On the structural nature of island constraints

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INTRODUCTION

The nature of island constraints continues to be an important question in linguistic theory and psycholinguistic investigation. In particular, the degree to which parsing considerations or constraints on grammatical representations best account for the existence of island constraints remains under debate. We believe that this framing of the issues is misleading. First, it suggests that the unacceptability attested in extraction from island environments could be entirely reduced to either parsing or grammatical constraints, rather than a combination of the two. Second, this approach to the issue obscures a more basic question: do islands effects at all reflect the fundamental grammatical or structural properties of island environments, or are they entirely the result of general converging processing factors? We here focus on this question by developing an observation made in Chomsky (1964). We present the results of two acceptability judgment studies that suggest that in properly controlled minimal pair sentences, structure remains a significant factor in controlling acceptability judgments in island contexts. While the results are compatible with accounts on either side of the processing-grammar divide, they do narrow the field of possible candidates to those that state the constraints in terms of the structure involved. This is a familiar observation that bears repeating in light of recent alternative theories of islandhood, which have challenged this generalization.

The observation we develop belongs to Chomsky (1964), who noted that (1) is three ways ambiguous. The three readings are in (2):

(1) John saw a woman walking to the station
(2) a. John saw a woman while he was walking to the station
   b. John saw a woman who was walking to the station
   c. John saw the event of a woman walking to the station

He further observes that the ambiguities disappear if we ask for the identity of the station, leaving only the interpretation in (2c):

(3) Which station did John see a woman walking to?

The reason for this reduction in ambiguity is straightforward given any conventional grammatical theory of islands, which generally treat adjuncts as islands. In (2a), walking to the station is an adjunct modifying the VP saw a woman. Consequently, it is an island, and extraction of which station is illicit. In (2b), walking to the station is also an adjunct, this time a reduced relative adjoined to the nominal a woman.\(^1\) Again, extraction is prohibited due to its status as an adjunct. In (2c), however, walking to the station is the predicate in the gerundive (small) clause a woman walking to the station, which is in turn complement to the perception verb see. Because this structure is not an island, it tolerates extraction and supports the event reading in (3).

\(^1\) There are two basic analyses of relatives; the NP-S analysis in which a woman is head of the relative clause or the Det-N analysis in which woman is the head. Either is fine for current purposes. In fact, any account that distinguishes complements from adjuncts will serve current purposes as this suffices to code the fact that adjuncts are islands.
What is appealing about this example is that it seems to control for everything but grammatical structure. For example, no explanation tied to lexical frequencies can be relevant in this case: the lexical items are identical across the three readings, and they differ only in their grammatical configurations. This example suggests that the evident reduction in ambiguity from (1) to (3) must stem from the structural configurations involved. In other words, walking to the station is grammatically an island for both (2a) and (2b). If this is correct, then the structural or grammatical properties of sentences must be relevant to demarcating extraction domains and this is reflected in speakers’ judgments concerning the acceptability of sentences under certain interpretations. Of course, this does not mean to say that only grammatical structure controls sentence acceptability. There are many factors that contribute to acceptability judgments. The grammatical conception of islands makes the minimal claim that part of any adequate account of filler/gap phenomena will involve properties of the structural/syntactic properties of the extraction domain. Not surprisingly, the effects of grammatical island restrictions will be most evident when all other factors are properly controlled.

THE CURRENT STUDY

The kind of argument built on (1) and (3) is hard to construct. It is not easy to find sentences that differ only with respect to their grammatical structure, as structure and meaning generally covary. However, when it is possible to construct such minimal pairs the structural effects of islandhood become evident. In this short paper, we apply this reasoning above to explore the properties of complex noun phrases. The particular focus will be on event denoting Noun-Complement Constructions (NCC) and their island properties. We compare these to event-denoting small clause Naked Infinitive Constructions (NIC). Following the logic outlined above, we expect to see a distinction between extraction from NCCs and NICs. The former are grammatical islands, and the latter are not. Interestingly, the semantics of the two constructions are very similar, and so comparing NCCs with NICs allows us to ask whether ‘islandhood’ is tied to syntactic configuration or semantic structure. Moreover, as we shall see, the contrasting cases are near minimal pairs, using almost identical lexical forms. This design allows us to control both for semantic interpretation and possible lexical interference, both factors that could in principle impede filler-gap processing. An additional feature of this manipulation is that the verbs we employ in our judgment studies preferentially take NP, rather than NIC complements. This fact makes it difficult to reduce any potential island effects to effects of constructional frequency, as island (NP) complements to the verbs we use are much more frequent than non-island complements (see the Appendix). Consequently, whatever acceptability differences there may be should reflect differences in syntactic organization.

We assume that grammatical structure covers both syntactic and semantic structure. In fact, there are reasons to think that there is a close correlation between the two so which (if any) dominates will be hard to determine. What is clear is that this kind of structure rather than information structure is what counts. See Lidz and Williams’ (2009) review of Goldberg (2006) for relevant discussion.

The judgments here are not “a is more acceptable than b” but “a is acceptable under interpretation c as compared to interpretation d.”
Thus our design parallels the argument that Chomsky (1964) presented, exploiting identical lexical forms to isolate potentially relevant structural differences. However, the contrasts we present below explore a somewhat stronger point than the example in (1) can. The three readings of (1) correspond to different semantic interpretations, and only one survives under wh-movement. In our design, we control for semantic interpretation and attempt to focus directly on syntactic differences. An example pair of sentences is in (4).

(4) a. Mary heard John clumsily attempt to kiss Mary
    b. Mary heard John’s clumsy attempt to kiss Mary

(4a,b) are near synonyms. The complement of the perception verb hear denotes an event in both cases: the event in which John clumsily attempted to kiss Mary. Moreover, the sentences are minimally different lexically. However, they are very different syntactically, with the complement in (4a) being clausal and the one in (4b) being a complex noun phrase. If acceptability is sensitive to syntactic structure, then we expect extraction from the second to result in reduced acceptability compared to extraction from the first.

We test this contrast with two sets of judgment tasks. The first study contrasts NICs with their corresponding definite NCCs both with and without extraction:

(5) a. Mary heard the sneaky burglar clumsily attempt to open the door
    b. Mary heard the sneaky burglar’s clumsy attempt to open the door
    c. What did Mary hear the sneaky burglar clumsily attempt to open?
    d. What did Mary hear the sneaky burglar’s clumsy attempt to open?

The second study contrasts NICs with indefinite subjects and their corresponding indefinite NCC in order to assess the effect of extracting out of definite noun phrases. For example, (6a) is clearly more acceptable than (6b), and everything but definiteness of the nominal extraction domain is constant across the two examples (Chomsky 1973). This makes the comparison of (7c,d) particularly interesting for it controls for these possible definiteness effects.

(6) a. Who did John buy a picture of?
    b. *Who did John buy the picture of?

(7) a. Mary heard someone clumsily attempt to open the door
    b. Mary heard a clumsy attempt to open the door
    c. What did Mary hear someone clumsily attempt to open?
    d. What did Mary hear a clumsy attempt to open?

Before we present the results of the study, it is worth touching briefly upon our motivations for deploying judgment study methodology on a contrast that may be intuitively evident to readers based on examples (5) and (7). First, since we are interested in isolating the structural effects on island acceptability, we must ensure that any such effect survives under different lexicalizations. This is standard operating procedure for many psycholinguistic paradigms, and we find judgment studies to be a useful way of
presenting evidence that the effects of interest are not linked to particular example sentences. Second, it is worthwhile to control for factors such as frequency and lexical identity to bolster the conclusions reached by introspection (an extension of the traditional ‘minimal pair’ methodology used in linguistics). This helps to clarify the generalizations of interest and build strong empirical support for them.

THE EXPERIMENTS

We conducted two parallel judgment studies using identical methodology and participant populations, and we describe the methodology first. Participants were asked to rate sentences on a 7-point scale, where 1 corresponded to ‘completely unacceptable’ and 7 corresponded to ‘completely natural’. They were instructed to avoid prescriptive notions of ungrammaticality by focusing on natural speech, and were provided with example sentences as practice. They registered their judgments by filling out a paper version of the questionnaire. The order of the sentences, experimental and filler sentences alike, was randomly generated for each participant.

For each experiment, 24 sets of experimental sentences were constructed. The critical experimental sentences in both the first and second judgment studies used verbs of perception drawn from a pool of 8 verbs, which are listed in the Appendix. Note that for all verbs employed, the proportion of ‘clausal’ completions (i.e. CP complements as well as NICs) was lower than the proportion of NP complement completions. In addition to the 24 experimental sentences, 72 filler sentences were included that had a mixture of unacceptable and acceptable sentences (ungrammatical fillers included ungrammatical auxiliary-verb combinations, unlicensed NPIs, and coordinate structure constraint violations).

For both experiments 1 and 2, 12 undergraduate students from the University of Maryland were recruited (7 females and 8 females in each group, respectively). The predictions for both experiments are straightforward. As in Sprouse (2007a), islandhood is defined with respect to an interaction effect. If extraction from an NCC is worse than extraction from an NIC construction, above and beyond any baseline differences in acceptability between NIC and NCC constructions, then we should observe an interaction effect. This effect would suggest that NCC constructions are islands with respect to extraction, causing a selective decrement in acceptability. On the other hand, if only main effects of extraction and complement type obtain, then this suggests that NCC and NIC complements do not differ with respect to their islandhood (i.e. neither would be an island).

EXPERIMENT 1

In experiment 1, two factors were crossed, giving the four conditions in (8) (repeated from 7 above). The verbs either took an NIC (8a,c) or an NCC (8b,d) complement (the factor COMPLEMENT). The object of the event denoted by the verbs completed was either left in-situ (8a,b), or turned into a wh-element and fronted to form a matrix interrogative (8c,d) (the factor WH).

(8) a. Mary heard the sneaky burglar clumsily attempt to open the door
b. Mary heard the sneaky burglar’s clumsy attempt to open the door

c. What did Mary hear the sneaky burglar clumsily attempt to open?

d. What did Mary hear the sneaky burglar’s clumsy attempt to open?

The results of the judgment study are summarized graphically in Figure 1, and mean acceptabilities for each of the conditions are presented in Table 1.

**Figure 1**: By-participant average ratings for Experiment 1. Error bars represent one standard error. Values are on a 7-point scale where 7 is perfectly acceptable, and 1 is completely unacceptable.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Rating (±SE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NIC, -WH</td>
<td>6.44 (±0.22)</td>
</tr>
<tr>
<td>NCC, -WH</td>
<td>6.29 (±0.19)</td>
</tr>
<tr>
<td>NIC, +WH</td>
<td>5.49 (±0.26)</td>
</tr>
<tr>
<td>NCC, +WH</td>
<td>3.15 (±0.28)</td>
</tr>
</tbody>
</table>

**Table 1**: Mean judgments and standard error by participants for Experiment 1. Values are on a 7-point scale where 7 is perfectly acceptable, and 1 is completely unacceptable.
The data from experiment 1 were analyzed with repeated-measures ANOVAs, by participants and items on the raw rating values. Both analyses revealed significant main effects of WH (by participants: $F(1,11) = 133.6, p < .0001$; by items: $F(1,23) = 104.7, p < .0001$) and COMPLEMENT (by participants: $F(1,11) = 39.3, p < .0001$; by items: $F(1,23) = 67.9, p < .0001$), as well as a significant interaction of $WH \times COMPLEMENT$ (by participants: $F(1,11) = 49.2, p < .0001$; by items: $F(1,23) = 29.5, p < .0001$).

The results of experiment 1 confirm the observation that extraction from NP contexts is worse than extraction from NIC contexts. In other words, the interaction of $WH \times COMPLEMENT$ is due to a significant decrement in acceptability for extracting a wh-element when it is contained inside an NCC complement, above and beyond the differences in acceptability engendered by wh-movement or complement type alone. This interaction effect is exactly what is predicted in island contexts (see, e.g. Sprouse 2007a, Sprouse, Fukuda, Ono & Kluender 2011).

However, as we noted at the outset, there is one possible confound in this comparison. As mentioned above, there is a well-known decrement in acceptability for extracting out of definite noun phrases. Thus, the observed unacceptability for extraction out of NCC complements may be due to the definite nature of the containing NP category, rather than to structural or grammatical differences between the NICs and NCCs we investigated. NICs, in contrast, have no such definiteness associated with the containing category. Experiment 2 aimed to address this confound.

**Experiment 2**

In experiment 2, we examined the same two crossed factors as in Experiment 1: COMPLEMENT and WH. In Experiment 2, we modified the paradigm in an attempt to remove the definiteness confound. For NCC conditions, this meant using an indefinite article in place of the possessor NP. For NIC conditions, we employed someone in place of a fully specified NP as the logical subject of the NIC condition. The conditions are given in (9) below.

\[(9)\]
\[
\begin{align*}
\text{a. Mary heard someone clumsily attempt to open the door.} \\
\text{b. Mary heard a clumsy attempt to open the door.} \\
\text{c. What did Mary hear someone clumsily attempt to open?} \\
\text{d. What did Mary hear a clumsy attempt to open?}
\end{align*}
\]

The results from Experiment 2 are summarized graphically in Figure 2, and average ratings are presented in Table 2. Repeated-measures ANOVA analysis revealed significant main effects of WH (by participants: $F(1,11) = 128.2, p < .0001$; by items: $F(1,23) = 83.0, p < .0001$) and COMPLEMENT (by participants: $F(1,11) = 19.6, p < .01$; by items: $F(1,23) = 11.4, p < .01$). Importantly, in addition to the two main effects, there was a significant interaction of $WH \times COMPLEMENT$ (by participants: $F(1,11) = 9.2, p < .05$; by items: $F(1,23) = 13.4, p < .01$).
Figure 2: By-participant average ratings for Experiment 2. Error bars represent one standard error. Values are on a 7-point scale where 7 is perfectly acceptable, and 1 is completely unacceptable.

Table 2: Mean judgments and standard error by participants for Experiment 2. Values are on a 7-point scale where 7 is perfectly acceptable, and 1 is completely unacceptable.

<table>
<thead>
<tr>
<th>Complement</th>
<th>NIC, -WH</th>
<th>NCC, -WH</th>
<th>NIC, +WH</th>
<th>NCC, +WH</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6.29 (±0.14)</td>
<td>6.21 (±0.16)</td>
<td>4.60 (±0.34)</td>
<td>3.43 (±0.27)</td>
</tr>
</tbody>
</table>

The results of Experiment 2 are qualitatively similar to the results of Experiment 1. There is an interaction of WH×COMPLEMENT, again due to a significant decrement in acceptability for extracting a wh-element when it is contained inside an NCC complement. The island effect in Experiment 2 is numerically smaller than it was in Experiment 1. This is consistent with a definiteness effect accounting for part of the interaction in Experiment 1, but it is important to note that this conclusion is not licensed from these data. There were significant differences between the materials in the two
studies that make it difficult to directly compare the size of the island effect across the two sets of conditions. For this reason we do not attempt to interpret this effect further.

**Discussion**

The present results confirm a rather straightforward intuition: in sentences such as (5c-d) (repeated as (10a-b) below), the structural identity of the verbal complement is responsible for the observed decrement in acceptability in the NCC case (10b). Interestingly, the pair of studies presented here raise the possibility that some portion of the unacceptability contrast observed in sentences such as (10) may be due to the independently motivated definiteness effect for extraction environments, an effect observed elsewhere (Chomsky 1973; Kluender and Kutas 1993b). This possibility requires further investigation, as the results provided here do not provide direct evidence for it. Nonetheless, even when the definiteness of the verb’s complement was controlled for, extraction from the NCC condition was significantly worse than extraction from the NIC condition, as evidenced by an interaction of extraction and complement type in both experiments.

(10)  

a. What did Mary hear the sneaky burglar clumsily attempt to open?  
b. What did Mary hear the sneaky burglar’s clumsy attempt to open?

As stated at the outset, the present results are not intended to adjudicate between processing and representational accounts of island phenomena. Rather, the aim of the present work was to try and sharpen the statement of the constraints on extraction by providing further evidence that the constraints are linked to structural facts of the sentences under consideration. There are a number of processing theories that link the difficulty in island constructions to on-line structure building limitations (Berwick and Weinberg 1984; Pritchett 1991; Kluender and Kutas 1993b; Hawkins 1999; Kluender 2004), and the present results are compatible with such claims.

However, we note that whether or not the distinction between parser and grammar in island accounts is coherent depends on auxiliary assumptions that one makes about the relation between the grammar and the parser (see discussion in Phillips and Lewis 2010). If one assumes a highly transparent linking between the grammar and parser (e.g. Phillips 1996), then it is not clear that it is a useful distinction to make. Instead, it is important to distinguish between accounts that have a structural component, and those that do not. In this latter class are a number of reductionist theories of island phenomena that attempt to explain island phenomena as an effect that is a by-product of overlapping, independently-motivated processing constraints. Examples of this are approaches that attempt to state the constraint in terms of recoverability of the filler (Hofmeister 2007b; Hofmeister and Sag 2010) or in terms constraints on attention or pragmatic relations (Deane 1991; Goldberg 2006; Ambridge and Goldberg 2008).

With respect to the latter class of theories, it is not clear what predictions an attention-based or pragmatic account would make for the current manipulations. For example, Deane (1991) states that ‘distractions’ that occur between the filler and gap site lead to unacceptability. Likewise, Goldberg (2006) hypothesizes that if the extraction environment is backgrounded, then extraction will be illicit. It is not obvious that the
NCC complements are more backgrounded than the NIC complements. In fact, the near synonymity of the matched pairs suggests that they are informationally on a par. In Experiment 1, it could be argued that having a possessor in the NCC complement contributes to the backgrounding of the possessed NP, by suggesting the existence of a contrast set. However, this suggestion would not extend to Experiment 2. In the absence of further reason to believe that NCC complements are backgrounded constituents (as opposed to NIC complements), accounts couched entirely in terms of attention to constituents or their information structural relations to one another do not predict the results presented here.

Hofmeister (2007b) and Hofmeister and Sag (2010) propose that the apparent unacceptability of extraction from island domains results from accumulating processing pressures. One such pressure is the recoverability of a filler from the information present at the gap site (see also Fodor 1978). To this end, they note that processing of ‘D-linked’ fillers (Pesetsky 1987, 2000) is facilitated relative to bare wh-fillers-(11a) is more difficult to process than (11b) at the gap site (Hofmeister and Sag 2010):

(11) a. I saw who Emma doubted the report that we had captured in the nationwide FBI manhunt.

b. I saw which convict Emma doubted the report that we had captured in the nationwide FBI manhunt.

Accounts that are stated in terms of how easily the filler material can be recovered do not predict the interactions presented here. Though we used bare wh-phrases throughout, the information provided by the gap site to guide access to the filler was constant across syntactic conditions. Furthermore, because number of discourse-new referents and their representational complexity at a structural level was controlled in our experiments, an account that appeals to notions ‘distraction’ (Deane 1991) or similarity-based interference (e.g. Lewis, Vasishth and Van Dyke 2006) to explain the failure to recover the filler in island environments would not cover the results presented here. In fact, these accounts might predict that the extraction conditions in Experiment 2 should show a reversed pattern of difficulty, because NIC complements introduce a new discourse referent / NP (someone) that is absent from the NCC case. Likewise, notions of familiarity (Bybee 2007) or frequency of structure (Hofmeister 2007b) predict opposite patterns of acceptability in the current experiment. Recall that across all the verbs used in our study, NCC rather than NIC complements were much more frequent (see Appendix). Although there is little doubt that the retrievability of fillers (based on information content, as well as interference from competing elements in memory) and the frequency of structure both modulate the acceptability of filler-gap dependencies, the present results suggest that the structural identity alone is indeed enough to generate island effects.

More generally, accounts that implicate a conspiracy of non-structural factors in causing unacceptability in island environments will have difficulty accounting for the present results: frequency of structural complement, number of discourse referents between filler and gap, and information structure considerations were all either equated across the two, or predict eased processing in the island-inducing NCC environments. However, as noted above, many processing theories of island phenomena include structural complexity as a determining factor driving the degraded status of extractions
from island environments (Kluender and Kutas 1993b; Kluender 2004). It is unclear what exactly makes a structure complex, however. For example, Kluender and Kutas (1993b) point to the additional difficulty engendered by beginning processing on a new clause, as well as difference in the lexical semantics of different complementizers (e.g. whether vs if vs that). Neither of these metrics of structural complexity appear to make the correct predictions for the current data: the relatively acceptable extractions from NICs are in clausal environments whereas the NCCs are not, and it is unclear what lexical differences would drive the unacceptability of the NCC extractions. Apart from differences in syntactic category (i.e. attempt is a verb in NICs and a noun in NCCs), the only lexical differences between the two conditions are the presence of an adverb in NICs rather than an adjective as in NCCs, and the presence of the possessor ‘s in the NCCs.

Instead, something like the Complex Noun Phrase Constraint (CNPC; Ross 1967, Chomsky 1973) appears to be active for the examples under consideration. As mentioned at the outset, it is certainly not the case that all variance in acceptability judgments for filler-gap dependencies will be reduced to structural relations. There is substantial evidence that ‘extragrammatical’ factors significantly modulate the perceived acceptability of wh-dependencies for island and non-island environments alike. The present data suggest, however, that there is an irreducible role for grammatical category in the statement of island constraints. This fact holds regardless of one pursues a purely grammatical account of island phenomena, or if one maintains that island phenomena are reducible to effects that arise during processing. It is worth noting, however, that one of the most attractive features of processing-based accounts of island phenomena is their appeal to independently motivated sources of difficulty in processing. While it is entirely possible to state the constraint on extraction in the current cases in terms of processing difficulty (i.e. a processing analogue of the CNPC), it is less clear that theoretical parsimony would cut in favor of the processing explanation over the grammatical explanation. That is, stating the extraction constraint in terms of the opacity of a nominal domain requires similar assumptions and stipulations for both grammatical and processing cases: the locus of unacceptability is in both cases localized to a particular grammatical category, a notion that by hypothesis has no independent status outside of the grammar.

There are exceptions to this statement, however. For example, Berwick and Weinberg’s (1984) explanation for the source of difficulty in islands is couched in terms of the representational capacity of the parser. The difficulty engendered by reconstructing a filler-gap dependency inside of an NP constituent is derived from the need to have a finite representation of the left context, restricting the parser’s ability to make the filler available at the gap site depending on the structural context. Their parser implements a version of the CNPC indirectly by imposing an architectural constraint on the representation of material that has already been processed, rather than by stating it directly as a primitive of the system.

CONCLUSION

As stated at the outset, the present studies did not aim to present evidence in favor of processing or representational theories of islandhood. Rather, the goal was more narrow. We have attempted to identify a uniquely structural contribution to the
unacceptability in island context by examining structures whose meaning was (largely) held constant across distinct structural descriptions. These provided an important test case, because meaning and structure very often covary. The data provide an important boundary condition on candidate explanations for island phenomena: they must be stated with reference to syntactic categories and configurations. This is natural for explanations that appeal to grammatical or syntactic constraints for island phenomena (Ross 1967; Chomsky 1973, 1986; inter alia), but does not rule out theories that reduce island effects (either synchronically or diachronically) to processing difficulties that arise in particular grammatical configurations (e.g. Berwick and Weinberg 1984; Kluender & Kutas 1993b; Hawkins 1999). While we agree that a theory that could reduce all island effects to independently-motivated processing considerations is a desirable goal, the current data are not predicted by an entirely reductionist account that explains islandhood only by appealing to a conspiracy of extragrammatical factors, or an account that entirely eschews syntactic factors. Instead, the current experiments suggest that the notion of syntactic category of the extraction domain is a crucial component of the correct theory of island phenomena.

ACKNOWLEDGMENTS

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BIBLIOGRAPHY


**APPENDIX**

Table 3 lists the estimated subcategorization proportions for NP and clausal complements (VP, IP, and CP) to the verbs used in Experiments 1 and 2. Subcategorization proportions were derived from the British National Corpus, as reported in Sabine Schulte im Walde (1998). Note that gapped arguments were not counted towards the subcategorization counts.

<table>
<thead>
<tr>
<th>Verb</th>
<th>Clausal complement</th>
<th>Nominal complement</th>
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<tr>
<td>hear</td>
<td>.24</td>
<td>.48</td>
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<td>see</td>
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<tr>
<td>sense</td>
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<td>.50</td>
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**Table 3**: Subcategorization proportions for verbs used in Experiments 1 and 2.