

Factive and manner-of-speaking islands are an artifact of nonlinearity in the acceptability judgment task

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The unacceptability of wh-extraction (e.g., question formation) out of certain syntactic structures, known as ‘island’ effects, has been a central topic in theoretical syntax for many years (Ross, 1967; Chomsky, 1973). A prominent example of islands is that extraction out of a sentential complement introduced by factive and manner-of-speaking verbs is less acceptable than extraction from a clause introduced by “bridge” verbs (1). Here we present 3 acceptability rating studies suggesting that there is no true island effect for such structures: instead there are separate, additive penalties based on two factors: (a) verb-frame frequency (cf. Dabrowska, 2004; Kothari, 2008), and (b) the presence of extraction. These penalties give rise to apparent island effects as a result of the nonlinear relationship between true acceptability and acceptability ratings as measured in Likert scales and forced-choice tasks. Our account provides a better fit to the data than syntactic (Snyder, 1982) and discourse-based (Ambridge & Goldberg, 2008) accounts of factive/manner-of-speaking verb islands. Furthermore, we show that a major outlier to our account, the verb ‘know’, is explained by pragmatic factors: when we use a different extraction construction (clefts, rather than questions) which eliminates these factors, ‘know’ is no longer an outlier.

In **Exp 1** we replicate Ambridge & Goldberg (2008), who argued that extraction from a sentential complement is unacceptable in proportion to its ‘backgroundedness’, indicated by scores on a negation test (2). Consistent with their account, they report a strong negative correlation of negation test scores and differences in acceptability ratings for declarative vs. wh-question (for 12 verbs in 3 verb classes). Using an expanded set of 24 verbs, we failed to replicate their results in a 5-point Likert-scale acceptability-rating and negation-test experiment ($r=-0.39$, $p=0.2$; see Fig.1). Further, we found overlap between acceptabilities for factive and bridge verbs, contradicting the syntactic account, which predicts non-overlapping acceptability between factive and bridge wh-questions given their distinct deep structures. Critically, we found a strong correlation between acceptability ratings for wh-question forms and verb frame (verb+*that*) frequency as measured in the Google books corpus ($r=.80$; $p<.001$). Furthermore, in post-hoc data analysis, we noticed that most ratings were between 4/5 and 5/5 for both the wh-questions and declaratives of verbs, suggesting that participants were using the Likert scale in a nonlinear fashion.

In **Exp 2** we controlled for this possibility by performing a forced-choice binary acceptability judgment task, with 48 verbs ($n=120$) beyond the 3 categories. We analyzed the results in a mixed-effects logistic regression where verb frame frequency, presence of extraction, and their interaction are assumed to make linear contributions to the log-odds of acceptance; these log odds are converted to acceptance probabilities by the nonlinear logistic transform. We found main effects for verb frame frequency ($\beta=0.58$, $p<0.001$) and extraction ($\beta=-3.27$, $p<0.004$), but no significant interaction of the two ($p>0.4$; numerically in the wrong direction on an ‘island’ account). The data are best modeled by positing that verb frame frequency and extraction have independent, additive effects in log-odds space (Fig. 2a), which give rise to a spurious interaction when log-odds are transformed into probabilities of acceptance (Fig. 2b).

In **Exp 3** we tested our frequency account on another type of extraction-cleft structures (24 verbs, $n=120$)-and dealt with a major outlier to this account: the verb ‘know’. We hypothesized that the idiosyncratic behavior of ‘know’ was due to pragmatic factors in the wh-question: a question is a request for knowledge but a question with ‘know’ implies that the speaker already has the knowledge. ‘Know’ should not behave idiosyncratically in other extraction constructions, such as clefts. As in Exp 2, we found main effects of verb frame frequency ($\beta=1.2$, $p<0.01$) and extraction ($\beta=-14.6$, $p<0.012$), but no interaction between them ($p>0.3$). Crucially, ‘know’ is not an outlier to the frequency account (Fig. 3).

- (1) (a) What did John **say/think** that Mary bought?
 (b) ??What did John **know/notice** that Mary bought?
 (c) ??What did John **whisper/mutter** that Mary bought?
 (2) **Sample negation task:** Please rate how true the second sentence is given the first sentence.
 Sentence 1: John didn't notice that Mary bought a car.
 Sentence 2: Mary didn't buy a car.

[wh-question formed by **bridge** verbs]
 [factive island]
 [manner-of-speaking island]

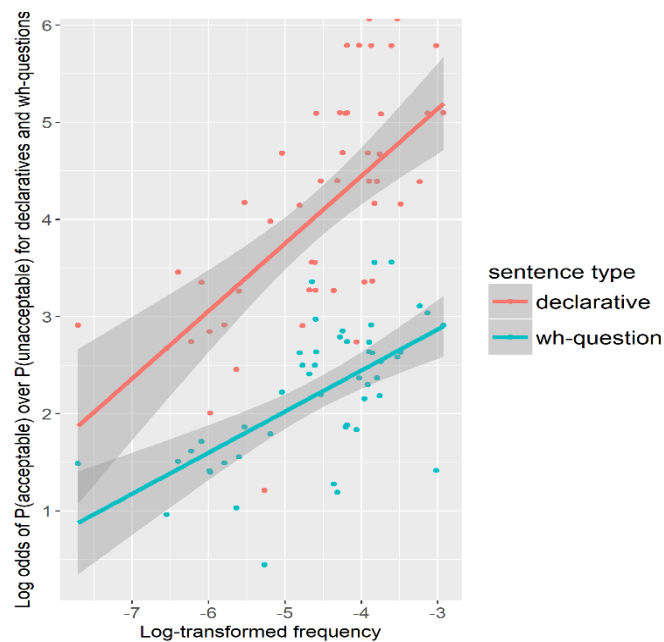
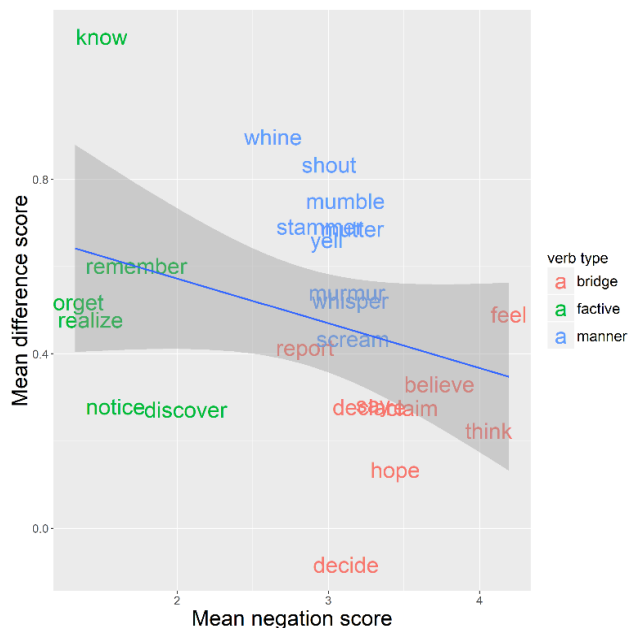


Fig.1. Correlation between mean negation scores and difference scores by verb on 5-point scales (24 verbs)

Fig.2a. Log-odds of 'acceptable' response for wh-q and declaratives against log-transformed frequencies (48 verbs)

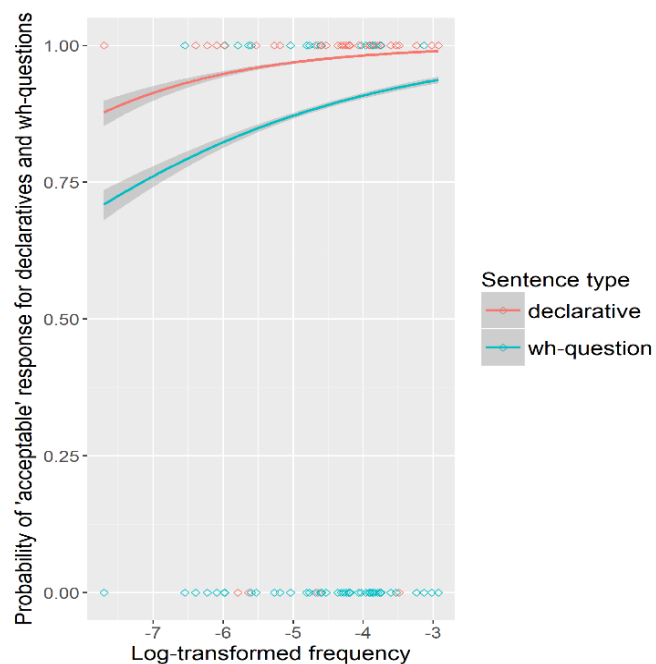


Fig.2b. Probability of 'acceptable' response for wh-q and declaratives against log-transformed frequencies (48 verbs)

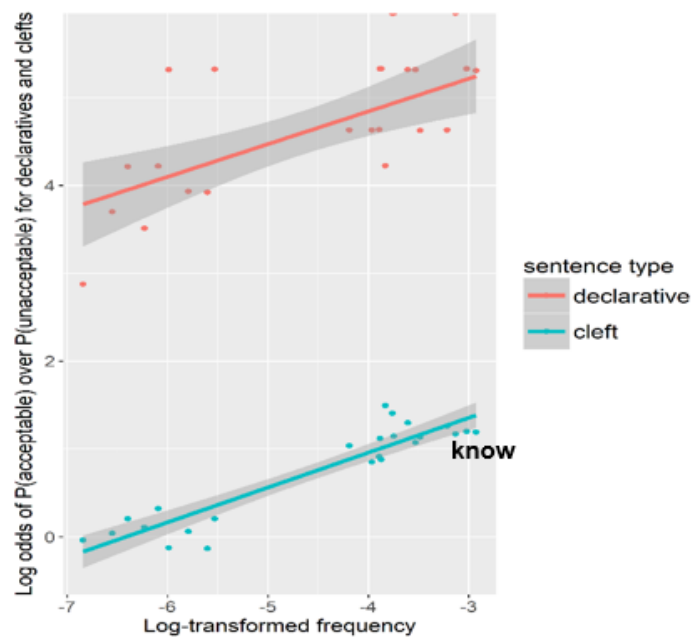


Fig.3. Log-odds of 'acceptable' response for clefts (e.g., 'It was the pie that Angela knew that Kevin liked.') and declaratives against log-transformed frequencies (24 verbs)