scores provided in Richter and Chaves (2020).¹¹ Using the same statistical model, we

¹¹The verb “groan” was not included in Richter and Chaves (2020)’s analysis. We calculated the SCR score for “groan” based on the method provided by Richter and Chaves (2020), and included it for analysis.

tested the effect of frequency as measured by the SCR scores. The effect of focus condition remained robust ($\beta = 0.12, SE = 0.02, t = 6.92, p < 0.001$), but neither the main effect of SCR ($\beta = -0.0002, SE = 0.02, t = -0.02, p = 0.987$) nor the interaction between SCR and condition ($\beta = 0.008, SE = 0.01, t = 0.83, p = 0.408$) reached significance.

2.3 Discussion

Our results show that foregrounding the embedded constituent ameliorates the degradedness of extracting that constituent from an MoS island, suggesting that there is a causal relationship between discourse backgroundedness and the magnitude of the MoS island effect. This provides support for the Backgroundedness Account, which attributes the degradedness of MoS island violations to a clash between the discourse backgroundedness of constituents contained in an MoS verb complement and the foregrounding wh-movement operation (Ambridge and Goldberg, 2008; Goldberg, 2013).

We did not find evidence in support of the Verb-Frame Frequency Account. Verb-frame frequency does not correlate with the acceptability of the wh-interrogatives containing an MoS island violation. More importantly, the Verb-Frame Frequency Account cannot capture the observed contrast between the focus conditions, since the comparison is between sentences with the same matrix verbs. Similarly, the Subjacency Account is not supported, either: whether the subjacency condition is violated is entirely syntactically determined and focus-independent. Therefore, subjacency cannot account for the contrast between the two focus conditions.

In sum, foregrounding MoS complements can ameliorate the MoS island effect. However, the source of the initial backgroundedness of MoS complements is still undetermined. Following Erteschik-Shir (2007), we hypothesize that MoS verbs are lexically heavy due to their manner components and are thus foregrounded by default, causing the MoS complements to be backgrounded. One natural prediction of this hypothesis is that by increasing the lexical weight of the light verb *say* with manner adverbs, we should be able to replicate the MoS island effect even without using MoS verbs. We put this prediction to test in the next experiment.

3 Experiment 2: Replicating the MoS Island Effect without MoS Verbs

In the previous experiment, we showed that the MoS island effect can be attenuated by discourse foregrounding the embedded content. In this experiment, we aimed to test whether the MoS island effect can be created by discourse backgrounding the embedded contents. Under the Backgroundedness Account, the bridge verb *say* is lexically light and cannot bear focus, and thus its complement is necessarily foregrounded and transparent to extraction. By adding lexical weight to the matrix predicate *say* using MoS adverbs (e.g., *loudly*, *softly*), the complement clause can be discourse backgrounded, and we should be able to replicate the MoS island effect without even using MoS verbs.

3.1 Methods

3.1.1 Participants

A total of 100 participants who did not participate in Experiment 1 were recruited through Prolific to complete the experiment. Based on the pre-registered exclusion criteria, responses from 7 participants were excluded, either because they did not self-report as native monolingual English speakers or because their ratings for unacceptable fillers were on average higher than those for acceptable fillers.

3.1.2 Materials

Similar to the design of Experiment 1, each participant was presented with 12 critical items and 24 filler items. Each item was in the form of a two-sentence dialog presented in text. Example stimuli are shown in (8). The first utterance was a declarative sentence with either *say* (Say condition) or *say* followed by an adverb (Say + Adverb condition) taking a complement clause. The second utterance was a wh-question with the embedded object moved from within the MoS complement. Each participant viewed each critical item once, with 6 items in the Say condition and 6 in the Say + Adverb condition. The 6 adverbs in the Say + Adverb condition were distinct and randomly selected from a total set of 12 adverbs. In addition, all participants were presented with the same set of 24 filler items, half of which are grammatical, and the other half ungrammatical. Example filler items are shown in (9).

(8) Example stimuli from Experiment 2

a. Say condition

Hanako said: John didn't say that Mary met with the lawyer.

Scott said: Then who did John say that Mary met with?

b. Say + Adverb condition

Hanako said: John didn't say softly that Mary met with the lawyer.

Scott said: Then who did John say softly that Mary met with?

(9) Example fillers from Experiment 2

a. Grammatical filler

Hanako said: Ronald didn't imply that Jacy rented the truck.

Scott said: Then who implied that Jacy rented the truck?

b. Ungrammatical filler

Hanako said: Tony didn't suggest that Frank and Lisa were in the office.

Scott said: Then who did Tony suggest that Frank and were in the office?

3.1.3 Procedure

After reading each dialog, participants were asked to rate the acceptability of the second utterance on a sliding scale with endpoints labeled "completely unacceptable" (coded as 0 for analysis) and "completely acceptable" (coded as 1 for analysis). The pairing between

the embedded clause and the matrix verb was randomized for both critical and filler trials. We divided 12 critical items and 24 fillers into 6 blocks. Each block contained 2 critical items, one from each condition, 2 acceptable fillers, and 2 unacceptable fillers. We randomly selected items from each condition, and both the block order and the order of items within each block were randomized.

3.2 Results

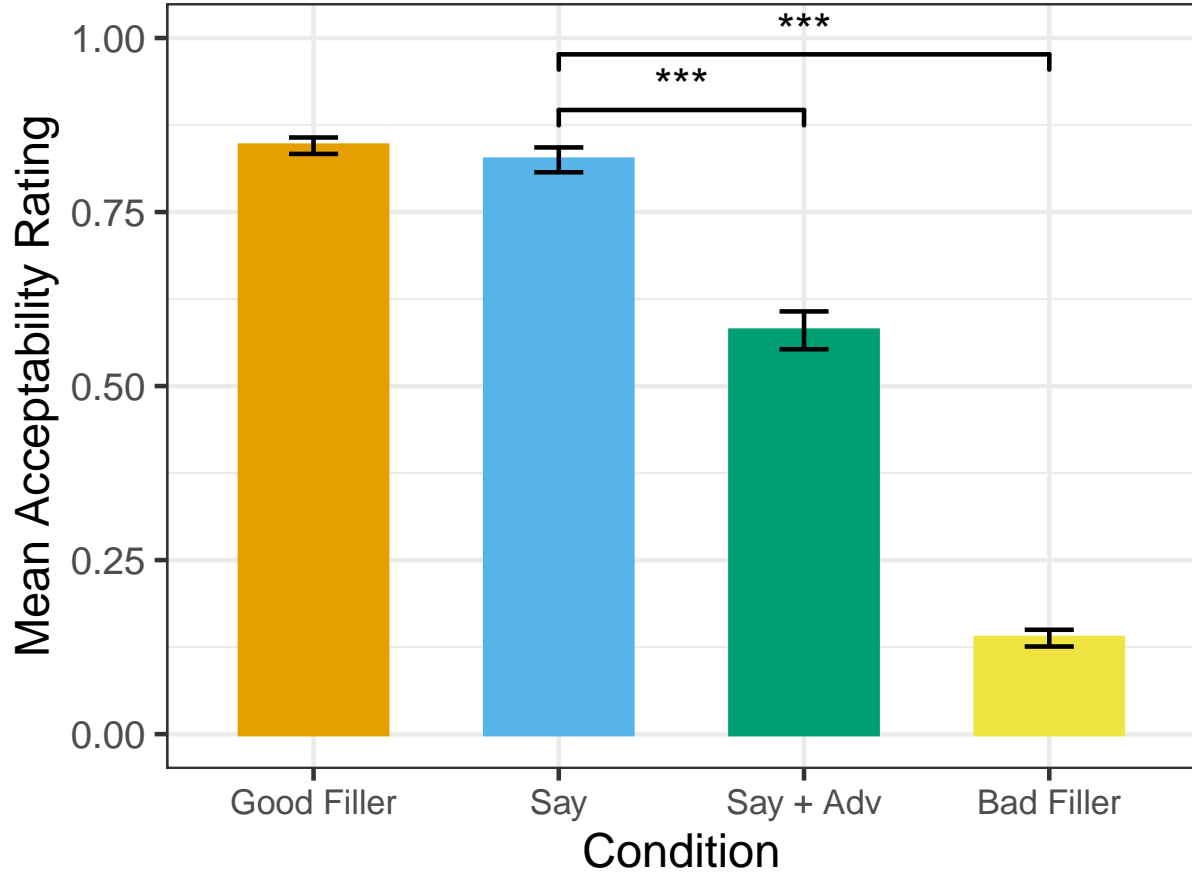


Figure 5: Mean acceptability ratings in different conditions. Error bars indicate 95% bootstrapped confidence intervals.

Fig. 5 shows the mean acceptability ratings in the four conditions. To test whether the MoS island effect can be replicated in the “*say* + adverb” construction, we fit a linear mixed-effects regression predicting acceptability from a dummy-coded fixed effect of condition (reference level: *Say*) with the maximal random effects structure that allowed the model to converge: by-item and by-participant random intercepts as well as by-participant random slopes for the fixed effect of condition. There was a significant main effect of condition, such that the acceptability ratings in the *Say* condition were higher than those in the *Say*

+ Adv condition ($\beta = -0.24, SE = 0.02, t = -12.4, p < 0.001$), and than those of the ungrammatical fillers ($\beta = -0.69, SE = 0.02, t = -28.9, p < 0.001$). In addition, the ratings were not significantly different between the Say condition and the grammatical fillers ($\beta = 0.02, SE = 0.02, t = 1.09, p = 0.279$). These results indicate that extracting the embedded constituent of a “say + adverb” construction was more degraded than extracting the complement of *say*, replicating the MoS island effect.

For the frequency measure, we first used COCA (Davies, 2008) to obtain two raw counts of each “say + adverb” construction: the total number of occurrences of the lemmatized *say* followed by the adverb and the number of occurrences of that construction with a sentential complement preceded by the complementizer *that* (excluding direct quotes).¹² We use the obtained frequency as the predicate-frame frequency measure and computed the SCR score of each construction as formulated in Equation (3).

$$\text{SCR}_{\text{say+adverb}} = \frac{\#(\text{say}_{\text{lemma}} \text{ adverb}, \text{SC})}{\#(\text{say}_{\text{lemma}} \text{ adverb})} \quad (3)$$

The acceptability ratings against the predicate-frame frequency and the SCR score are shown in Fig. 6 and Fig. 7, respectively. To test the effect of frequency on acceptability, we fit a linear mixed-effects regression model predicting acceptability ratings in the Say + Adverb condition from a main effect of the log-transformed and mean-centered predicate-frame frequency obtained in the corpus study and the maximal random effects structure justified by the design: by-participant and by-item random intercepts and random slopes for the fixed effect. There was no significant main effect of frequency ($\beta = -0.005, SE = 0.01, t = -0.44, p = 0.664$). Likewise, we used the same statistical model with the SCR measure, and there was no significant main effect of SCR ($\beta = -0.003, SE = 0.01, t = -0.26, p = 0.793$). These results indicate that the acceptability of extracting the embedded content from a “say + adverb” construction does not vary by the relative frequency of that “say + adverb” construction taking a sentential complement.

3.3 Discussion

The results of Experiment 2 show that when the matrix verb is the bridge verb *say*, extraction from the complement clause is more degraded when *say* is modified by MoS adverbs (e.g., loudly, softly) compared to when no adverb is present. This suggests that the MoS island effect can be replicated even in sentences without MoS verbs by adding lexical weight to the matrix predicate. This observation is predicted by the Backgroundedness Account: the added lexical weight due to the MoS adverbs has the same discourse backgrounding effect on the complement clause as MoS verbs do, resulting in an island effect.

On the other hand, predicate-frame frequency did not predict the acceptability ratings in the “say + adverb” construction, which suggests a lack of evidence for the Frequency

¹²We did not include cases where the sentential complement was not preceded by the complementizer *that*. This is theoretically motivated since the complement clauses of MoS verbs resist complementizer dropping (Pesetsky, 1995; Snyder, 1992; Stoica, 2016; Stowell, 1981; Zwicky, 1971). In addition, all context and target sentences presented in the current study contain the complementizer, and thus we only include occurrences where the SC is preceded by the complementizer *that*.

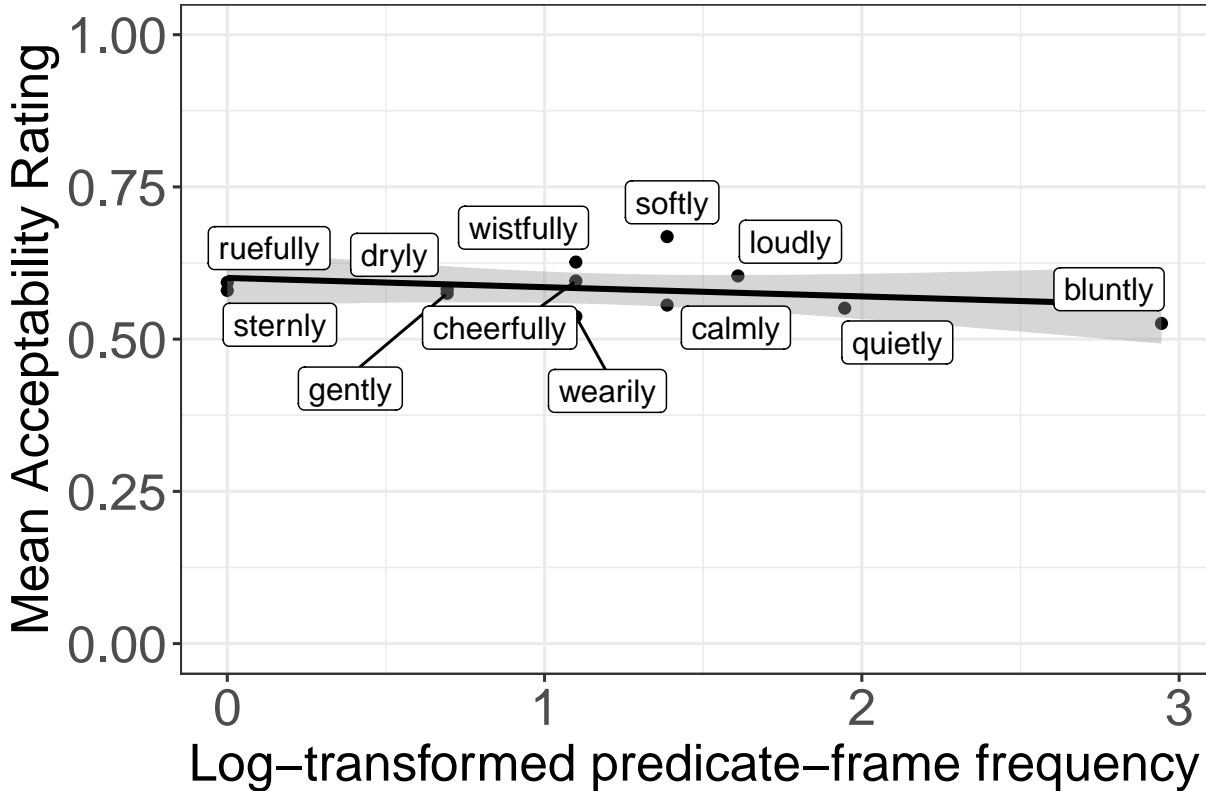


Figure 6: Mean acceptability ratings in the Say condition and the Say + Adverb condition against the log-transformed frequency of the predicate-frame. The shaded ribbon represents bootstrapped 95% confidence intervals.

Account. In addition, since sentences in the two conditions both have *say* as their matrix verb and only differ in terms of the presence or absence of the following adverb, none of them contained the complex-NP structure that would lead to the violation of the subjacency condition. Hence, the Subjacency Account is also not supported.

To provide further evidence for the Discourse Account, in Experiment 3, we tested whether using context sentences to discourse foreground the embedded content in the “*say* + adverb” construction would ameliorate the island effect, analogous to the results of Experiment 1.

4 Experiment 3: Discourse Effect on MoS Islands without MoS Verbs

Given that we observed the MoS island effect in the “*say* + adverb” construction, in this experiment, we tested the discourse effect on MoS islands with “*say* + adv” construction. As in Experiment 1, we manipulated the backgroundedness of the constituent in the complement clause of MoS verbs using context sentences that correspond to different prosodic

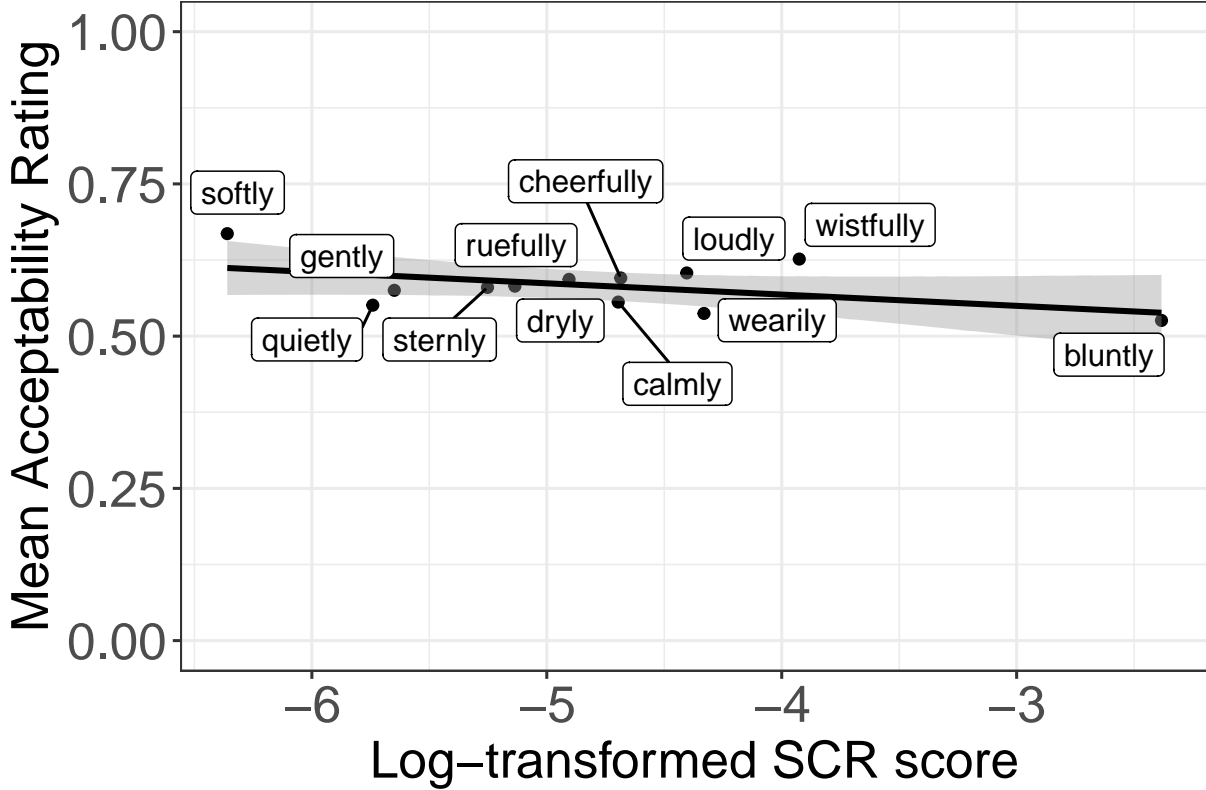


Figure 7: Mean acceptability ratings in the Say condition and the Say + Adverb condition against the log-transformed sentence SCR scores. The shaded ribbon represents bootstrapped 95% confidence intervals.

patterns. We hypothesized that when the complement clause selected by a “say + adverb” construction is more foregrounded (i.e., in the Embedded Focus condition), extracting from that clause should be more acceptable than when it is discourse backgrounded.

4.1 Participants

A total of 100 participants who did not participate in the previous two experiments were recruited through Prolific to complete the experiment. Based on the pre-registered exclusion criteria, responses from 6 participants were excluded, either because they did not self-report as native monolingual English speakers or because their ratings for unacceptable fillers were on average higher than those for acceptable fillers.

4.2 Materials and Procedure

The experimental materials and procedure were identical to Experiment 1, except that all MoS verbs in the stimuli were replaced by “say + adverb” combinations. Example stimuli are shown in (10). There were two experimental conditions: the Adverb Focus condition,

in which the adverb following *say* in the first utterance was capitalized and bolded, and the Embedded Focus condition, in which the embedded object in the first utterance was capitalized and bolded. The second utterance was identical in both focus conditions. All participants were presented with the same set of 24 filler items, which were identical to those used in Experiment 1 (examples shown in 7).

(10) Example stimuli from Experiment 3

a. Adverb Focus condition

Hanako said: John didn't say **SOFTLY** that Mary met with the lawyer.

Scott said: Then who did John say softly that Mary met with?

b. Embedded Focus condition

Hanako said: John didn't say softly that Mary met with the **LAWYER**.

Scott said: Then who did John say softly that Mary met with?

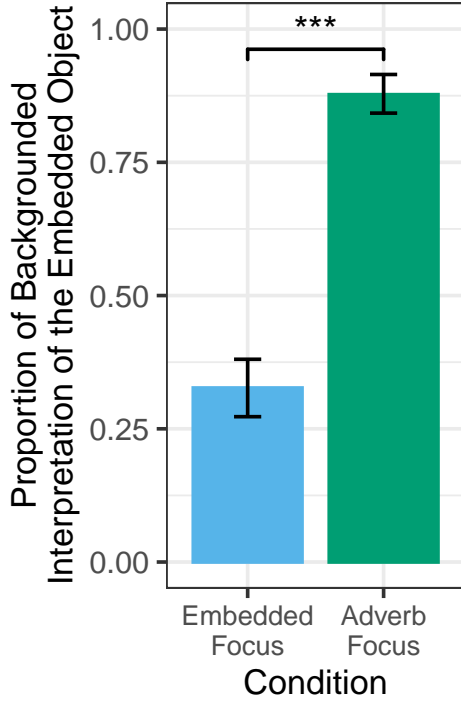
The same rating tasks and comprehension tasks as in Experiment 1 were used. See Fig. 1b for example questions of the comprehension task used to probe the backgroundedness of the extracted content.

4.3 Results

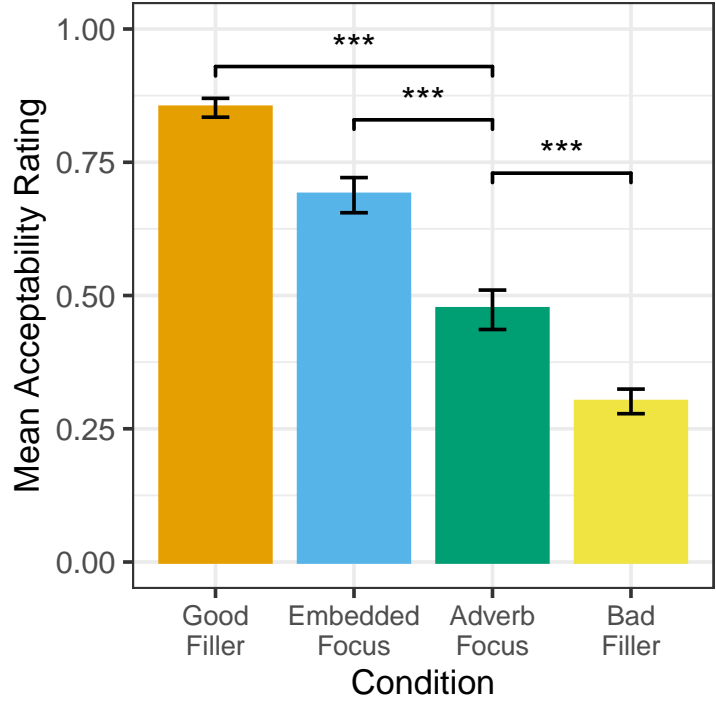
Similar to the analyses in Experiment 1, we first tested the effect of the context sentence on the backgroundedness of the embedded content. Fig. 8a shows the proportion of responses that received the backgrounded interpretation of the embedded content in the comprehension task. We fit a logistic mixed-effects regression model predicting backgroundedness from a fixed effect of focus condition (reference level: Adverb Focus) along with by-item and by-participant random intercepts and slopes for the fixed effect. In comparison to the Adverb Focus condition, there were fewer backgrounded responses in the Embedded Focus condition ($\beta = -3.99, SE = 0.74, z = -5.42, p < 0.001$), suggesting that the focus manipulation changed the backgroundedness of the embedded content in the expected way.

For the main analysis, Fig. 8b shows the mean acceptability ratings in the four conditions. We fit a linear mixed-effects regression predicting acceptability from a dummy-coded fixed effect of focus condition (reference level: Adverb Focus) and the maximal random effects structure allowing model convergence: by-participant random intercepts and slopes for the fixed effect of condition. There was a significant main effect of focus condition, such that sentence acceptability was higher in the Embedded Focus condition than in the Adverb Focus condition ($\beta = 0.21, SE = 0.03, t = 6.90, p < 0.001$). Additionally, in comparison to sentences in the Adverb Focus condition, the grammatical fillers were ($\beta = 0.39, SE = 0.03, t = 13.38, p < 0.001$), whereas ungrammatical fillers were less acceptable ($\beta = -0.16, SE = 0.04, t = -3.62, p < 0.001$). This increase in acceptability when the adverb received focus suggests that foregrounding the embedded content via the context sentence attenuates the island effect.

Finally, we used the two frequency measures of each “*say* + adverb” construction from the corpus analysis reported in Experiment 2 to test the effect of predicate-frame frequency on acceptability. Fig. 9 and Fig. 10 show acceptability ratings in the two conditions against the predicate-frame frequency values and the SCR scores, respectively. Using



(a) Backgroundedness responses.



(b) Mean acceptability ratings.

Figure 8: Results of Experiment 3 across focus condition. Error bars indicate 95% bootstrapped confidence intervals.

the same statistical models for the frequency analyses in Experiment 1, we first fit a linear mixed-effects regression predicting acceptability rating from main effects of condition, log-transformed and mean-centered predicate-frame frequency, and their interaction. The model also included the maximal random effects structure that allowed the model to converge: by-participant random intercepts and random slopes for the effects of condition, predicate-frame frequency, and their interaction; as well as by-item random intercepts and random slopes for the fixed effect of condition. There was a significant main effect of focus condition ($\beta = 0.11, SE = 0.02, t = 6.99, p < 0.001$), but neither the effect of predicate-frame frequency ($\beta = 0.01, SE = 0.02, t = 0.38, p = 0.712$) nor its interaction with condition ($\beta = -0.01, SE = 0.01, t = -0.89, p = 0.375$) was significant.

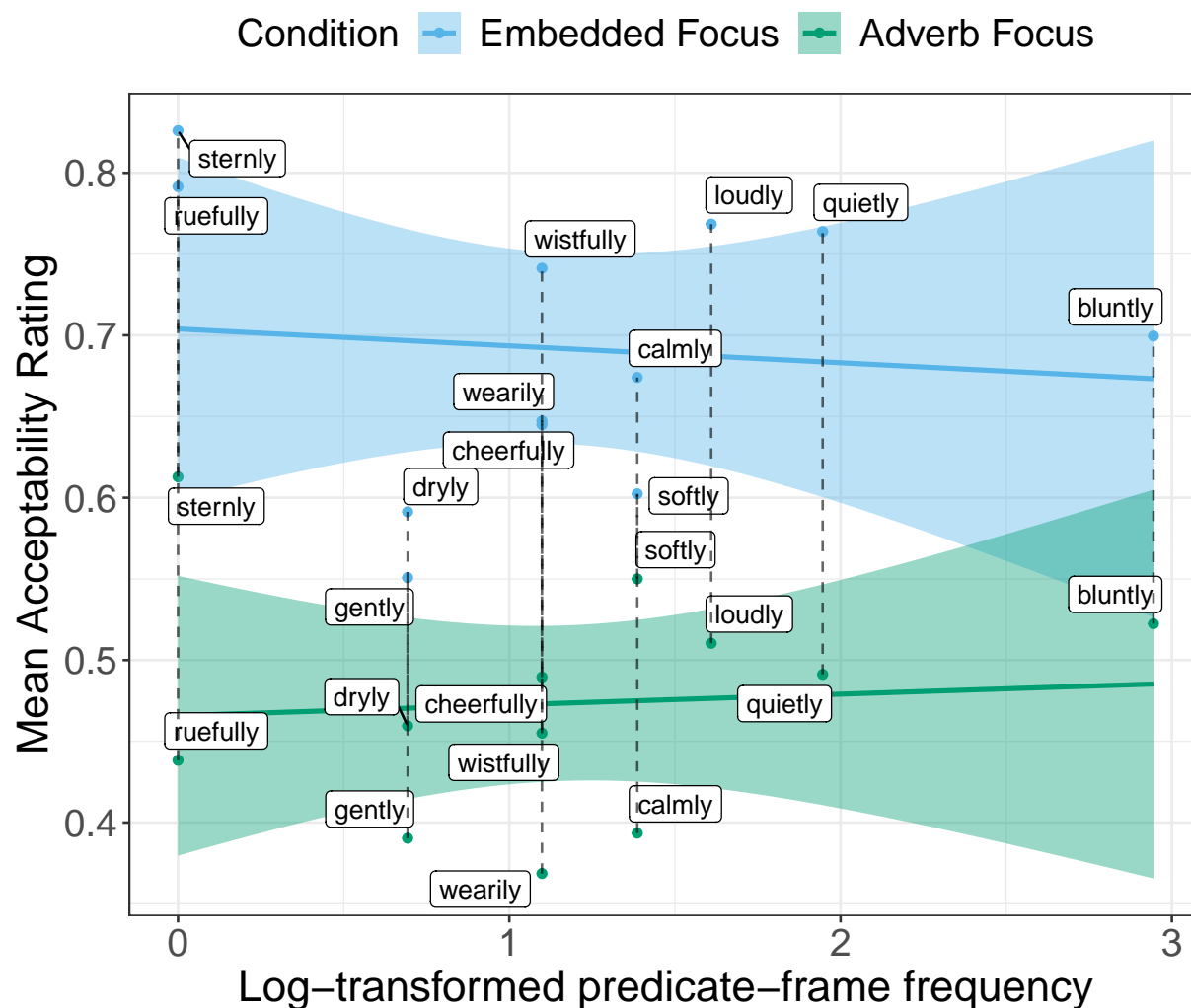


Figure 9: Mean acceptability ratings in the Adverb Focus condition and the Embedded Focus condition against the log-transformed predicate-frame frequency. The shaded ribbons represent 95% bootstrapped confidence intervals.

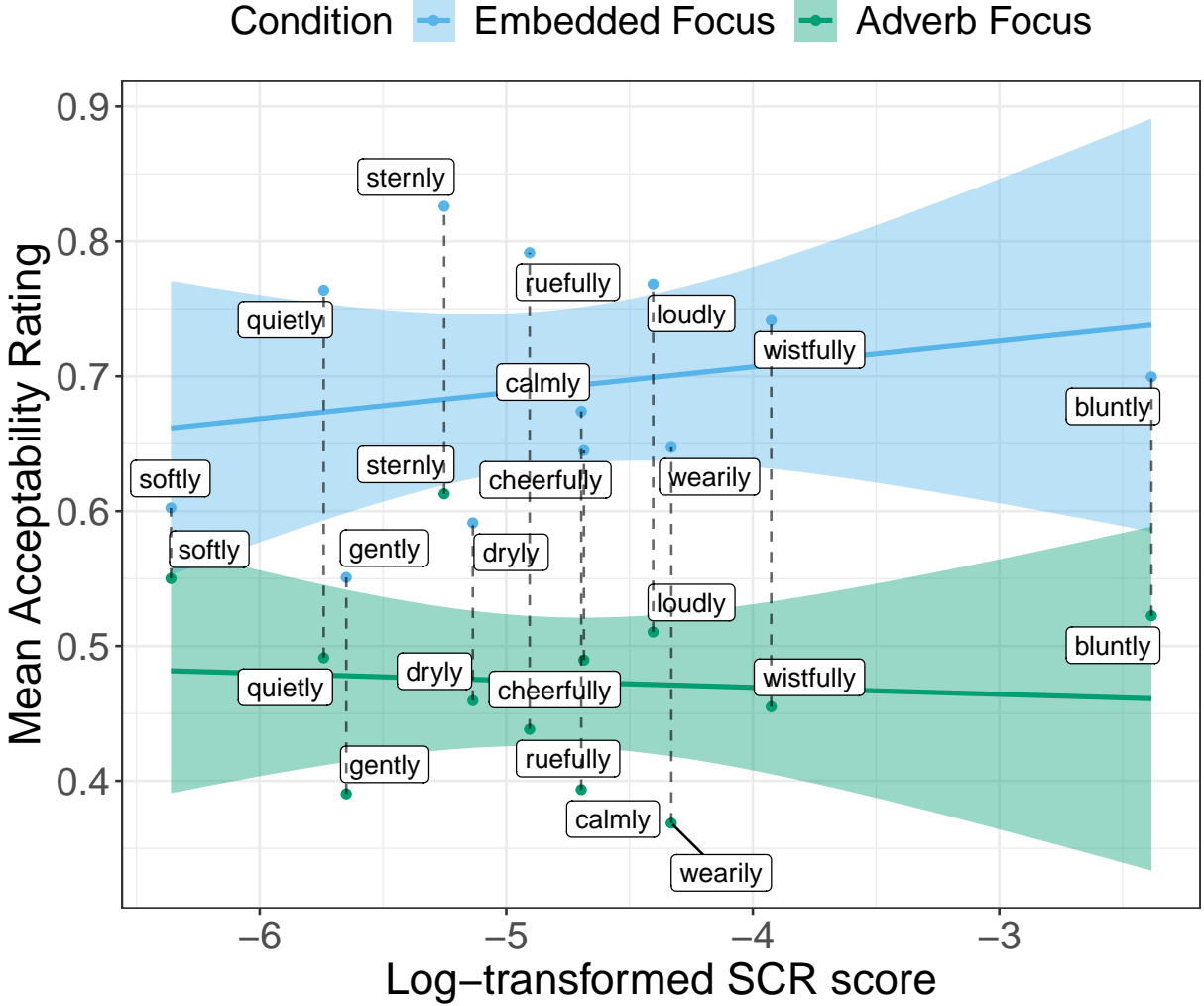


Figure 10: Mean acceptability ratings in the Adverb Focus condition and the Embedded Focus condition against the log-transformed Sentential Complement Ratio (SCR) scores. The shaded ribbons represent 95% bootstrapped confidence intervals.

The same model run with the SCR frequency score yielded the same results: a significant main effect of focus condition ($\beta = 0.11, SE = 0.01, t = 7.27, p < 0.001$), but neither a significant effect of SCR ($\beta = 0.01, SE = 0.02, t = 0.56, p = 0.587$) nor of its interaction with condition ($\beta = 0.01, SE = 0.01, t = 0.70, p = 0.484$).

4.4 Discussion

In combination with the results from Experiment 2, where we replicated the MoS island effect by increasing the lexical weight of the bridge verb *say* with MoS adverbs, the results of the current experiment show that foregrounding the embedded constituent in the “*say* + adverb” construction ameliorates the island effect. This is in line with findings in Experiment 1, which revealed a discourse effect on MoS islands. Therefore, the degradedness of

extracting the embedded constituent contained in the complement clause of an MoS verb or *say* modified by an MoS adverb can be attributed to the discourse backgrounded status of the embedded constituent, further supporting the Backgroundedness Account. Moreover, as in Experiment, the results support neither the Frequency Account nor the Subjacency Account.

5 General Discussion

In this paper, we presented three acceptability judgment experiments. In Experiment 1, we showed that the MoS island effect can be ameliorated through a discourse manipulation. In Experiment 2, we showed that the MoS island effect can be replicated even in sentences with the bridge verb *say* taking complement clauses by increasing the lexical weight of the matrix predicate using MoS adverbs (e.g., loudly, softly). In Experiment 3, we showed that the MoS island effect observed in the “*say* + adverb” construction in Experiment 2 behaves exactly like the MoS island effect observed in sentences with MoS verbs: it is also sensitive to the discourse manipulation.


These experimental results bear out two predictions of the Backgroundedness Account of the MoS island effect. First, the Backgroundedness Account implicates the discourse backgroundedness of the extracted elements rather than structural properties of the sentence as the source of island effects. Therefore, without altering the syntactic structure of a sentence, the island effect should be ameliorated by foregrounding an extracted element that is initially discourse backgrounded. This is exactly what we found in Experiment 1: DPs embedded in MoS complements are by default backgrounded and resist extraction; but when they receive prosodic focus and are thus discourse foregrounded, extracting them becomes more acceptable.

Second, one should be able conjure up an island effect by backgrounding an extracted element that is initially in the foreground. This is supported by the results from Experiment 2: DPs embedded in the complement clause of *say* are not backgrounded, and thus can be extracted; however, they can be backgrounded by adding lexical weight to the matrix predicate using manner adverbs, resulting in less acceptable extraction. In Experiment 3, we further confirmed that the island effect that surfaced in Experiment 2 behaves just like the MoS island effect observed in Experiment 1, in that it is sensitive to information structural manipulations.

These results cannot be explained under either the Subjacency Account or the Verb-Frame Frequency Account. Under the Subjacency Account, the MoS island effect is attributed to the underlying complex NP structure of sentences with MoS verbs (i.e., the structure in (4)). Syntactic rather than information structural properties are considered the direct cause of the MoS island effect under this account. Therefore, the Subjacency Account predicts that foregrounding the extracted DP by changing the prosodic pattern as in Experiment 1 should not alter the syntactic structure of the critical sentences and thus should not affect the magnitude of the MoS island effect, contrary to the findings of Experiment 1. The Subjacency Account also does not predict the effect observed in Experiment 2: in both the *say* and *say* + adverb conditions in Experiment 2, the critical

sentences involved a matrix verb *say* taking a complement clause, which do not have the complex NP structure as in (4). Therefore, the Subjacency Account does not predict the contrast between the *say* and *say* + adverb conditions in Experiment 2.

One way to potentially reconcile the results of Experiment 2 with the Subjacency Account is to propose a structural difference between the sentences of the *say* and the *say* + adverb conditions. Some may argue that the adverb modifying *say* initially originates in a position following the embedded complement clause, and the complement clause needs to undergo rightward movement (akin to extraposition and heavy NP shift) to achieve the word order where the adverb immediately follows *say*. This rightward movement of the embedded CP is shown in 11.

- (11) ??Who did John say *t* softly that Mary met with?
- 

Following this analysis, wh-movement from within the embedded clause would be prohibited due to the Freezing Effect (Culicover and Wexler, 1977, 1980; Ross, 1967): no movement can occur from within an extraposed constituent.¹³ Following Johnson (1986), the Freezing Effect can be accounted for using the Subjacency Condition.¹⁴ Therefore, we can still maintain a purely syntactic explanation for the degradedness of the *say* + adverb condition observed in Experiment 2. However, in Experiment 3, we observed that the degradedness of sentences like (11) can be ameliorated by information structural manipulations, an effect that cannot be explained if subjacency is the only reason that the *say* + adverb condition is degraded in Experiment 2.

The results also do not support the Verb-Frame Frequency Account. In Experiment 1, sentences in the two critical conditions (Verb and Embedded focus conditions) involved the exact same set of MoS verbs, and thus the observed acceptability contrast cannot be attributed to a difference in verb-frame frequency. Follow-up analyses further showed that in Experiment 1, there was no correlation between the acceptability of the MoS island sentences and the verb-frame frequency of each MoS verb taking complement clauses, further confirming that verb-frame frequency is not the source of the MoS island effect. In Experiments 2 and 3, all critical sentences included the same matrix verb *say*. Therefore, verb-frame frequency cannot account for any contrasts observed in the critical comparisons in Experiments 2 and 3. One may argue that the most relevant frequency measure in Experiments 2 and 3 should take into account the whole matrix predicate (i.e., the frequency of *say* + different manner adverbs followed by complement clauses), rather than just the frequency of verbs taking complement clauses. However, the predicate-frame frequency

¹³The empirical evidence for the Freezing Effect is mixed. Culicover and Wexler (1980) noted certain acceptable examples of extraction from extraposed clauses like (1):

(1) What was it clear that Mary had bought?

Other exceptions to the Freezing Effect were also noted in Rizzi (2007), Gallego (2009, 2010), and Müller (2010). See Corver (2017) for a comprehensive review.

¹⁴It is rather controversial whether the Freezing Effect should have a syntactic explanation. Past studies have also proposed processing-level (Hofmeister et al., 2015; Konietzko et al., 2018; Winkler et al., 2016) and pragmatic (Martens, 2021) accounts of the Freezing Effect.

measures calculated based on corpus counts of *say* + different manner adverb followed by complement clauses did not correlate with the acceptability of the *say* + adverb wh-questions in Experiments 2 and 3. As a result, the Verb-Frame Frequency Account falls short of accounting for the results of the current study.¹⁵

In sum, the current study provides support for the Backgroundedness Account of the MoS island effect, and challenges the Subjacency Account and the Verb-Frame Frequency Account. This does not mean that we ruled out the possibility of syntactic and frequency factors playing a role in the MoS island effect. Below we present several possible ways that syntactic and frequency factors may interact with the MoS island effect.

It is possible that the complex-NP structure as shown in (4) is in fact the correct underlying structure for sentences showing the MoS island effect, but the direct source of the island effect is the discourse backgrounded nature of appositive CPs rather than a violation of the subjacency condition. In this case, syntactic properties (the complex-NP syntactic structure) determine the discourse backgroundedness of constituents, which in turn gives rise to island effects. Note that this analysis diverges from our proposal, which states that the default backgroundedness of MoS complements is due to the heavy lexical weight of MoS verbs. We favor our proposal for two reasons. First, we showed in Experiments 2 and 3 that the MoS island effect can be created by adding lexical weight to matrix predicates, which serves as a proof of concept that lexical weight can affect discourse backgroundedness. In contrast, it is less clear whether the appositive CP structure gives rise to discourse backgroundedness. Second, our proposal is more parsimonious in that it maintains the same syntactic structure as in (3) for both bridge verbs and MoS verbs taking embedded complement clauses, and does not posit any silent structure. Nevertheless, it is an empirical question whether the complex-NP syntactic structure is the indirect cause of the MoS island effect, which we leave for future studies.

It is possible that the magnitude of the MoS island effect is affected by certain frequency measures other than the verb-frame frequency as defined in Liu et al. (2019, 2022a). For example, the acceptability of MoS island sentences could be predicted by the frequency of MoS verbs taking complement clauses that contain extraction gaps, or the frequency of wh-questions containing MoS verbs. Future corpus studies are needed to test these possibilities. However, one should be cautious in using a correlation between acceptability ratings and certain frequency measurements to argue for a frequency-based account of an acceptability effect. If such a correlation is found, it is still unclear whether the low frequency of use leads to degraded acceptability or whether the degraded acceptability leads to the structure being less frequently used.

The current study has implications for the study of island effects and the experimental

¹⁵Richter and Chaves (2020) suggested a possible explanation for why the effect of verb-frame frequency reported in Liu et al. (2019, 2022a) may fail to replicate in other studies: it is possible that the correlation between verb-frame frequency and acceptability that Liu et al. (2019, 2022a) observed was mainly driven by a verb-class effect. Bridge verbs in general have a higher frequency of taking complement clauses than MoS verbs, and extracting from bridge verb complements is more acceptable than extracting from MoS complements. This difference between verb classes gives rise to a false picture of correlation between verb-frame frequency and extraction acceptability. However, when analyzing only MoS verbs, verb-frame frequency may not correlate with extraction acceptability.

syntax enterprise in general. First, it is unlikely that there is a single constraint responsible for all island effects. Although island effects have traditionally been considered the result of syntactic constraints, we demonstrated that at least for the MoS island effect, information structural factors contribute to degraded acceptability. It is possible that among the wide range of island effects known to linguists, there exist other types with non-syntactic sources just like the MoS island effect. We should carefully explore the possibility of non-syntactic accounts of islands before considering all island effects the explananda of syntactic theories. Second, we showed that sentence acceptability ratings can be affected by information structural factors. This adds to the long list of observations that extra-grammatical factors affect acceptability ratings (Schutze, 1996) and highlights the oversimplification of the widely adopted linking hypothesis of experimental syntax that differences in acceptability reflect differences in grammaticality.

Finally, several questions are left unanswered. First, it has been observed that the complement clauses of MoS verbs cannot be headed by null complementizers, whereas the complement clauses of bridge verbs can (Pesetsky, 1995; Snyder, 1992; Stoica, 2016; Stowell, 1981; Zwicky, 1971). This contrast is shown below in (12).

- (12) a. John said (that) Mary is in the courtyard.
- b. John whispered *(that) Mary is in the courtyard

This contrast naturally follows from the Subjacency Account, where the two sentences in (12) involve two different syntactic structures, and null complementizer is not possible when the embedded clause is not under syntactic selection by the matrix verb (i.e., in an appositive structure, as is the case with the MoS verb). This contrast in (12) could also follow from the Verb-Frame Frequency Account: it has been shown that the use of the overt complementizer *that* is preferred over its null counterpart when the embedded clause that it heads is less predictable given the prior context (Jaeger, 2010; Wasow et al., 2011). Therefore, the low frequency (and hence low predictability) of complement clauses following MoS verbs gives rise to a preference of using overt complementizers with MoS verbs. By contrast, the Backgroundedness Account makes no predictions about the effect shown in (12), and hence has less explanatory power compared to its alternatives. It is possible that there is a causal link between the backgroundedness of a complement clause and the overtness of its complementizer, a possibility which should be investigated by future studies.

Another open question concerns the decomposition of the MoS verbs. MoS verbs have often been analyzed as a manner verb composed from the light verb *say* and a manner component (e.g., *whisper* = say in a whispering manner), or a creation verb composed from the light verb *make* and a nominal component (e.g., *whisper* = make a whisper). In the current study, we assumed the manner verb analysis following Erteschik-Shir (2007). However, it is evident that a creation verb interpretation of MoS verbs is possible, especially considering the following example of an MoS verb that does not entail a *saying* action:

- (13) She howled something at me, but she wasn't saying anything. (Zwicky, 1971)

As discussed earlier, the Subjacency Account assumes not only that MoS verbs can be lexically decomposed as creation verbs (*make* + a nominal component), but also that such

decomposition is reflected syntactically, giving rise to the appositive structure in (4). In the current study, we provided ample evidence against such a syntactic analysis. However, it is still possible that the creation verb decomposition is an available interpretation of the MoS verbs to comprehenders, but such decomposition does not give rise to a special syntactic structure, unlike what is suggested by the Subjacency Account. Both the manner verb decomposition and the creation verb decomposition make the same prediction that MoS verbs are lexically complex and thus can bear focus, and therefore their complement clauses can be discourse backgrounded. Under the Backgroundedness Account, both ways of analyzing the MoS verbs predict that MoS complements are islands. In the current study, we do not have direct evidence that participants in Experiment 1 interpret the MoS verbs as manner verbs as opposed to creation verbs. Future studies can investigate which interpretation(s) of the MoS verbs participants arrive at when reading MoS island sentences, and test whether the interpretation interacts with the MoS island effect.

6 Conclusion

In the current study, we demonstrated that the MoS island effect can be ameliorated by foregrounding the extracted DP, and that the complements of the bridge verb *say* behave like MoS islands when they are backgrounded due to the added lexical weight to the matrix predicate. These results support a causal relationship between discourse backgroundness and the MoS island effect, and challenge accounts that attribute the MoS island effect to syntactic or frequency factors.

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