To appear in *Lingua* (accepted April 2015)

Title

Resumptive pronouns, structural complexity, and the elusive distinction between grammar and performance: evidence from Cantonese

Authors

Elaine J. Francis[a], Charles Lam[b], Carol Chun Zheng[b], John Hitz[c], and Stephen Matthews[d]

[a] Department of English, Purdue University, Heavilon Hall, 500 Oval Drive, West Lafayette, IN 47907, U.S.A., ejfranci@purdue.edu

[b] Linguistics Program, Purdue University, Beering Hall, 100 North University St., West Lafayette, IN 47907, U.S.A., charleslam@purdue.edu, zheng66@purdue.edu

[c] Department of English, University of Central Oklahoma, 100 North University Drive, Edmond, OK 73034, U.S.A., JHitz@uco.edu

[d] School of Humanities (Linguistics), University of Hong Kong, CRT-909, Run Run Shaw Tower, Pokfulam Road, Hong Kong, matthews@hkucc.hku.hk

Corresponding Author

Elaine J. Francis, Department of English, Purdue University, Heavilon Hall, 500 Oval Drive, West Lafayette, IN 47907, U.S.A., ejfranci@purdue.edu, Tel: +1-765-494-3740

Resumptive pronouns, structural complexity, and the elusive distinction between grammar and performance: evidence from Cantonese

Abstract

The use of resumptive pronouns in relative clauses appears to be governed by structural complexity in grammar and usage. Resumptive pronoun distributions across languages typically follow the Noun Phrase Accessibility Hierarchy (Keenan and Comrie 1977, Noun Phrase Accessibility and Universal Grammar, *Linguistic Inquiry*: 8: 63-99): if the grammar allows resumptive pronouns in one position, it also allows them in more deeply embedded positions. Hawkins (2004, *Efficiency and Complexity in Grammars*, Oxford University Press) predicts a parallel effect in usage: when the grammar permits the option of either resumptive pronoun or gap, resumptive pronouns should be used more often as structural complexity increases. Results of two experiments, an elicited production task and an acceptability judgment task, affirm Hawkins' prediction for Cantonese: resumptive pronouns were used more often and rated as more acceptable as the complexity of the relative clause increased from subject to direct object to coverb object and from non-possessive to possessive. Furthermore, resumptive pronoun use was apparently not governed by any categorical grammatical constraints on filler-gap dependencies. Resumptive pronouns were sometimes omitted in coverb object relatives, contrary to a proposed adjunct island condition. Implications for theories of grammatical competence are considered.

Keywords

acceptability judgment; Cantonese; relative clause; resumptive pronoun; sentence production; structural complexity

1. Introduction

Across typologically diverse languages, resumptive pronouns are a common strategy for dependency formation in relative clauses and other filler-gap constructions. Such pronouns have the morphology of ordinary pronouns, are interpreted as co-referential with the head noun of the relative clause, and occur in the position where a gap would otherwise go. Although commonly characterized as "ungrammatical" in English according to the results of judgment tasks (e.g. Ferreira and Swets 2005), they do occur in spontaneous speech, as in the following examples from Prince (1990: 483):

(1) a. Apparently there are such things as bees in the area which if you're stung by **them**, you die.

b. He looks like one of those guys you got to be careful throwing **them** fastballs.

In contrast to English, for which RPs are at best marginally acceptable, there are many languages for which RPs are fully grammatical in certain structural positions. In Cantonese Chinese, for example, RPs are grammatical in object positions, as in (2).[1]

(2) [Ngo5 ceng2 **keoi5dei6**$_i$ sik6 faan6 ge3] pang4jau5$_i$
1sg invite 3pl eat rice REL friend
"friends that I invite **them** to have dinner" (Matthews and Yip 2011: 330)

[1] The following abbreviations are used in this article: 1sg 'first person singular pronoun', 3sg 'third person singular pronoun', 3pl 'third person plural pronoun', CL 'classifier', FGD 'filler-gap domain', GEN 'genitive marker', NPAH 'Noun Phrase Accessibility Hierarchy', NVN 'noun verb noun ordering', OV 'object verb ordering', RC 'relative clause', REL 'relativizer', RP 'resumptive pronoun', SVO 'subject verb object ordering'.

Thus, we will distinguish grammatically licensed RPs of the type found in Cantonese, and with which the current study is primarily concerned, from so-called “intrusive” RPs (Sells 1984) of the type found in English.

The usage of (grammatically licensed) RPs both within and across languages is commonly linked with the notion of structural complexity. Keenan and Comrie (1977, 1979) observe that the cross-linguistic distributions of resumptive pronouns (henceforth RPs) and gaps in relative clauses (henceforth RCs) typically follow the Noun Phrase Accessibility Hierarchy (Keenan & Comrie 1977: 66), as in (3).

(3) Noun Phrase Accessibility Hierarchy (NPAH)

Subject > Direct Object > Indirect Object > Oblique > Genitive > Object of Comparison

Based on a typologically diverse sample of 26 languages, they identified two implicational relations: (1) if the grammar of a language allows gaps in one position on the hierarchy (e.g. direct object), it will allow them in all other positions that are to its left (e.g. subject); (2) conversely, if the grammar of a language allows RPs in one structural position (e.g. direct object), it will allow them in all other positions that are to its right (e.g. indirect object). They suggest that these hierarchies are related to processing difficulty, with the more explicit nature of an RP making complex dependencies easier to process. However, they also observe that the distribution of these elements is grammatically conventional. That is, languages vary in terms of the cut-off point along the hierarchy at which an RP strategy is adopted. Several languages in their sample allow either gap or RP at the transition point(s) in the hierarchy (e.g. direct object position for Hebrew)—a fact which will become crucial for the aims of the current study.

Building on these insights, Hawkins (1999, 2004: 177-190) proposes that these two implicational relations correspond to the increasing structural complexity of the filler-gap dependency, going from left to right on the Noun Phrase Accessibility Hierarchy (henceforth, NPAH). This complexity is quantified in terms of the size of the filler-gap domain (FGD), defined

as the structural distance (in node count on a syntactic tree) between the head noun and the subcategorizing verb, as well as any additional arguments on which the gap (or RP) depends for its interpretation and processing (2004: 175). The key advantage of using RPs in more complex structures, according to Hawkins, is that the arguments of the subcategorizing verb can be processed locally without reference to the head noun of the RC. Conversely, the advantage for gaps in simpler structures is that greater efficiency can be achieved through less morphological form processing (Hawkins 2004: 190).

Also following on from suggestions in Keenan and Comrie (1977: 90-94), Hawkins proposes that the kind of processing complexity relevant to the formation of grammatical constraints, as observable in cross-linguistic patterns of gap and RP distributions, is correlated with patterns of usage within a single language. This is part of his more general Performance Grammar Correspondence Hypothesis (PGCH), as quoted in (4):

(4) Grammars have conventionalized syntactic structures in proportion to their degree of preference in performance, as evidenced by patterns of selection in corpora and by ease of processing in psycholinguistic experiments (2004: 3).

The crucial data from performance come from languages that allow two (or more) options to express the type of structures that are grammatically restricted in other languages. The specific prediction for RPs is, then, as follows:

(5) When the grammar of a language allows the option of either RP or gap, RPs will be used more frequently in more complex structural environments, to facilitate processing in those environments (based on Hawkins 2004: 183-186).

Hawkins (2004: 184-186) provides a few illustrative examples from Hebrew (Ariel 1999) and Cantonese (Matthews and Yip 2003) which appear to support this hypothesis. While we will see that the prediction in (5) receives some additional empirical support from experimental studies of

RP usage in English, as well as from a corpus study of conversational Hebrew (Ariel 1999), it has not been thoroughly tested.

The primary aim of the current study is to test Hawkins' (2004) Performance Grammar Correspondence Hypothesis, and more specifically the hypothesis formulated in (5) above, using data from acceptability judgments and elicited production of RCs with and without RPs. The language under investigation, Cantonese, offers a range of different RC types, some of which optionally allow RPs and are therefore directly pertinent to the hypothesis in (5). For those cases, which include direct object RCs and possessive RCs, we expect RPs to be produced more frequently and judged as more acceptable as structural complexity increases.

The remaining RC types, for which RPs are grammatically restricted, also allow us to address some interesting questions. With respect to typological theories, we can ask whether Cantonese grammar is consistent with the NPAH and/or the more precise complexity metrics described in Hawkins 2004. Although quite similar, the two approaches differ with respect to the status of subject RCs and direct object RCs in languages like Cantonese and Mandarin—languages which show the typologically rare combination of SVO clause order and head-final NP order. Hawkins (2004) calculates the FGD size of subject RCs and direct object RCs to be the same (and thus equally likely to allow a RP) when the verb is transitive, in languages with these special word order properties. However, the NPAH predicts that subject position is universally more accessible (and thus less likely to allow a RP) than direct object position. The current study tests whether direct object RCs differ from subject RCs, thus bearing on the divergent predictions of the NPAH and Hawkins' FGD metric.

Although the current work is designed primarily to test these predictions of Hawkins (2004), it also addresses two issues of relevance for generative syntax. The first is McCloskey's (1990) Highest Subject Restriction, an anti-locality condition (akin to Condition B of the binding theory) which bans RPs from occurring in the highest (matrix) subject position of a RC or other filler-gap construction. This generalization is said to hold for a high proportion of the languages

that have grammatically licensed RPs (Asudeh 2012). In Cantonese, unlike English, RPs are grammatically licensed (and in fact preferred in certain contexts), and so it is relevant to ask whether the Highest Subject Restriction holds for Cantonese. If so, RPs should not be produced in subject RCs and should be judged as unacceptable in this context. The second is the observation of Ross (1986), McCloskey (1990), and many other generative linguists that RPs typically lack sensitivity to constraints on movement, and thus can occur in island contexts where gaps cannot occur. To the extent that RPs lack this sensitivity (i.e. excluding cases of movement-like RP distributions found in some languages), they are assumed to be base-generated (McCloskey 2006: 104). In the current work, "coverb" object RCs, which are described in Section 2 and which have been claimed by Francis and Matthews (2006) to constitute a type of adjunct island, are included to address this issue. If RPs show immunity to movement constraints, they should be produced and accepted in coverb object RCs, in contrast to gaps, which should not occur in this context.

The remainder of this article is structured as follows. Section 2 describes previous empirical research on RPs in English, Hebrew, Mandarin, and Cantonese. Section 3 describes the two experiments: an acceptability judgment task and an elicited production task. Both experiments showed clear evidence of complexity effects in performance, in support of our hypothesis in (5), and a clear subject-object asymmetry such that RPs were more acceptable and occurred more frequently in direct object RCs as compared with subject RCs. The latter finding was consistent with the NPAH but not with Hawkins' (2004) FGD metric. In addition, both experiments indicated the expected preference for either RP or gap, as given in previous grammatical descriptions of Cantonese RCs. However, the production data revealed that RPs are neither disallowed from subject position nor required in coverb object position, suggesting that these positions may not be subject to strict grammatical constraints. Hence, the traditional distinction between grammar and performance proves to be elusive when considering the

gradient nature of our Cantonese data. Section 4 provides a general discussion and concludes the paper.

2. Previous research

2.1 Structural complexity and resumptive pronouns in English

As noted above, RPs in English are considered to be "intrusive," meaning that they are not fully licensed by the grammar even though they do occur in spontaneous speech. As Polinsky et al (2013: 343) observe, intrusive RPs occur in both simple and complex structural contexts, even including highest subject position—a position which is typically not available for grammatically licensed RPs (cf. Cann et al 2004; Prince 1990). However, English RPs tend to be judged as unacceptable in those same contexts in which they are produced (Polinsky et al 2013: 344). Furthermore, the results of several judgment tasks have shown that intrusive RPs in island-violating clauses were rated as equally bad or worse than the corresponding gapped clauses (Alexopoulou and Keller 2007; Ferreira and Swets 2005; Heestand et al 2011; McDaniel and Cowart 1999; Polinsky et al 2013). Thus, unlike grammatically-licensed RPs in languages such as Hebrew and Irish, intrusive RPs do not show immunity to island effects.

Because of these special characteristics of intrusive RPs, studies of English cannot be used to directly test our hypothesis in (5). However, some studies of English RPs have shown complexity effects similar to those predicted in (5). Both Ferreira and Swets (2005) and McKee and McDaniel (2001) showed that RPs were commonly elicited from adult native speakers of English in RCs for which the subject of an embedded question was relativized (e.g. *This is the donkey that I don't know where **it** lives*). McKee and McDaniel (2001) also show a high proportion of RPs in the elicitation of genitive object RCs (e.g. *Pick up the robber that Dorothy is swinging **his** rope*). In contrast, adult speakers rarely produced RPs in simpler clause types, such as prepositional object RCs (e.g. *Pick up the girl that the giraffe is sitting on **her***). Importantly, McKee and McDaniel (2001) replicated the same complexity effects in a forced-

choice acceptability judgment task (2001: 137). These results seemingly contradict the results of the other acceptability judgment studies mentioned above, possibly be due to the nature of the task (forced-choice versus gradient scale) or the materials used.

Some other studies of intrusive RPs have shown relatively more subtle complexity effects. In an acceptability judgment task, Hofmeister and Norcliffe (2013) found that acceptability of RPs was much closer to that of gaps in embedded object contexts than in simple direct object contexts, although RPs were always less acceptable than gaps. This replicated a similar result from Alexopoulou and Keller (2007). Interestingly, Hofmeister and Norcliffe investigated self-paced reading in addition to acceptability judgments, and found that RCs with RPs were read faster than RCs with gaps in the embedded object condition, in the critical region following the verb. This leads the authors to conclude that although RPs are not grammatically licensed in English, they do apparently aid in the processing of complex dependencies.

Results from child language and second-language acquisition also show complexity effects. In addition to testing English-speaking adults (n = 34), as described above, McKee and McDaniel (2001) tested 82 monolingual English-speaking children aged three to eight. Children accepted RPs at a significantly higher rate than adults in all contexts for which gaps were grammatical. They also accepted RPs in direct object, prepositional object, and embedded subject positions more often than in highest subject position (McKee and McDaniel 2001: 137). In contrast, the adult control group rarely accepted RPs in any of these positions. Similar complexity effects have been found in studies of adult second-language learners of English. For example, Tezel (1998) tested the ability of three groups of L2 learners from different L1 backgrounds (Mandarin, Arabic, and Turkish) to correctly judge and produce English RCs, with the "correct" response being a gapped RC structure. Although she expected to find greater RP use in the two groups whose L1 has grammatically licensed RPs (Mandarin and Arabic), the only significant effects were related to structural complexity. All three groups produced and

196 accepted RPs in direct object more often than in subject RCs and in prepositional object RCs
197 more often than in direct object RCs. We may then speculate that both children learning their
198 first language and adults learning a second language may be more sensitive to RC complexity
199 than adult native speakers (who do show sensitivity for the more complex RC types), due to the
200 working memory demands involved in speaking and understanding a language that is not fully
201 mastered. As also suggested by Moravcsik (2006: 171-172), who discusses similar data, RP
202 use may be one strategy for mitigating these demands.
203
204 *2.2 Structural complexity and resumptive pronouns in Hebrew*
205 We have seen some experimental evidence from English indicating that RPs may aid in the
206 production and comprehension of RCs, especially for more complex clause types and for child
207 and adult learners. However, since English RPs are intrusive rather than grammatically
208 licensed, the implications for our hypothesis in (5) are indirect. We now turn to evidence from
209 Hebrew, a language for which RPs are grammatically licensed and distributed in a similar
210 manner to those in Cantonese.
211 Ariel (1999) investigated the role of accessibility in predicting the presence of RP versus
212 gap in a corpus of conversational Hebrew RCs.[2] Although Ariel's corpus was relatively small
213 (77 RCs total), her results are consistent with our hypothesis (5). RPs were attested but gaps
214 were used much more often in subject, direct object, and prepositional object RCs, indicating
215 that RPs may be grammatically optional in all three positions. In line with the predictions of (5),
216 RPs were used most often in prepositional object RCs (41% of prepositional object RC tokens),
217 and less often in subject and direct object RCs. Although generative studies of Hebrew claim

[2] Unlike Keenan and Comrie (1977), who defined NP accessibility purely in terms of the grammatical role of the relativized element, Ariel assumes a broader notion of psychological accessibility which includes grammatical role along with other factors.

that RPs are banned from highest subject position but optional in direct object position (Borer 1984, Shlonsky 1992), Ariel found no difference between subject and direct object RCs, with each showing RP use in 8% of tokens. Thus, Ariel's corpus data show a clear effect of structural complexity on the frequency of RP use for different types of RCs, in line with Hawkins' (2004) predictions, but fail to show any distinction between subject RCs and object RCs. In Section 3, we will report similar complexity effects for Cantonese.

2.3 Structural complexity and resumptive pronouns in Cantonese and Mandarin

Following studies of Chinese syntax (Gu 2001; Huang, Li, and Li 2009), we believe that Cantonese RPs are grammatically licensed, and as such should show immunity to constraints on wh-movement (Huang, Li, and Li 2009: 221). Thus, we expect that Cantonese RPs should be distributed similarly to those in Hebrew and Mandarin, and should be distinct from the intrusive RPs found in English. Specifically, English RPs are uniformly judged as less acceptable than gaps, and do not show immunity to constraints on movement (Polinsky et al 2013). In contrast, Cantonese RPs are expected to be fully acceptable in certain positions and to show immunity from constraints on movement (i.e. to be judged as acceptable in island-violating contexts). The relevance of the Highest Subject Restriction to Chinese is less clear (Gu 2001 claims that RPs are optional in subject RCs), but such a restriction is in line with most published descriptions of Mandarin (Hawkins and Chan 1997; Hsiao 2003; Hu and Liu 2007) and Cantonese (Matthews and Yip 2011) and will therefore be hypothesized to hold for Cantonese.

To understand the specific predictions of our hypothesis in (5) regarding speakers' preferences in grammatically optional contexts, it is first necessary to determine which structural contexts are restricted by the grammar, and which contexts optionally permit either gap or RP. Our initial hypotheses are based on the available grammatical descriptions of Cantonese (Matthews and Yip 2011) and on the results of acceptability judgment tasks involving gapped

RCs in Cantonese (Francis and Matthews 2006). We will also consider experimental studies of RPs in Mandarin (Hitz 2012; Hu and Liu 2007; Ning 2008; Su 2004; Yuan and Zhao 2005), and will briefly address the mixed results in comprehension studies of subject versus object RCs (with gaps) in Mandarin (Chen et al 2008; Cheng et al 2011; Hsiao and Gibson 2003; Lin and Bever 2006).

The Sinitic languages, including Cantonese and Mandarin, are typologically unusual in having a basic clause ordering of SVO within a prenominal relative clause. Example (6) illustrates a simple direct object RC in Cantonese. The gap occurs within the relative clause in the canonical object position following the verb, while the co-indexed head noun follows the relative clause.

(6) [Ngo5 ceng2 __$_i$ ge3] pang4jau5$_i$
1sg invite (gap) REL friend
"friends that I invite" (Matthews and Yip 2011: 330)

The structure of a simple subject RC, as in (7), is similar, except that the gap occurs in the subject position before the verb.

(7) [__$_i$ ceng2 ngo5 ge3] pang4jau5$_i$
(gap) invite 1sg REL friend
"friends that invite me"

Specifically for languages with this type of mixed head-ordering, Hawkins' (2004) FGD metric deviates slightly from the NPAH. The NPAH states that subjects are universally more accessible to relativization than direct objects. However, Hawkins' FGD metric distinguishes between languages that are consistently head-initial or head-final from languages like Cantonese with a mixed head ordering. Recall that FGD is a measure of the structural distance

between the head noun and the subcategorizing verb (not to be confused with the distance between the head noun and the gap), plus any additional arguments on which the gap depends for its interpretation and processing (2004: 175). In consistently head-final languages such as Japanese and Turkish, the subcategorizing verb occurs in clause-final position, directly preceding the head noun, and therefore the FGD for a subject RC need not contain the direct object NP. Thus, these languages have smaller FGDs for subject RCs as compared with object RCs (regardless of the linear distance between head noun and gap, which is not relevant for FGD calculation). For languages like Cantonese with mixed head ordering, subject RCs and direct object RCs are said to have equal FGDs when the verb is transitive. Unlike for other language types, the direct object NP intervenes between the subcategorizing verb and the head noun, meaning that the FGD for a subject RC, as in (7), needs to contain the direct object NP. Since the FGD for an object RC always contains the subject NP, the FGDs for subject and object RCs are equal in languages with this special word order typology.[3]

According to Matthews and Yip (2011: 330-331), Cantonese appears consistent with the NPAH: RPs are banned from matrix subject position, optional in direct object and possessor positions, and required in prepositional object and object of comparison positions. This apparent difference between subject and direct object RCs is predicted by the NPAH, but not by Hawkins' FGD metric, according to which no difference is expected. In line with Hawkins' prediction in (5) above, Matthews and Yip (2011) observe that the optional use of RPs in direct object contexts appears to be more felicitous when the object is part of a larger structure

[3] Hawkins assumes that a direct object gap always depends on the subject for its interpretation; thus, the subject is always included in the FGD of a direct object RC regardless of word order. He further assumes that a subject gap does not depend on the direct object for its interpretation, and so the direct object is only included within the FGD of a subject RC in cases where the direct object occurs in a position between the head noun and the subcategorizing verb.

containing a complement clause and less felicitous in a simple direct object RC. Thus, the gapped structure in (6) above is preferred over the equivalent RP variant, whereas the RP structure in (8) is preferred over the equivalent gapped variant (2011: 330).

(8) [Ngo5 ceng2 **keoi5dei6**$_i$ sik6 faan6 ge3] pang4jau5$_i$
1sg invite 3pl eat rice REL friend
"friends that I invite **them** to have dinner" (Matthews and Yip 2011: 330)

In addition, Matthews and Yip (2011) state that an RP is required when the object of a "coverb" (a preposition-like element occurring as the first verb in a serial verb construction) is relativized. In (9), the object of the coverb, *tung4* 'with', is realized as a RP.[4]

(9) [Ngo5 tung4 **keoi5dei6**$_i$ king1gai2 ge3] hok6saang1$_i$
1sg with 3pl chat REL student
"the students that I chat with **them**" (Matthews and Yip 2011: 331)

[4] Following Matthews and Yip (2011) and Francis and Matthews (2006), we are using the term "coverb" to refer to the first verb in a serial verb construction, which together with its complement serves a function similar to that of a PP in English. Importantly, all Cantonese coverbs share the morphosyntactic properties of ordinary verbs (such as the possibility for aspectual marking), thus distinguishing them from the more preposition-like coverbs of Mandarin (Li and Thompson 1981) and from the true prepositions of Cantonese (such as dative *bei2* 'to'). Thus, we analyze the coverb phrase (coverb + object) as a VP functioning as an adjunct to the following VP.

Matthews and Yip's (2011) description as summarized above receives additional support from a formal judgment task. Francis and Matthews (2006) found that simple direct object RCs, as in (10), were rated as significantly more acceptable than coverb object RCs, as in (11). In contrast to the examples in (6-9), all of their stimuli as exemplified in (10-11) used an alternative RC structure in which the relative marker *ge3* is omitted and the head noun is instead preceded by a demonstrative determiner and a classifier. This structure was chosen for use with auditory stimuli because it is more common in the spoken language.

(10) Ngo5 wan2 __$_i$ go2 go3 pang4jau5$_i$ m4 hai2dou6
1sg seek (gap) that CL friend not here
"The friend I'm looking for is not here"

(11) Ngo5 wan2 __$_i$ king1gai2 go2 go3 pang4jau5$_i$ m4 hai2dou6
1sg seek (gap) chat that CL friend not here
"The friend I'm looking for to chat with is not here"

The authors proposed that the lower acceptability of sentences like (11) as compared with sentences like (10) was due to a grammatical constraint banning extraction of a coverb's object (a type of adjunct island condition).[5] Francis and Matthews (2006: 784) concur with Matthews and Yip's (2011) observation that such grammatical violations can be "saved" with the insertion

[5] Francis and Matthews (2006: 763-765) further support their analysis of coverb phrases as adjuncts using tests for constituency, which show that the coverb together with its object forms a constituent which can optionally be omitted, and with facts about the binding of reflexive pronouns, which show that the object of a coverb cannot act as the antecedent of a reflexive pronoun within the following VP.

of a resumptive pronoun, as in (9) above. However, the only quantitative data were from gapped clauses. The current study will test coverb RCs with and without RPs, comparing them against simple subject RCs and direct object RCs with and without RPs.

Although previous studies of Cantonese provide no quantitative data on RP use, a few experimental studies of RPs in Mandarin Chinese do (Hitz 2012; Hu and Liu 2007; Ning 2008; Su 2004; Yuan and Zhao 2005). In four of the five experimental studies on Mandarin RP use, subject and object RCs behaved similarly. In acceptability judgment tasks, gaps were rated as more acceptable than RPs to the same degree in subject and object RCs (Hitz 2012; Ning 2008; Yuan and Zhao 2005), and in an elicited production task (Su 2004), gapped clauses were produced in 100% of subject and object RCs (i.e. RPs were never produced). Ning (2008) also reports that for self-paced reading, both subject RCs and object RCs were read faster at the head noun when the relativized position contained a gap as compared with an RP, and there was no difference between subject RCs and object RCs. This is in contrast to many syntactic descriptions of Mandarin RCs (e.g. Hawkins and Chan 1997; Hu and Liu 2007) claiming that RPs are banned from subject RCs but optional in direct object RCs. One study on Mandarin RPs did show this type of subject-object asymmetry, however. In a forced-choice acceptability judgment task, Hu and Liu (2007) found that 14 out of 15 participants judged RP-containing object RCs as acceptable, while none judged RP-containing subject RCs as acceptable. Thus, while the preponderance of available evidence suggests that gaps are preferred over RPs to an equal degree in subject RCs and object RCs, Hu and Liu's (2007) results suggest that there may be variation depending on the task, items, and/or population of speakers tested.

The apparent lack of any subject-object asymmetry in studies of Chinese RPs is reminiscent of the mixed results from previous studies of the online processing of gap-containing RCs in Mandarin. In accordance with the NPAH, studies of head-initial languages like English (Gibson 1998; King and Just 1991; Traxler et al 2002), German (Schriefers et al 1995), and French (Holmes and O'Regan 1981) as well as head-final languages like Japanese

(Miyamoto and Nakamura 2003; Ueno and Garnsey 2008) and Korean (Kwon et al 2010; Kwon et al 2013) have consistently shown a processing advantage for subject RCs over direct object RCs across a variety of task types (self-paced reading, ERP, eye-tracking). However, studies of Mandarin RC processing have shown inconsistent results (for object advantage: Chen et al 2008; Hsiao and Gibson 2003; for subject advantage: Cheng et al 2011; Lin and Bever 2006). According to the summary of these studies in Vasishth et al (2013: 2) (all of which used visual written stimuli) four of twelve previous studies found a processing advantage for object RCs while eight found an advantage for subject RCs. Since Hawkins' (2004) FGD metric predicts equal difficulty for subject RCs and object RCs, other explanations for such asymmetries must be given.

To understand these mixed results, we need to acknowledge that multiple factors simultaneously influence the processing of Mandarin RCs (Hsiao and MacDonald 2013; Vasishth et al 2013). Explanations based on storage and integration costs, as correlated with filler-gap distance, generally predict an object RC advantage, since the linear distance between gap and head noun is greater for subject RCs (e.g. Hsiao and Gibson 2003). In addition, the NVN order of object RCs, which resembles that of a simple transitive clause, may confer a processing advantage by facilitating thematic role assignment and semantic interpretation of the RC (Kwon et al 2013: 575).[6] In contrast, the NPAH, according to which subjects are universally more accessible to relativization than direct objects, predicts an advantage for subject RCs. Similarly, probabilistic constraints that affect how expected a certain type of RC is within a particular context also generally predict an advantage for subject RCs, since subject RCs are more frequent in production, as shown in corpora of Mandarin (Vasishth et al 2013). However probabilistic constraints can still predict an object RC advantage in some contexts. As Hsiao

[6] However, Lin (2008: 824) shows that the NVN order of object RCs may also be a disadvantage in that they are more susceptible to misanalyses (garden path effect) than subject RCs.

and MacDonald (2013) show by means of a Simple Recurrent Network (SRN) model of RC processing in Chinese, which extrapolated patterns based on actual corpus frequencies, the predictability of an RC apparently depends on several factors, including the animacy of the two nouns, the position of the RC within the sentence, and the relative frequencies of the various clause types with a similar word order which are in competition with each other during parsing, causing temporary ambiguities (Hsiao and MacDonald 2013).

Following Vasishth et al (2013), we believe that these studies of Mandarin RC processing, although apparently showing contradictory results, actually show the influence of several factors that simultaneously influence RC processing, with different experimental tasks and stimulus items revealing a stronger relative influence of certain factors over others. As described above, such factors include linear filler-gap distance, hierarchical phrase structure (i.e. position on the NPAH), frequency of use, and temporary ambiguities arising during online processing. We believe that some but not all of these factors may affect the current data. Because our acceptability and production tasks are offline tasks, the stimuli from the current study should not be susceptible to temporary ambiguities (garden path effects). However, we might find differences between different RC types based on linear filler-gap distance, hierarchical structure, and/or frequency of use. While our hypotheses are framed in terms of hierarchical structure, these other factors (linear distance and frequency of use) will also be considered.

In summary, Matthews and Yip (2011) and Francis and Matthews (2006) have provided several descriptive and quantitative findings relevant to the current study. Following these previous studies, and consistent with syntactic analyses of Chinese RPs (Gu 2001; Huang, Li, and Li 2009), we will assume the following as our initial hypotheses regarding the grammatical constraints governing RP distribution in Cantonese RCs: (1) gaps are grammatical and RPs are ungrammatical in subject position, in accordance with the Highest Subject Restriction (McCloskey 1990); (2) RPs are optional in direct object position; (3) RPs are optional in

possessor position; (4) RPs are grammatical and gaps are ungrammatical in coverb object position, in accordance with the adjunct island condition (Francis and Matthews 2006). All of these observations with the exception of the hypothesized difference between subject and object RCs are consistent with Hawkins' (2004) FGD complexity metric. This subject-object asymmetry, if confirmed with empirical data, is consistent with the NPAH, and also with explanations that invoke the greater frequency or predictability of subject RCs. Previous studies of Mandarin are informative in the following respects. First, studies of Mandarin RP use show that there was a discrepancy between linguistic descriptions (which predicted a subject-object asymmetry) and actual experimental results (most of which found none). Secondly, studies of Mandarin RC processing show evidence of several competing factors that may affect the processing of subject RCs and direct object RCs, including not only hierarchical structure but also linear filler-gap distance and frequency of use.

3. Cantonese experiments

Two experiments, an acceptability judgment task and an elicited production task, investigated the following research questions:

(1) What is the effect of structural complexity on RP use in Cantonese?
   - Are RPs used and accepted more often in contexts with greater structural complexity, and vice versa for gaps (Hawkins 2004)?

(2) What are the grammatical constraints on RP use in a simple Cantonese RC?
   - Are RPs ungrammatical in subject RCs (Matthews and Yip 2011)?
   - Are RPs required in coverb object RCs to avoid an island constraint violation (Francis and Matthews 2006)?
   - Are RPs grammatically optional in direct object RCs and possessive RCs?

(3) Are RPs used and accepted more often in direct object RCs as compared with subject RCs? (Matthews and Yip 2011)

Hypotheses specific to each task are given below.

3.1 Experiment 1: Acceptability judgment task

By asking participants to listen to sentences and rate their acceptability on a seven-point scale, this experiment tested how the structural position of the relativized element affects judgments of well-formedness in RCs with and without RPs.

Design and materials

Following Francis and Matthews (2006), we used the demonstrative + classifier RC structure (without relative marker *ge3*) for all of the RC items—this being the more frequently used RC structure in spoken Cantonese.[7] The verbs within the RC were always transitive, and the structural position of the relativized element (RP or gap) was manipulated with respect to two factors related to structural complexity. The first factor is the grammatical role of the relativized element (or of the NP containing it, in the case of possessives) within the RC, or Grammatical Role for short. As shown for non-possessive examples in (12), three levels of Grammatical Role were included in the design: subject, direct object and coverb object.

[7] The RC structure with demonstrative + classifier is subject to different interpretive constraints than the structure with *ge*3. Namely, the demonstrative + classifier structure requires a definite interpretation of the NP, while the *ge3* structure does not (Matthews and Yip 2001). The stimuli for the judgment task were constructed so that a definite interpretation was normal and natural, and so we believe that this interpretive restriction would not have affected the responses. The stimuli for the production task did not contain any RC, and so the participants were free to respond with either type of RC structure.

(12) a. Subject:

keoi5 bong1 ngo5 go2 go3 neoi5jan4 hou2 hou2jan4

3sg help 1sg that CL woman very kind

"The woman who **she** helped me is very nice."

b. Direct object (*bong1* functions as transitive main verb):

ngo5 bong1 **keoi5** go2 go3 neoi5jan4 hou2 hou2jan4

1sg help 3sg that CL woman very kind

"'The woman who I helped **her** is very kind."

c. Coverb object (*bong1* functions as coverb):

ngo5 bong1 **keoi5** maai5 ce1 go2 go3 neoi5jan4 hou2 hou2jan4

1sg help 3sg buy car that CL woman very kind

"The woman who I bought a car for **her** is very kind."

We assume that the coverb object is the most deeply embedded among the three positions, because it is an object-NP within an adjunct to the main VP (Francis and Matthews 2006). Thus, the NPAH predicts the following order of increasing complexity: subject, direct object, coverb object. As explained in Section 2 above, Hawkins' (2004) FGD metric deviates from the NPAH in predicting no difference between subject and direct object RCs.

The second factor is the role of the relativized element within the relativized NP, or Possession for short. Both sentences in (13) are in the subject condition (13a repeats 12a above) and contain RPs. The only difference is that (13b) has a possessive subject *keoi5 aa3go1* 'her brother' in which the relativized element (here an RP) functions as a possessor embedded within the NP, whereas in (13a) the relativized element (*keoi5* 'she') functions as the subject by itself. Both the NPAH and Hawkins' FGD metric predict that possessive RCs should be more complex and less accessible than non-possessive RCs.

(13) a. Non-possessive subject:

keoi5 bong1 ngo5 go2 go3 neoi5jan4 hou2 hou2jan4

3sg help 1sg that CL woman very kind

"The woman who she helped me is very kind."

b. Possessive subject:

keoi5 aa3go1 bong1 ngo5 go2 go3 neoi5jan4 hou2 hou2jan4

3sg brother help 1sg that CL woman very kind

"The woman who her brother helped me is very kind."

The third factor is Resumption: the choice between RP and gap. Examples (12) and (13) are all in the RP condition (with RP in boldface). Example (14) shows a direct object RC in RP and gap conditions.

(14) a. Direct object RP:

ngo5 bong1 **keoi5** go2 go3 neoi5jan4 hou2 hou2jan4

1sg help 3sg that CL woman very kind

"The woman who I helped her is very kind."

b. Direct object gap:

ngo5 bong1 __ go2 go3 neoi5jan4 hou2 hou2jan4

1sg help (gap) that CL woman very kind

"The woman who I helped is very kind."

To summarize, the design includes three factors: Grammatical Role (3 levels: subject, direct object and coverb object), Possession (2 levels: non-possessive and possessive) and Resumption (2 levels: gap and RP), for a total of 12 conditions. Each condition crosses with five different sets of lexical items, for a total of 60 experimental items. The five lexicalizations

are based on the following five verbs, which occur as either main verb or coverb depending on the condition: *tung4* 'with', *doi6* 'replace', *gan1* 'follow', *wan2* 'seek', and *bong1* 'help'. Although participants rated all 60 experimental items, the 12 items containing the verb *tung4* 'with' were excluded from the current analysis because of some special restrictions on this verb which did not apply to the other four verbs.[8] As in most previous studies of Chinese RC processing, all NPs in the experimental stimuli were animate and human, and all verbs within the RC were transitive. This animacy configuration was in fact necessary for the RP manipulation, since RPs in Cantonese RCs are exclusively animate. The full set of experimental items is shown in the Appendix.

60 filler sentences were also included, for a total of 120 sentences. The filler sentences, which did not contain any RCs, were distributed into three categories, according to their pre-determined acceptability (Bad, Medium, and Good). The Medium fillers contained minor anomalies (for example, a quantified noun preceded by the incorrect numeral classifier), while the Bad fillers had more severe grammatical errors (for example, a quantified noun with classifier omitted).

Participants

Twenty-two participants, 11 male and 11 female, were recruited over social networking sites and posters on campus at Purdue University. All participants were self-reported native

[8] We agree with an anonymous reviewer that the item *tung4* 'with' is problematic in the simple subject and object conditions, and the results in fact showed that sentences containing this item in these two conditions were judged as lower in acceptability. For this reason, stimuli containing *tung4* have been omitted from the analysis. However, we have run the statistical analyses for both the judgment task and the production task with and without the stimuli containing this item, and the overall pattern of results was unaffected.

speakers of Cantonese, ranging in age from 19 to 29 years old, and all of them were fluent in at least one other language including English. None reported any diagnosis of speech, language, or hearing problems. Participants gave informed consent and were paid $10 for completing the experiment.

Procedure

Stimuli were given via computer interface using E-Prime software. Participants were asked to rate the sentence stimuli on a seven-point scale, with "1" being completely unacceptable and "7" being fully acceptable. They first listened twice through headphones to the sound recording of each sentence. (Sentences were played twice because in pilot testing, participants complained that they could not adequately judge the longer sentences after hearing them only once.) After the recording was played, the rating options (1 to 7) showed up on the screen and participants could click to indicate their choice. Responses were automatically recorded by the software.

Each participant heard all 120 sentences. The 120 sentences were divided into 6 blocks, each with 20 sentences. Sentences were assigned to blocks according to a Latin Square design, to ensure that the items within each block came from different sets of lexical items and different sentence types. The ordering of items within each block as well as the ordering of the blocks themselves was uniquely randomized for each participant. Blocks were separated by optional breaks, and the experiment sessions took 45 - 60 minutes.

Hypotheses

As Hofmeister et al (2013) and others have noted, acceptability judgments are influenced by grammatical rules as well as processing factors. We assume, therefore, that performance-based complexity effects and grammatical constraints will simultaneously influence participants' judgments of the stimulus sentences. We have divided our hypotheses into complexity effects (hypothesis 1), which focus on the acceptability of RP conditions relative to other RP conditions

of differing levels of complexity, and grammatical constraints (hypothesis 2), which focus on the acceptability of RP conditions relative to gap conditions within a particular RC type. We recognize that the grammatical constraints governing RCs themselves encode structural complexity and cannot necessarily be distinguished from performance-based complexity effects, but nevertheless find this a useful way to divide the hypotheses.

(1) What is the effect of structural complexity on acceptability ratings? Are RPs rated higher in acceptability in contexts with greater structural complexity, and vice versa for gaps (Hawkins 2004)?
    a. RPs are more acceptable in possessive RCs as compared with non-possessive RCs, and vice versa for gaps (Hawkins 2004).
    b. RPs are increasingly acceptable according to their grammatical role: subject < direct object < coverb object. Gaps follow the reverse pattern: subject > direct object > coverb object (Hawkins 2004).[9]

(2) What are the grammatical constraints on RP use in simple Cantonese RCs?
    a. RPs are ungrammatical and therefore less acceptable than gaps in subject RCs (Matthews and Yip 2011).[10]

[9] Recall that the hypothesized difference between subject and object RCs is not consistent with Hawkins' (2004) FGD complexity metric, although it is consistent with the NPAH and with previous grammatical descriptions of Cantonese (Matthews and Yip 2011).

[10] An anonymous reviewer points out that Cantonese allows a null *pro* in subject and object positions of independent clauses, which could be temporarily confusable with a true gap in an online comprehension task (i.e. when reading or listening to the first part of the RC, which could be initially parsed as an independent clause). We believe that this fact should have little or no

b. Due to an island constraint that applies to gapped clauses, gaps are ungrammatical and therefore less acceptable than RPs in coverb object RCs (Matthews and Yip 2011, Francis and Matthews 2006) and in possessive coverb object RCs.

c. Both RPs and gaps are acceptable (although perhaps only marginally so) in direct object RCs, possessive subject RCs, and possessive direct object RCs.

(3) Does RP use differ in subject versus object RCs?

a. RPs are more acceptable in direct object RCs as compared with subject RCs (Matthews and Yip 2011).

Results

Filler items: the ratings from actual participants confirm the validity of the pre-determined filler categories, as shown in Figure 1 (error bars throughout represent Standard Error of the mean). These ratings can serve as a baseline for interpreting the ratings of the experimental sentences.

Experimental Items: due to the large number of conditions and factors, we analyzed the possessive and non-possessive conditions separately, to examine the effects of Grammatical Role and Resumption within each level of Possession. As shown in Figure 2 and Figure 3, the

---

effect on our offline judgment task, since participants were required to listen to the full sentence twice before responding. In addition, the fact that sentences were presented out of context means that there would be no discourse antecedent available to license *pro,* also making such an interpretation improbable (cf. Ng 2011). Finally, there should be no competition between *pro* and gap in the production task, since participants deliberately produced RCs rather than independent clauses.

interaction between Grammatical Role and Resumption differed for possessive versus non-possessive conditions. In the non-possessive conditions (Figure 2), a clear reversal of preferences was shown, with the preference for gap over RP which was found in the subject and direct object conditions reversing in the coverb object condition. In possessive conditions (Figure 3), a preference for RP over gap was found across all three grammatical roles, and the interaction was more subtle.

Figure 1: Acceptability ratings of filler items

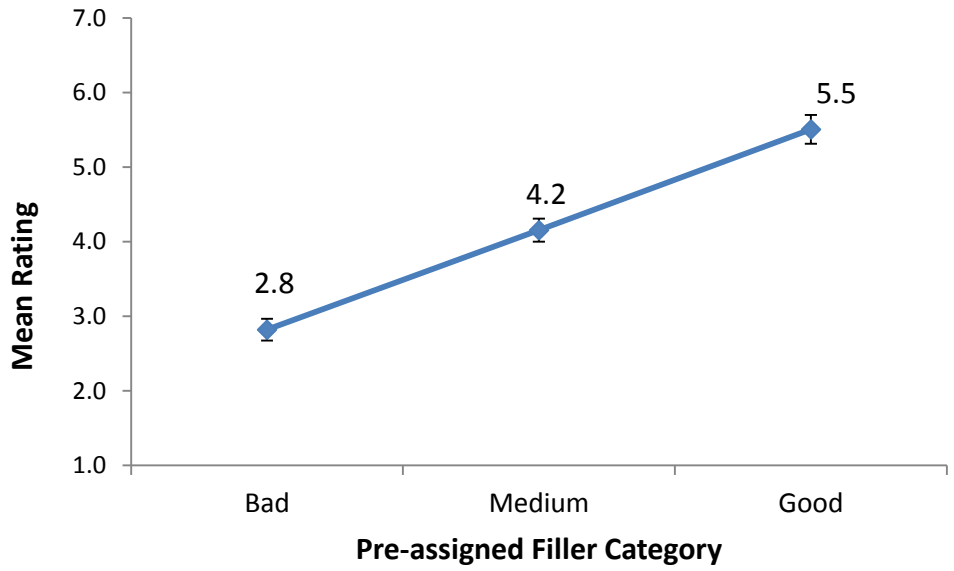


Figure 2: Acceptability ratings for non-possessive relative clauses

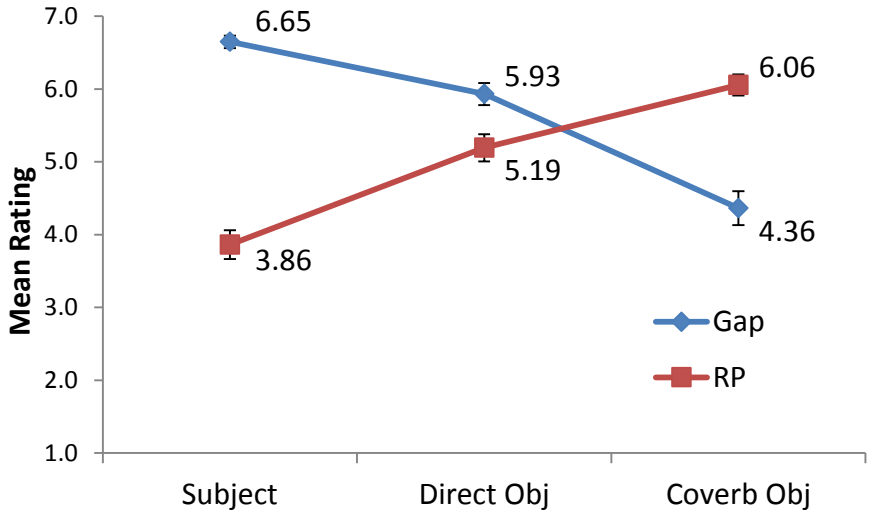
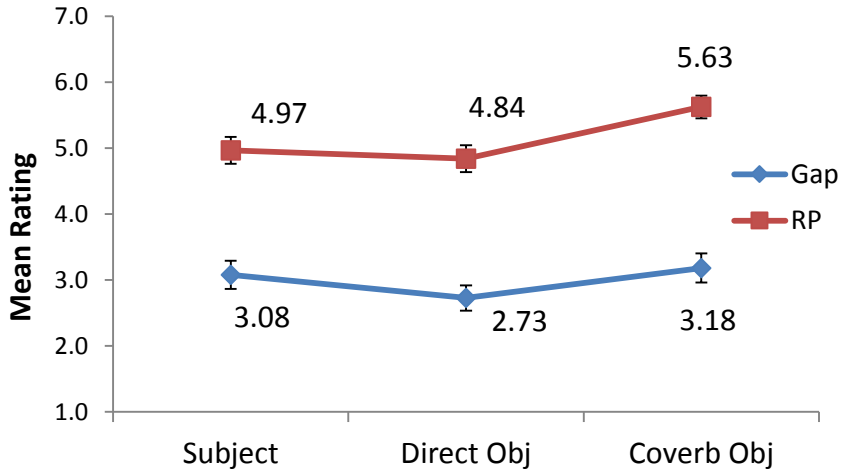


Figure 3: Acceptability ratings for possessive relative clauses



A linear mixed model analysis of the six non-possessive conditions (Figure 2) included three independent variables: Grammatical Role, Resumption, and Verb. The factor Verb represents the particular set of lexical items containing a certain verb/coverb (e.g. one set contained *bong1* 'help' in all 12 conditions). This factor was included to test for any effects of lexical differences. Participant was included as a random variable. There was a significant

main effect of Resumption ($F(1, 498) = 23.55$, $p < 0.01$). On average, gaps were rated higher than RPs (5.65 as compared with 5.04). However, the advantage for gaps was only found in the subject and direct object conditions, while the opposite effect (an advantage for RPs) was shown in the coverb object condition. This reversal as shown in Figure 2 resulted in a significant interaction between Resumption and Grammatical Role ($F(2, 498) = 106.4$, $p < 0.01$). Due to the strong interaction, the main effect of Grammatical Role was much smaller, but still significant ($F(2, 498) = 3.10$, $p = 0.05$). Pairwise comparisons showed that within the RP conditions, subject differed from direct object ($t = 6.79$, $p < 0.01$) and direct object differed from coverb object ($t = 4.26$, $p < 0.01$). Similarly, within the gap conditions, subject differed from direct object ($t = 4.22$, $p < 0.01$) and direct object differed from coverb object ($t = 6.16$, $p < 0.01$). With respect to the relative acceptability of gaps and RPs, pairwise comparisons confirm that gaps were rated higher than RPs in subject RCs ($t = 13.56$, $p < 0.01$), while RPs were rated higher than gaps in coverb object RCs ($t = 6.77$, $p < 0.01$). There was a small but significant effect of Verb ($F(3, 498) = 3.39$, $p = 0.02$), apparently due to the higher acceptability of RPs in the object condition with the verbs *bong1* 'help' and *doi6* 'replace'.

A linear mixed model analysis of the six possessive conditions (Figure 3) also included three independent variables: Grammatical Role, Resumption, and Verb. Participant was again included as a random variable. There was a highly significant main effect of Resumption ($F(1, 498) = 237.25$, $p < 0.01$), such that RPs were consistently rated higher than gaps (5.14 as compared with 3.0). There was a significant main effect of Grammatical Role as well ($F(2, 498) = 6.69$, $p < 0.01$), due to the higher ratings for coverb object RCs. Unlike in the non-possessive conditions, there was no significant interaction between Grammatical Role and Resumption ($F(2, 498) = 1.34$, $p = 0.26$). However, a pairwise comparison showed that coverb object RCs were rated higher than direct object RCs ($t = 4.14$, $p < 0.01$). Again, there was a main effect of Verb ($F(3, 498) = 8.62$, $p < 0.01$), this time due to the higher acceptability of *doi6* 'replace' in the gapped conditions.

In addition to examining possessive and non-possessive conditions separately, we also examined RP and gap conditions separately, to better see the effects of Possession and Grammatical Role within each level of Resumption (Figures 4-5). Because only four pairwise comparisons were essential, we did not run separate mixed model analyses on RP and gap conditions. In the RP conditions (Figure 5), possessive subject RCs received higher ratings than non-possessive subject RCs ($t = 4.88$, $p < 0.01$). However, in the direct object condition, there was no advantage for possessive RCs ($t = 1.93$, $p = 0.06$), while in the coverb object condition, there was a slight advantage for non-possessive RCs ($t = -2.62$, $p = 0.01$). With respect to the gap conditions (Figure 4), non-possessive RCs were rated significantly higher than possessive RCs across all grammatical roles, as confirmed by a pairwise comparison of the two coverb condtions ($t = 5.60$, $p < 0.01$).

Figure 4: Acceptability ratings for relative clauses with gaps

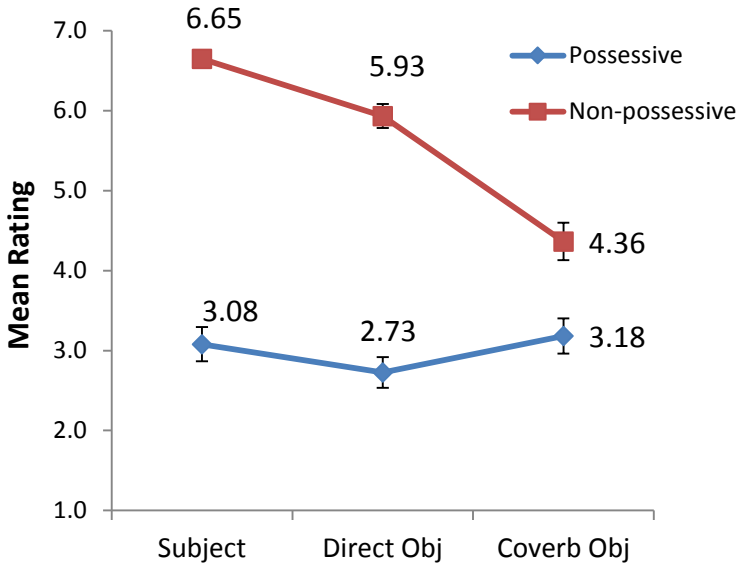
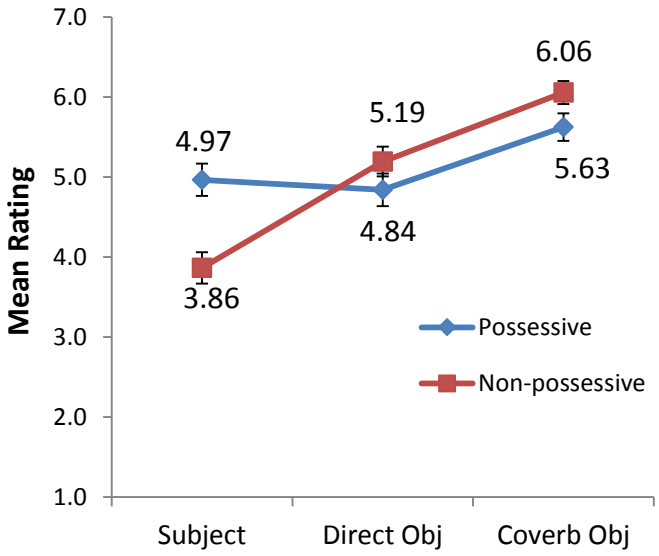


Figure 5: Acceptability ratings for relative clauses with RPs



Discussion

Clear complexity effects are shown in the acceptability judgment data, partially confirming our hypotheses in (1) above. Hypothesis (1a) stated that RPs should be more acceptable in possessive RCs as compared with non-possessive RCs, while gaps should be less acceptable in possessive RCs as compared with non-possessive RCs. The expected patterns are shown across all gap conditions (Figure 4), but for RP conditions, only subject RCs showed this pattern (Figure 5). This could be due to the fact that possessive RCs were rated lower overall than non-possessive RCs, obscuring any complexity effects within the RP conditions. The fact that possessive RCs were consistently rated higher with RPs as opposed to gaps (Figure 4) suggests that there is in fact a complexity effect related to Possession, but due to the overall lower ratings for possessive RCs, the effect is only visible in the advantage of RPs over gaps. Hypothesis (1b) stated that RPs should be increasingly acceptable according to their grammatical role (subject < direct object < coverb object), while gaps should follow the reverse pattern (subject > direct object > coverb object). This type of interaction is clearly shown in the non-possessive conditions (Figure 2). In possessive conditions, such a pattern is found in only

one comparison: the greater acceptability of RPs in coverb object RCs as compared with direct object RCs (Figure 3).

We were also interested in whether the grammatical constraints on RP use, as proposed by Matthews and Yip (2011), would be supported by acceptability judgment data. Our hypotheses in (2) stated that RPs are ungrammatical in subject RCs, required to maintain grammaticality in coverb object RCs, and optional in direct object RCs, possessive subject RCs, and possessive direct object RCs. The relative patterns of acceptability between RP and gap conditions are consistent with the first two hypotheses: there was a clear advantage for gap over RP in subject RCs, and a clear advantage for RP over gap in coverb object RCs (Figure 2). Furthermore, the greater acceptability of direct object RCs with gaps as compared with coverb object RCs with gaps (Figure 2) replicates the adjunct island effect shown in Francis and Matthews's (2006) acceptability judgment task. The hypothesis that RPs should be optional in direct object RCs also receives support, since both RPs and gaps received relatively high ratings in the direct object conditions (Figure 2), at a level comparable to the Good filler sentences (Figure 1). The data are inconclusive as to the hypothesis that RPs should be optional in possessive RCs (Figure 3). It is clear that RPs were more acceptable than gaps in possessive RCs, and that possessive RCs were generally lower in acceptability than non-possessive RCs, with gap conditions receiving ratings comparable to the Bad filler sentences and RP conditions receiving ratings somewhat higher than the Medium fillers. Under one interpretation, extraction from a possessive RC is ungrammatical, and only RPs are grammatical. Under another interpretation, both options are grammatical, and the advantage for RPs is a usage-based complexity effect. Under either scenario, the overall lower ratings for possessive clauses are likely related to the low frequency and/or syntactic complexity of this structure. The results of the production task, reported in the next section, will shed some light on this issue.

Hypothesis (3), which is actually a sub-component of hypothesis (1), asked whether RPs would be more acceptable in direct object RCs as compared with subject RCs, and the answer was clearly affirmative (Figure 3). The current result is consistent with Matthews and Yip's (2011) description of Cantonese, but differs from most of the previous studies of RPs in Mandarin Chinese (Hitz 2012, Ning 2008, Su 2004, Yuan and Zhao 2005), which found no difference between subject and direct object RCs. Thus, our results for Cantonese appear more consistent with the predictions of the NPAH (Keenan and Comrie 1977), whereas the previous studies of Mandarin appear more consistent with Hawkins' (2004) FGD metric.

3.2 Experiment 2: Elicited production

In this experiment, a sentence-combining task was used to elicit spoken production of Cantonese RCs. Responses were coded as "target" (corresponding to the intended RC type) or "non-target", and responses were further examined for the presence or absence of a RP. Much like Experiment 1, this experiment tested how the structural position of the relativized element affected participants' choice of RP or gap in RCs of differing levels of structural complexity.

Design and Materials

In this task, participants were given two sentences, in the form of (15a) and (15b). Their task was to combine them into one sentence. The target response (i.e. the expected response), as shown in (16), contains a relative clause.

(15) a. Relative clause

ngo5 bong1 go2 go3 neoi5jan2

1sg help that CL woman

"I helped that woman."

b. Matrix clause

keoi5 hou2 hou2jan4

3sg very kind

“She is very kind.”

(16) Target response

ngo5 bong1 (keoi5) go2 go3 neoi5jan2 hou2 hou2jan4

1sg help (3sg) that CL woman very kind

“The woman who I helped (her) is very kind.”

When participants combine the two sentences to form an RC in this manner, they naturally choose to produce either an RP or a gap in the relativized position. Example (16) shows the position of the RP *keoi5* in a possible target response. Any response with the intended RC type, with or without the RP, and with or without the optional relative marker *ge3,* was counted as a target response.

The design was essentially similar to that used in Experiment 1, in that the expected target responses were the same as the sentences that were used as stimuli in the judgment experiment (see Appendix). In this experiment, the speaker’s choice of RP or gap was a dependent variable, and thus there was no independent variable of Resumption. The independent variables Grammatical Role (3 levels: subject, direct object and coverb object) and Possession (2 levels: non-possessive and possessive) were the same as in Experiment 1, and the same five sets of lexical items were used. The set of six items containing the verb *tung4* ‘with’ was omitted from the current analysis, for the same reasons given above for Experiment 1 (see note 7).

The 3 x 2 design with 5 sets of lexical items gives us 30 experimental items. Another 30 items were included as fillers. The filler items also involved RCs (as was necessary given the nature of the sentence-combining task), but they did not have any of the same verbs used in the

experimental sentences. The presentation order of the items was divided into blocks and randomized for each individual participant in the same manner as in Experiment 1.

Both target and non-target responses were coded for Resumption (whether an RP or gap was produced). Non-target responses were additionally coded for Simplification-- whether the RC that was produced was simpler in structure than the intended target response. A response was coded as Simplified if one or more of the following conditions was true: (1) a simple subject or direct object RC was used in response to a stimulus from one of the other conditions; (2) one or more of the phrases contained in the stimulus sentences was omitted; or (3) a non-possessive RC was used in response to a stimulus from a possessive condition. Note that the first condition is neutral as to whether subject RC or direct object RC is simpler, leaving open the possibility that these structures are of the same level of complexity (as per Hawkins' FGD metric). A response was counted as Simplified if the participant produced a subject RC in response to a direct object stimulus or vice versa. Any difference between subject and direct object conditions would be shown in terms of a difference in the frequency of switching.

Participants

All of the participants (N=22) in Experiment 1 also participated in Experiment 2; thus the demographic details are the same. However, one male participant's data were excluded from Experiment 2 due his inability to perform the task as intended, as evidenced by an unusually low rate of target responses. Thus, the dataset for Experiment 2 consists of responses from 21 of the 22 participants. Participants gave informed consent and were paid $10 for completing the experiment.

Procedure

To ensure that participants were not aware of the RP manipulation when performing the production task, the production task always came first, followed by the judgment task approximately one week later. As in Experiment 1, stimuli were given via computer interface using E-Prime software. Participants listened to two short sentences and combined them into one longer sentence containing a subject-modifying RC. Figure 7 shows an example of the task. The image on the left is exactly what a participant would see in the experiment. On the right is an annotated image.

Figure 6: Screenshot with production stimuli (English-glossed version on the right)

First, the two stimulus sentences were shown on the screen and the corresponding audio files were played. After the sentence pair was played twice, a mouse-click icon appeared and the participants would decide when they were ready to produce the sentence. Once they clicked to proceed, the computer program would automatically record their speech and send it to a file named by the appropriate item number.

To maximize the number of target responses, the instructions also specified two requirements for combining the sentences. First, the two NPs targeted to become head noun and relativized element were underlined and participants were explicitly told to identify them as the same thing. Second, participants were also told to produce the last three characters (i.e. the predicate) of the second stimulus sentence at the end of their response. These instructions

were designed to strongly encourage participants to embed the first sentence into the second sentence. Each participant produced all 60 sentences, and the session took approximately 30 - 45 minutes to complete.

Hypotheses

As with acceptability judgments, participants' responses in the production task were likely influenced by a combination of grammatical constraints and performance-based complexity effects. One advantage of a production task over a judgment task for teasing apart these different types of effects is that we can assume that participants should normally produce sentences that are allowed by the grammar. Given the way the task was designed, the participant always had the option of including the RP or leaving it out, and therefore unlike in the judgment task in Experiment 1, for which some of the items were ungrammatical, participants were never required to produce an ungrammatical sentence. (This is also in contrast to Ferreira and Swets' (2005) production experiments on English in which they elicited island-violating sentences which were ungrammatical for both RP and gap options.) Again, our hypotheses are divided into complexity effects (1) and grammatical constraints (2).

(1) What is the effect of structural complexity on RP use? Are RPs used more often in contexts with greater structural complexity, and vice versa for gaps (Hawkins 2004)?
    a. RPs are used more frequently (and gaps less frequently) in possessive RCs as compared with non-possessive RCs.
    b. RPs are used more frequently (and gaps less frequently) according to grammatical role: subject < direct object < coverb object.

(2) What are the grammatical constraints on RP use in a simple Cantonese RC?
    a. RPs are ungrammatical and therefore not used in subject RCs (Matthews and Yip 2011). Gaps are used exclusively in subject RCs.

b. Due to an island constraint that applies to gapped clauses only, gaps are ungrammatical in coverb object RCs (Matthews and Yip 2011, Francis and Matthews 2006). Therefore, RPs are used exclusively in these contexts.

c. Both RPs and gaps are possible (although there may be preferences for one or the other) in direct object RCs, possessive subject RCs, and possessive direct object RCs.

(3) Does RP use differ in subject versus object RCs?

a. Due to the different grammatical constraints on their usage, RPs are sometimes used in direct object RCs but never in subject RCs (Matthews and Yip 2011).

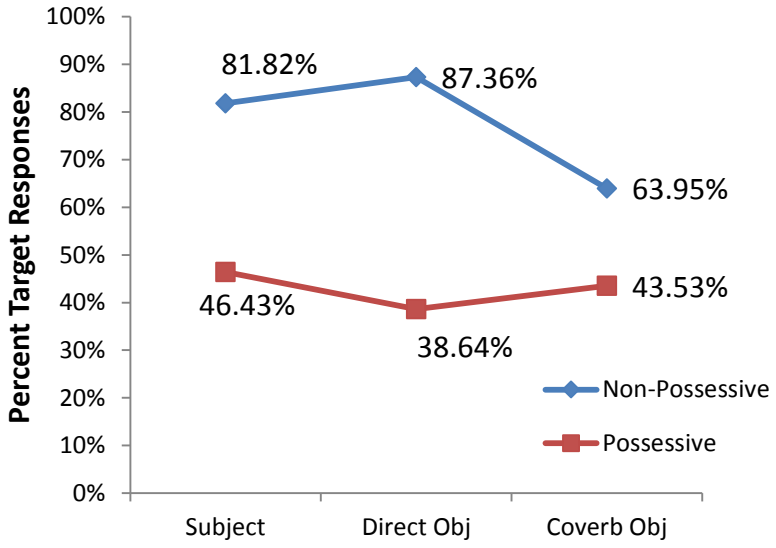
Results

Three analyses are given here. In the first, we considered the entire data set. The dependent variable was a binary choice: whether the response was target or non-target. In the second analysis, we considered only the target responses and treated Resumption—speaker's choice of RP or gap—as the dependent variable. In the third, we considered only the non-target responses, and included two dependent variables: Resumption and Simplification. Like Resumption, Simplification is a binary variable, the value of which is determined by whether the actual response was structurally less complex than the intended target response. The same three independent variables were used throughout all of the analyses: Possession, Grammatical Role, and Verb. Our hypotheses as given above apply only to the primary analysis—the analysis of target responses. We did not have any specific hypotheses regarding the distribution of non-target responses, but included those analyses here to provide clues regarding the difficulty of producing different types of RCs.

Target vs. non-target responses

Although participants almost always produced some kind of RC in the subject-modifying position, only 57% of responses (313 out of 518) qualified as target responses in which the participant produced the exact type of RC targeted by the stimulus sentences. As shown in Figure 7, the rate of target productions varied according to condition, with simple (non-possessive) subject and object conditions receiving a higher rate of target responses than the other four conditions.

Figure 7: Percent target responses by Possession and Grammatical Role



These trends were analyzed statistically using a mixed logit model. Possession, Grammatical Role, and Verb were included as independent variables, and Participant was included as a random factor. The dependent variable was a binary choice: the speaker's production of target or non-target response. Results show a significant main effect of Possession, such that non-possessive conditions received a higher rate of target responses than possessive conditions ($F(1, 470) = 90.43$, $p < 0.01$). A smaller but significant main effect of Grammatical Role was also shown ($F(2, 470) = 3.36$, $p = 0.04$), as manifested in a lower rate of target responses for the

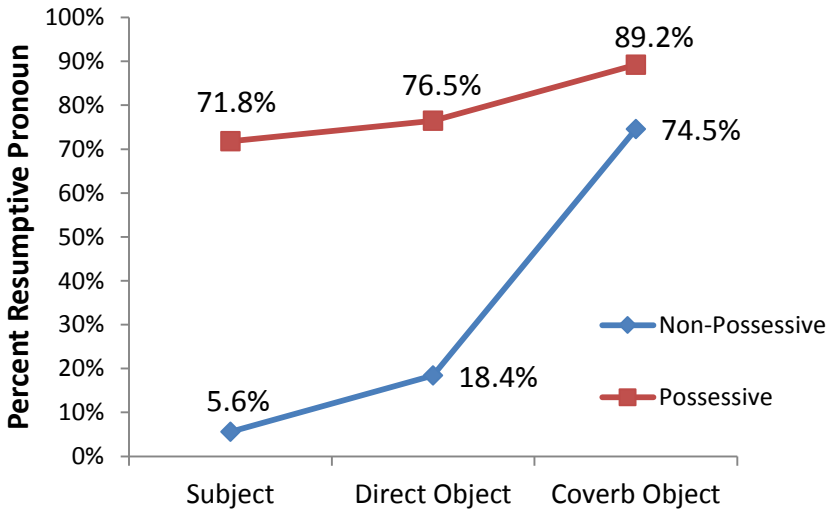
coverb conditions. There was also a significant interaction between Possession and Grammatical Role ($F(2, 470) = 5.08$, $p < 0.01$). This interaction was shown as a greater difference between possessive and non-possessive for subject and direct object roles (left half of figure 7), and a smaller difference between possessive and non-possessive for the coverb object role (right half of Figure 7). There was also a significant effect of Verb ($F(3, 470) = 5.32$, $p < 0.01$), due to the lower rate of target responses for items containing the verb *gan1* 'follow' in the direct object and coverb object conditions.

In the following, we will provide separate analyses for target and non-target responses.

Target responses only

For target responses, the dependent variable was Resumption: speaker's choice of either gap or RP in the relativized position. The results are shown in Figure 8 as the percentage of responses for which the participant used a RP rather than a gap.

Figure 8: Percent RP by Possession and Grammatical Role, target responses only



A mixed logit model was used to analyze the effects of Possession, Grammatical Role, and Verb on participants' choice of either RP or gap. Participant was also included as a random

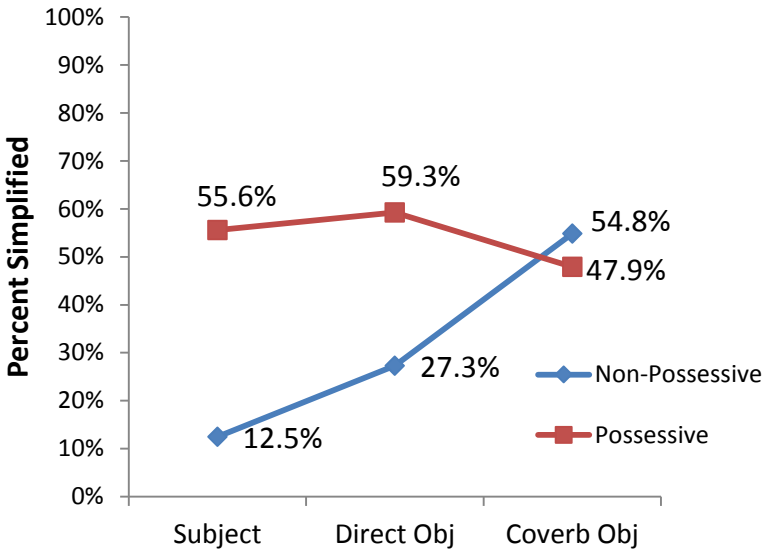
factor. As in the acceptability task, there were significant main effects of Possession and Grammatical Role, both of which show complexity effects in line with our hypotheses. With respect to Possession, possessive conditions had a higher rate of RP production than non-possessive conditions ($F(1, 284) = 54.67$, $p < 0.01$). With respect to Grammatical Role, coverb object conditions produced the highest rate of RP production, followed by direct object and subject conditions ($F(2, 284) = 18.86$, $p < 0.01$). There was also a significant interaction between Possession and Grammatical Role ($F(2, 284) = 5.38$, $p < 0.01$): there was a greater difference between possessive and non-possessive conditions for subject and direct object RCs (left half of Figure 8), and a smaller difference for coverb RCs (right half of Figure 8). In this case, there was no main effect of Verb ($F(3, 284) = 0.93$, $p = 0.56$).

Consistent with our hypotheses and with the results of Experiment 1, gaps were preferred over RPs in subject and direct object RCs, while RPs were preferred over gaps in all other conditions. However, these preferences did not appear to be categorical. Participants in fact produced both RPs and gaps in all six positions. Contrary to our expectation, 5.6% (4 out of 72) of subject RC tokens contained an RP, and 25.5% (14 out of 55) of coverb object RC tokens contained a gap. As expected, however, direct object and possessive RCs showed a pattern consistent with grammatical optionality: both RPs and gaps were produced in these contexts. As expected, there was a greater number of RP tokens in direct object as compared with subject RCs, and this was consistent with the difference in acceptability that was found in Experiment 1.

Non-target responses only

Many non-target responses involved simplification of structure, as defined above in the Design and Materials section. The graph in Figure 9 reflects the data showing the Simplified category as the dependent variable.

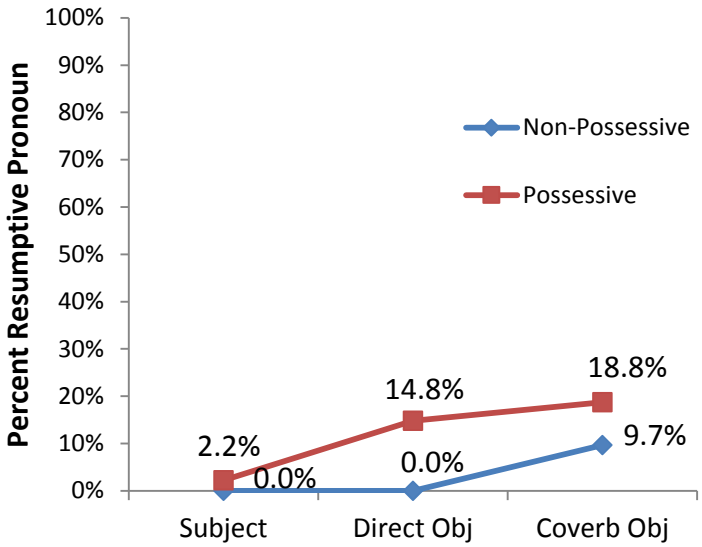
Figure 9: Percent Simplified by Possession and Grammatical Role, non-target responses only



As shown in Figure 9, non-target productions were least likely to be simplified in the non-possessive subject and direct object conditions. The direct object conditions showed a higher rate of simplification than the subject conditions, meaning that participants were more likely to produce a subject RC based on a direct object RC stimulus than they were to produce a direct object RC based on a subject RC stimulus. (Note that participants *never* produced a coverb object RC or a possessive RC in response to a simple subject or direct object stimulus.) Due to the small sample size for non-target responses (n=205), none of the trends shown in Figure 9 was statistically significant.

Non-target responses were also analyzed using Resumption as the dependent variable, as shown in Figure 10. Because there were so few tokens containing a RP, the mixed logit model did not converge for this analysis. However, the trends shown in the graph appear consistent with the trends shown in the target responses (Figure 8), except that many fewer RP tokens were produced overall. This is an interesting result, because it suggests that when speakers produced a non-target structure, they usually manipulated the structure in such a way that an RP was not needed.

Figure 10: Percent RP by Possession and Grammatical Role, non-target responses only



Discussion

Results of the elicited production task in Experiment 2 were mostly consistent with the results of the acceptability judgment task in Experiment 1. However, the expected complexity effects in the target responses were shown even more clearly than in Experiment 1. All three possessive conditions received more RP responses than all three non-possessive conditions, and RP use increased according to grammatical role (subject < direct object < coverb object) in both possessive and non-possessive conditions (Figure 8). These complexity effects were not as apparent in the possessive conditions in Experiment 1 (Figure 3), although they were quite clear in both experiments in the non-possessive conditions (Figure 2, Figure 8). The preferences for RP over gap or vice versa were, for the most part, consistent with previous grammatical analyses of Cantonese RCs (Matthews and Yip 2011, Francis and Matthews 2006), on which our hypotheses in (2) were based. Gaps were strongly preferred over RPs in subject RCs, while RPs were strongly preferred over gaps in coverb object RCs. However, it is interesting that speakers produced both RPs and gaps in all six conditions. Unexpectedly, 5.6% of responses in the subject RC condition contained an RP. This result could plausibly be

dismissed as performance error, thus maintaining the Highest Subject Restriction.[11] However, the 25.5% of gap responses in the non-possessive coverb object RC condition are less likely to be due to random error. Rather, it appears that the proposed adjunct island condition (Francis and Matthews 2006), although consistent with the current acceptability data (Figure 2), might instead be a usage-based complexity effect. This seems especially plausible given that the percentage of gap responses was higher in the non-possessive coverb RC condition as compared with the more complex possessive coverb RC condition (25.5% vs. 10.8%), while gaps were excluded from neither position (Figure 8). It is interesting that similar complexity effects were shown in RP use in the non-target responses, although there were many fewer RP responses overall among non-targets (Figure 10). Taken together with the fact that non-target responses for the more complex RC types were usually simplified in structure (Figure 9), it appears that participants used two main strategies for coping with the production of complex RCs: the first was to produce the expected RC type with an RP (target responses), and the second was to produce simpler RC types containing no RP (non-target responses).

Both RPs and gaps were used in possessive subject RCs and possessive direct object RCs, as expected (hypothesis 2c). Across these two possessive conditions, there was a strong preference for RPs over gaps (74%, 54 out of 73 tokens, were RPs). This was consistent with the corresponding greater acceptability of RPs as compared with gaps found in Experiment 1. This result sheds some light on our puzzling finding in Experiment 1 that possessive RCs with gaps received low acceptability ratings, comparable to those of the Bad filler sentences (which were constructed in such a way to be clearly ungrammatical). Since gaps were produced in 26% (19 out of 73 tokens) of possessive subject and direct object RCs, it seems unlikely that

[11] An RP was used in subject position in 4 of 72 tokens. An item analysis revealed no discernable pattern for what might have caused this, since each token was lexically distinct. The four tokens came from the following four verb sets: *bong1, doi6, wan2,* and *gan1.*

there would be any grammatical constraint against extraction from possessive RCs. The overall lower acceptability of possessive RCs (which was shown in RP conditions as well as gap conditions in Experiment 1) might instead be due to the difficulty associated with possessive RCs. This explanation receives some support from the analysis of non-target responses. The possessive conditions were less likely than non-possessive conditions to yield a target response (Figure 7), while the non-target responses produced in the possessive conditions were often simplified to a non-possessive structure (Figure 9). Importantly, our study does not reveal the precise reason for the difficulty of possessive RCs. This difficulty could be due to their structural complexity, their low frequency of occurrence, or a combination of these factors.

Hypothesis (3) predicted that RPs would be used more often in direct object RCs as compared with subject RCs, and this difference was as expected (Figure 8). In addition, a similar subject-object asymmetry was found in the non-target productions: participants were more likely to produce a subject RC when presented with a direct object stimulus than vice versa (Figure 9), suggesting that perhaps subject RCs were generally easier to produce than direct object RCs. These findings thus corroborate the pattern of acceptability shown in Experiment 1 in which direct object RCs were more acceptable than subject RCs in the RP conditions, and vice versa in gap conditions. Again, the results apparently support the predictions of the NPAH (Keenan and Comrie 1977), while differing from the results of previous studies of RP use in Mandarin and from Hawkins' (2004) FGD-based predictions. It is interesting that this pattern shown by our adult Cantonese-speaking participants is very similar to the pattern shown by five-year-old Mandarin-speaking children. In an elicited production task, Su (2004: 12) found that child speakers of Mandarin in the younger age group (ages 5;0 to 5;6) showed greater RP use in direct object RCs as compared with subject RCs (11% vs. 3%), in contrast to adults, who never used RPs. This subject-object asymmetry could plausibly be treated as a complexity effect which shows up in child language but disappears as the language is fully acquired (although of course RPs persist in more complex structures such as possessive

RCs). One possible interpretation is that the subject-object asymmetry in RP production starts out as a usage-based complexity effect in both languages, before gradually being suppressed by the norms of the adult language in the case of Mandarin.

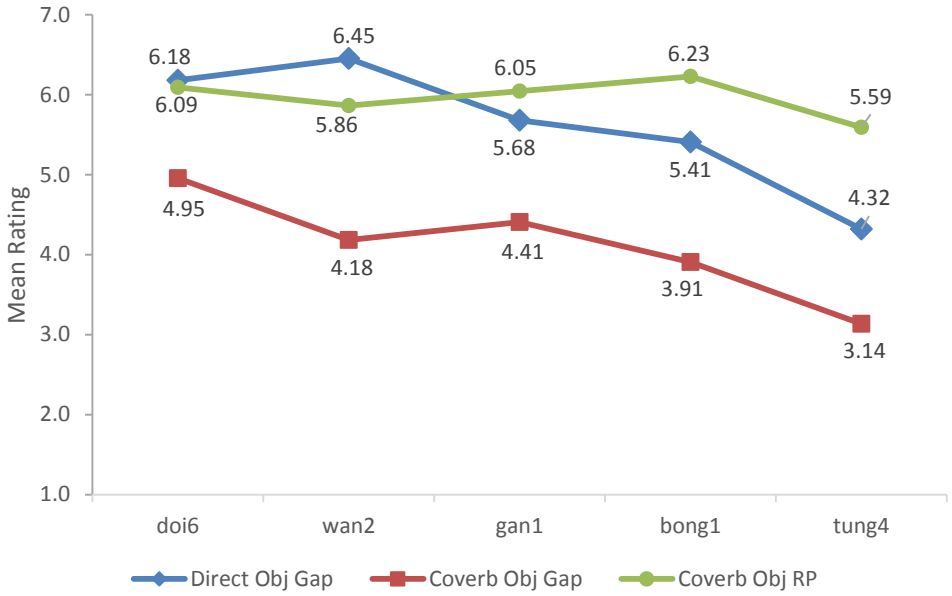
3.3 Analysis of individual verbs in Experiments 1-2

As noted above, Francis and Matthews (2006) investigated the acceptability of gapped RCs in Cantonese and found that coverb object RCs were less acceptable than direct object RCs. They attributed this effect to an adjunct island condition barring the extraction of a coverb's object. One very interesting finding, which complicated their analysis, was that the acceptability of coverb object RCs varied by individual verb. While coverb RCs were never more than marginally acceptable, RCs containing the coverbs *tung4* 'with' and *hai2* 'at' were rated as significantly less acceptable than RCs containing the other four coverbs (*doi6* 'replace', *wan2* 'seek', *gan1* 'follow', *pui4* 'accompany'). The authors speculated that this difference may be due to differences in the frequency of these verbs across different constructions. A small-scale corpus analysis showed that *tung4* 'with' and *hai2* 'at' were predominantly used as coverbs within a serial verb construction, whereas *wan2* 'seek' and *gan1* 'follow' were predominantly used as main verbs (2006: 781). Thus, unlike the other coverbs, *tung4* 'with' and *hai2* 'at' occur in a preposition-like function (as adjuncts to the main verb) more often than they occur as main verbs themselves, possibly leading to differences in the way listeners process relative clauses containing these verbs (2006: 781). Since the data from the current experiments bear on the same issue, we conducted an analysis of individual verb use in non-possessive coverb object RCs.

Figure 11 (below) shows the data for individual verbs in the three crucial conditions from the acceptability judgment task. Comparing the coverb object gap condition with the direct object gap condition, we can see that gaps in the coverb object position were always less acceptable than gaps in the direct object position. Thus, the apparent adjunct island effect that

was shown in the acceptability data from Francis and Matthews (2006) was replicated in the current study not only overall (as shown above in Figure 2) but across all verbs. Now comparing the coverb object gap condition with the coverb object RP condition, it is clear that the RP variant received a higher rating than the gapped variant across all of the verbs (Figure 11). This result also appears to be consistent with an adjunct island condition applying to gapped clauses. However, ratings of individual coverbs differed within the coverb object gap condition. Participants rated coverb clauses lowest when the objects of *tung4* 'with' (mean rating 3.14) and *bong1* 'help' (mean rating 3.91) were extracted, and highest when the object of *doi6* 'replace' was extracted (mean rating 4.95). Pairwise t-tests revealed that within the coverb object gap condition, no two items shown adjacent to each other in Figure 11 significantly differed in acceptability. However, *doi6* 'replace' differed from *tung4* 'with' ($t = 3.31$, $p < 0.01$) and *gan1* 'follow' also differed from *tung4* 'with' ($t = 2.29$, $p = 0.03$). There was a marginally significant difference between *doi6* 'replace' and *bong1* 'help' ($t = 2.01$, $p = 0.06$). Note that the current sample size is quite small ($n = 110$). We expect that more of these differences would become significant with a larger sample size.

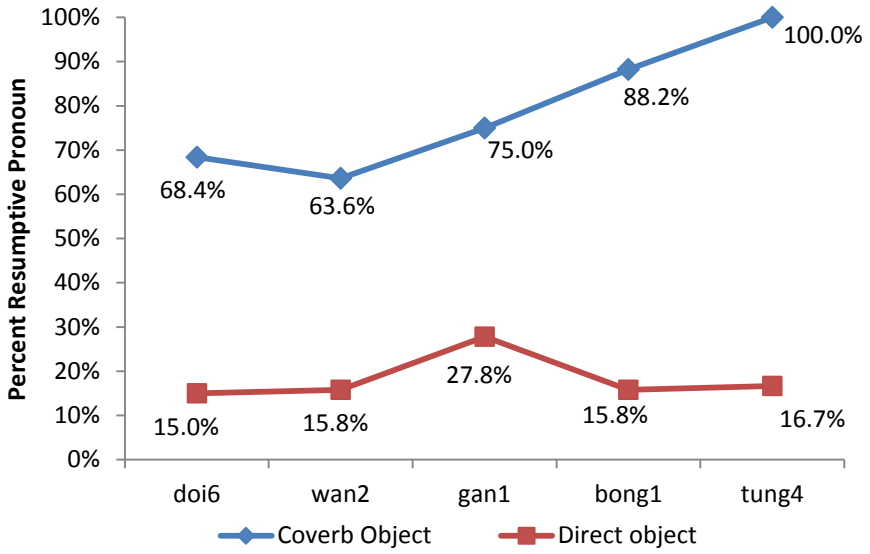
Figure 11: Acceptability of coverb object RCs under extraction, by individual coverb



Similarly, the data from the elicited production task show that RPs were produced more often than gaps in coverb object RCs (Figure 8 above), and that this was true across all verbs (Figure 12). In addition, RPs were produced much more often in coverb object RCs than in direct object RCs across all verbs (Figure 12). As noted in the discussion of Figure 8 above, we expected based on the adjunct island effect shown in acceptability that speakers would not produce coverb object RCs with gaps. However, speakers in fact produced gaps in 25.5% of coverb object RCs (i.e. they produced RPs in only 74.5% of cases). Looking at individual verbs within the coverb object condition, we can see that each verb differed with respect to the percentage of RP responses. Speakers produced the most RPs as the object of the coverb *tung4* 'with' (100%) and *bong1* 'help' (88.2%) and the fewest RPs as the object of the coverb *wan2* 'seek' (63.6%) and *doi6* 'replace' (68.4%). Thus, what appears to be a stronger dispreference for extraction by the coverbs *tung4* 'with' and *bong1* 'help' is consistent across both experiments, just as it was for *tung4* 'with' and *hai2* 'be at' in Francis and Matthews' (2006) study. However, due to the small number of target responses in the coverb object condition (n = 60), leaving less than ten items in most cells, chi square tests revealed no significant

differences between any two coverbs in the production task. The trends shown in Figures 11-12 are interesting and suggestive, but not definitive.

Figure 12: Percent RPs produced in coverb and direct object RCs, by individual coverb



One tempting interpretation of the pattern shown in the coverb object condition in Figure 12 is that *tung4* 'with' is a preposition, showing a categorical preference for RP over gap (i.e. a preposition-stranding constraint), while the remaining items are verbs, showing a non-categorical preference for RP over gap (i.e. a usage-based complexity effect as per Hawkins' prediction). However, our previous study showed that all of these verbs, including *tung4* 'with', display verb-like behavior with respect to aspectual marking and other morphosyntactic features (Francis and Matthews 2006). Thus, we argued that these items are always verbs, and never ambiguous in category status. The differences among them shown in the previous study and in Figures 11-12 are therefore unlikely to be due category status (preposition vs. verb), but possibly reflect lexical semantic and/or frequency-based effects. We would also emphasize that the apparent difference between *tung4* and the other verbs in Figure 12 was based on a small number of tokens and was not statistically significant. The status of these items clearly requires

1057 further investigation, but one thing we can conclude at this point is that the apparent adjunct
1058 island effect from the acceptability task is unlikely to be due to the application of a categorical
1059 grammatical rule, and more likely reflects a usage-based preference for RPs over gaps based
1060 on the structural complexity of the coverb construction.
1061
1062 **4. General discussion**
1063 Two experiments examined the effects of structural complexity on RP use in Cantonese. With
1064 respect to grammar, the trends were in the expected direction based on Matthews and Yip's
1065 (2011) description of Cantonese RCs. In both acceptability and production, gaps were strongly
1066 preferred in subject RCs while RPs were strongly preferred in coverb object RCs. One finding
1067 not specifically predicted by Matthews and Yip (2011), but which showed a similar preference
1068 pattern in both acceptability and production, was that RPs were consistently preferred over gaps
1069 in possessive RCs. Despite the strength and consistency of these preferences, the results of
1070 the production task revealed that both gaps and RPs occurred in the target productions for all
1071 six structural positions. Since the occurrence of RPs was rare in subject position, we believe
1072 these results are consistent with McCloskey's (1990) Highest Subject Restriction, with
1073 exceptional cases occurring due to performance error. However, for the other five structural
1074 conditions, RP use does appear to be a legitimate option. Since participants always had the
1075 option of producing the preferred structure (unlike in the acceptability judgment task, where they
1076 were required to judge sentences in both gap and RP conditions), such results challenge the
1077 general applicability of the proposed adjunct island condition on extraction (Francis and
1078 Matthews 2006). It should be emphasized, however, that Cantonese RPs still patterned as
1079 grammatically-licensed RPs rather than as intrusive RPs, in that they were judged as more
1080 acceptable than gaps in four of the six contexts tested. This contrasts sharply with English, for
1081 which RPs have been judged as unacceptable in contexts where gaps were acceptable, and for
1082 which RPs have been judged to be just as unacceptable as gaps in island contexts (e.g.

Heestand et al 2011). Furthermore, for our Cantonese study, the trends shown in the production task largely replicated the trends shown in the judgment task, whereas studies of English have shown a large discrepancy between acceptability (RPs are generally unacceptable) and production (RPs are consistently produced in some contexts) (Ferreira and Swets 2005). Our results were, however, quite similar to the gradient pattern that Ariel (1999) found in her corpus study of Hebrew, a language for which the status of RPs as grammatically licensed is uncontroversial. Thus, while the current results might challenge some of the proposed grammatical constraints governing RP use, they do not appear to support an analysis of Cantonese RPs (or Hebrew RPs) as intrusive RPs.

While support for the proposed grammatical constraints was only partial, there was clear evidence for usage-based complexity effects, as predicted by our original hypothesis in (5) and repeated here:

(5) When the grammar of a language allows the option of either RP or gap, RPs will be used more frequently in more complex structural environments, to facilitate processing in those environments (based on Hawkins 2004: 183-186).

These complexity effects were shown most clearly in the production task. RPs were used more frequently according to their grammatical role (subject < direct object < coverb object) and according to whether they occurred on their own or as a possessor within a larger NP (non-possessive < possessive). Very similar effects were shown in the acceptability task. Within the non-possessive conditions, RPs were more acceptable according to their grammatical role (subject < direct object < coverb object), and vice versa for gaps. Grammatical role effects did not show up as clearly in the possessive conditions, but, the preference for RPs over gaps in possessive conditions was clear.

Data from both tasks showed clear evidence for a subject-object asymmetry, such that RPs were more acceptable and more likely to be produced in direct object RCs as opposed to subject RCs. These results are consistent with the NPAH (Keenan and Comrie 1977), as well as the near-universal advantage for subject RCs in online processing (Kwon et al 2013). They may also be related to an overall greater frequency of subject RCs (Hsiao and MacDonald 2013).[12] These results are not specifically predicted by Hawkins' (2004) FGD metric, according to which subject RCs and object RCs are of equal FGD size in languages like Cantonese. They also show no effect of linear filler-gap distance—a factor shown in some (but not all) studies of Mandarin RC processing to result in a processing advantage for direct object RCs (e.g. Hsiao and Gibson 2003). In the context of RP use, such a linear distance effect would presumably be manifested in the more frequent occurrence of RPs in subject RCs as compared with direct object RCs, which is the opposite of the current finding. Interestingly, a similar asymmetry to that found in RP use in the target productions was shown in the non-target productions: participants were more likely to produce a subject RC based on a direct object stimulus than they were to produce a direct object RC based on a subject RC stimulus. This finding suggests that subject RCs may be easier to produce than direct object RCs, thus lending some support to the idea that complexity effects as shown in RP distributions are motivated in part by processing difficulty (Hawkins 2004; Keenan and Comrie 1977; McKee and McDaniel 2001). The non-categorical nature of this difference between subject and direct object RCs again suggests that we are seeing a usage-based complexity effect, as opposed to a strict grammatical constraint.

Could it be, then, that in the absence of strict grammatical rules limiting RPs to certain positions, the predictions of our hypothesis in (5) are enough to account for all of the current data? We think not, for the simple reason that the hypothesis in (5) says nothing about

[12] Corpora of Mandarin show that subject RCs are much more frequent than direct object RCs (e.g. Hsiao and MacDonald 2013); however, no corpus data are available for Cantonese.

language-specific patterns of distribution. For example, while the hypothesis in (5) predicts that RPs will be produced more often in possessive RCs than in non-possessive RCs, it does not specify the degree of this difference, nor does it specify when RPs will be preferred over gaps. Similarly, although it is predicted that RPs will show up more often in coverb object RCs than in direct object RCs, the strength of this preference (74.5% vs. 18.4%), and the fact that RPs are preferred over gaps in coverb RCs but not in direct object RCs, are not specifically predicted.

Finally, we observed that the distribution of RPs and gaps in coverb object RCs differs with respect to the individual verb (Figures 11-12), possibly reflecting their different lexical semantic properties and frequency distributions across different constructions. For the verb *tung4* 'with' as used in coverb object RCs, a categorical preference for RPs seems to be in effect: RPs were used in 100% of tokens and gaps are never used. For the other four verbs, the strength of the preference for RP over gap varies, apparently in a conventional manner that is consistent across acceptability and production. However, we must be cautious in attributing any importance to the categorical behavior of *tung4* 'with' in the production task, given the relatively small number of tokens in the sample and the lack of any statistically significant difference between *tung4* 'with' and the other verbs.

Overall, then, our results show clear effects of structural complexity on language use as predicted by Hawkins (2004) and as formulated in (5) above, while also showing language-specific patterns of distribution which have traditionally been described in terms of grammatical constraints. Our analysis of these data is complicated, however, by the fact that all six conditions appear to allow both RPs and gaps in production, despite showing strong preferences for one or the other. We might suggest, then, that the constraints allowing or prohibiting RP use in particular structural contexts are partially but not fully grammaticalized. Hawkins' (2004) Performance-Grammar Correspondence Hypothesis states that performance preferences within a single language (in this case, Cantonese) should resemble cross-linguistic patterns of conventionalized grammatical constraints (in this case, RP and gap distributions

across languages). The idea is that processing complexity directly influences patterns of usage, which over time, may become encoded in the form of grammatical rules (i.e. grammaticalized). The difference between usage-based complexity effects and grammaticalized complexity effects is in the directness of the link between processing complexity and choice of syntactic structure. When the grammar allows multiple options, speakers' choices may be directly influenced by processing difficulty. When the grammar allows only one option, the speaker has no real choice, but the grammar ensures that, in general, the more efficient structure is chosen (Hawkins 2004). Because grammaticalization is a gradual process, partial grammaticalization can and must occur at some stage, and this at least appears to be the case for Cantonese. Our data indicate that speakers have a choice between gap and RP, and that this choice is influenced not only by complexity *per se*, but also by language-specific conventions.

What could this idea of partial grammaticalization mean for a theory of grammatical competence? One possible answer comes from the Decathlon Model of grammar, which has been employed to account for phenomena such as *that*-trace structures in German—structures which are dispreferred but are still marginally acceptable and may occur in production (Featherston 2005, 2011). According to this model, and in contrast to mainstream generative theories of syntax, there are no absolute grammatical constraints. Rather, each grammatical constraint comes with a quantifiable violation cost, and multiple violations within the same sentence show a cumulative effect, as evident in the results of acceptability judgment tasks (Featherston 2005: 1297). Thus, while violating a constraint involves a binary decision (a structure either violates a particular constraint or it does not), constraint violations are often "survivable". Applying this idea to the current dataset, we might suggest that there is in fact an adjunct island condition which affects coverb object RCs, but its violation cost is survivable, resulting in the occasional occurrence of gaps. The observed lexical differences are trickier to account for. Assuming that all of the coverbs occur within the same structural configuration, which Francis and Matthews (2006) give us good reason to believe is the case, these lexical

differences are not predicted by any kind of grammatical constraint (whether of the "survivable" kind or not). It could be that violation cost as defined for a particular structural configuration interacts with other non-syntactic factors, such as the lexical semantic features of each verb and/or the frequency with which a particular item occurs in the coverb construction. It is, in fact, surely the case that the gradual phenomenon of grammaticalization involves a complex interaction among factors related to syntax, semantics, pragmatics, and frequency of use, resulting in the synchronic patterns of variation that we observe (Bybee 2006).

The current experiments were not designed to distinguish between different models of grammatical competence, and so these final remarks must be considered speculative. We can, in fact, envision other possible explanations for the current results. There could, for example, be non-syntactic explanations for all of the conventionalized preferences shown in our data, thus eliminating any need for "survivable" grammatical constraints. Culicover (2013: 144) presents a plausible account along these lines, in which the degraded acceptability of many island-violating structures results not from the application of a formal constraint but rather from the low frequency of such structures, which gives them a weak representation in the dynamical system that processes language. Alternatively, it could be that the unexpected productions in our Cantonese data were entirely due to performance errors and not allowed by the grammar at all, thus allowing us to maintain ordinary grammatical rules. However, we find Featherston's (2005) model particularly attractive because it allows us to maintain a distinction between competence and performance, while also providing a more flexible notion of competence which can capture the intuition that there really are grammatical constraints on RP use in Cantonese, exceptions to which need not (necessarily) be considered performance errors. More generally, our own experience concurs with that of Gibson and Fedorenko (2013: 117), who observe that experimental tasks often yield patterns of responses that are unexpected from theoretical predictions based on informal syntactic judgments. As the field of linguistics moves toward more widespread use of quantitative data, traditional generative notions of grammatical rules and

linguistic knowledge are beginning to be viewed with greater scrutiny even among those (such as Featherston) who consider themselves to be working within the generative paradigm.

In conclusion, these data from Cantonese support our hypotheses based on Hawkins' (2004) proposal that RP and gap distributions are influenced by structural complexity in both grammar and usage. Evidence for complexity effects was shown across all conditions, including subject RCs versus direct object RCs, and across two different tasks. The unexpected optionality of RPs in some of the conditions presents a challenge for traditional ideas of the competence-performance distinction and merits further investigation.

Acknowledgements

We gratefully acknowledge research assistant Xuebo Gong for her assistance with transcription and data measurements, and three anonymous *Lingua* reviewers for their careful comments and suggestions on earlier drafts of this article. We are grateful to participants at the CUNY Conference on Human Sentence Processing (Ohio State University, March 2014), the Second Workshop on Innovations in Cantonese Linguistics, (University of Chicago, March 2014), and the SLHS Brown Bag and Ling Lunch seminars (Purdue University) for their feedback on early presentations of this work. We especially thank the following individuals for their insights: Lauren Clemens, Peter Culicover, Jack Hawkins, Philip Hofmeister, Chien-Jer Charles Lin, Maryellen MacDonald, Jason Merchant, Fritz Newmeyer, Maria Polinsky, Gregory Scontras, Tom Wasow, and Ming Xiang. We are grateful for financial support from the Department of English, the WILKE Undergraduate Research Internship Program, and the Linguistics Program at Purdue University. Finally, we acknowledge the excellent support we received from the Statistical Consulting Service at Purdue University, in particular Jyotishka Datta and Bruce Craig.

References

Alexopoulou, T., Keller, F. (2007). Locality, cyclicity, and resumption: At the interface between the grammar and the human sentence processor. *Language* 83, 110-160.

Ariel, M. (1999). Cognitive universals and linguistic conventions: The case of resumptive pronouns. *Studies in Language*, 23(2), 217-269.

Asudeh, A. (2011). Local grammaticality in syntactic production. In: Bender, E. and Arnold, J. (Eds.) *Language from a Cognitive Perspective: Grammar, Usage, and Processing.* Stanford: CSLI Publications, pp. 51-80.

Asudeh, A. (2012). *The Logic of Pronominal Resumption*. Oxford University Press.

Borer, H. (1984). Restrictive relatives in Modern Hebrew. *Natural Language and Linguistic Theory*, 2(2), 219-260.

Bybee, J. (2006). From usage to grammar: The mind's response to repetition. *Language*, 82(4), 711-733.

Cann, R., Kaplan, T., Kempson, R. (2005). Data at the grammar-pragmatics interface: the case of resumptive pronouns in English. *Lingua*, 115(11), 1551-1577.

Chen, B., Ning, A., Bi, H., Dunlap, S. (2008). Chinese subject-relative clauses are more difficult to process than the object-relative clauses. *Acta Psychologica*, 129(1), 61-65.

Cheng, T., Cheung, H., Wu, J. T. (2011). Spoken relative clause processing in Chinese: Measure from an alternative task. *Language and Linguistics*, 12(3), 669-705.

Culicover, P. W. (2013). *Grammar and Complexity: Language at the Intersection of Competence and Performance*. Oxford University Press.

Featherston, S. (2005). That-trace in German. *Lingua*, 115(9), 1277-1302.

Featherston, S. (2011). Three types of exceptions–and all of them rule-based. In: Simon, H. (Ed.) *Expecting the unexpected: Exceptions in grammar*, Mouton de Gruyter, pp. 291-323.

Ferreira, F., Swets, B. (2005). The production and comprehension of resumptive pronouns in

relative clause “island" contexts. In: Cutler, A. (Ed.), *Twenty-first century psycholinguistics: Four cornerstones*, Lawrence Erlbaum Associates, Mahway, NJ, pp. 263-278.

Francis, E. J., Matthews, S. (2006). Categoriality and object extraction in Cantonese serial verb constructions. *Natural Language and Linguistic Theory* 24, 751-801.

Gibson, E. (1998). Linguistic complexity: Locality of syntactic dependencies. *Cognition*, 68(1), 1-76.

Gibson, E., Fedorenko, E. (2013). The need for quantitative methods in syntax and semantics research. *Language and Cognitive Processes*, 28(1-2), 88-124.

Gu, Gang. (2001). *A Study of Resumptive Pronouns.* (Doctoral dissertation). Chinese University of Hong Kong.

Hawkins, J. A. (1999). Processing complexity and filler-gap dependencies across grammars. *Language*, 75(2), 244-285.

Hawkins, J. A. (2004). *Efficiency and Complexity in Grammars*. Oxford University Press, Oxford.

Hawkins, R., Chan, C. Y. H. (1997). The partial availability of Universal Grammar in second language acquisition: The ‘failed functional features hypothesis’. *Second Language Research*, 13(3), 187-226.

Heestand, D., Xiang, M., Polinsky, M. (2011). Resumption still does not rescue islands. *Linguistic Inquiry*, 42(1), 138-152.

Hitz, John. (2012). A Study of the Constraints Affecting Resumption in Turkish and Mandarin Chinese Relative Clauses, and the Transfer of these Constraints to English as a Second Language. (Doctoral dissertation). Purdue University.

Hofmeister, P., Jaeger, T. F., Arnon, I., Sag, I. A., & Snider, N. (2013). The source ambiguity problem: Distinguishing the effects of grammar and processing on acceptability judgments. *Language and Cognitive Processes*, 28(1-2), 48-87.

Hofmeister, P., Norcliffe, E. (2013). Does resumption facilitate sentence comprehension? In:

Hofmeister, P., Norcliffe, E. (Eds.) *The Core and the Periphery: Data-driven Perspectives on Syntax inspired by Ivan A. Sag*. CSLI Publications, Stanford, CA.

Holmes, V. M., O'Regan, J. K. (1981). Eye fixation patterns during the reading of relative-clause sentences. *Journal of Verbal Learning and Verbal Behavior*, 20(4), 417-430.

Hu, X., Liu, C. (2007). Restrictive relative clauses in English and Korean learners' second language Chinese. *Second Language Research*, 23(3), 263-287.

Hsiao, F., Gibson, E. (2003). Processing relative clauses in Chinese. *Cognition*, 90(1), 3-27.

Hsiao, Y., MacDonald, M. C. (2013). Experience and generalization in a connectionist model of Mandarin Chinese relative clause processing. *Frontiers in Psychology*, 4, 1-19.

Keenan, E. L., Comrie, B. (1977). Noun phrase accessibility and universal grammar. *Linguistic Inquiry*, 8, 63-99.

Keenan, E. L., Comrie, B. (1979). Data on the noun phrase accessibility hierarchy. *Language*, 55(2), 333-351.

King, J., Just, M. A. (1991). Individual differences in syntactic processing: The role of working memory. *Journal of Memory and Language*, 30(5), 580-602.

Kwon, N., Gordon, P. C., Lee, Y., Kluender, R., Polinsky, M. (2010). Cognitive and linguistic factors affecting subject/object asymmetry: An eye-tracking study of prenominal relative clauses in Korean. *Language*, 86(3), 546-582.

Kwon, N., Kluender, R., Kutas, M., Polinsky, M. (2013). Subject/object processing asymmetries in Korean relative clauses: Evidence from ERP data. *Language*, 89(3), 537-585.

Lin, C. J. C. (2008). The processing foundation of head-final relative clauses. *Language and Linguistics*, 9(4), 813-839.

Lin, C. J. C., Bever, T. G. (2006). Subject preference in the processing of relative clauses in Chinese. In Baumer, D., Montero, D. & Scanlong, M., (Eds.) *Proceedings of the 25th West Coast Conference on Formal Linguistics,* Cascadilla Press, Somerville, MA, pp. 254-260.

Lord, C. (1993). *Historical Change in Serial Verb Constructions*. John Benjamins Publishing.

Matthews, S., Yip, V. (2001). Aspects of contemporary Cantonese grammar: the structure and stratification of relative clauses. In: Chappell, H. (Ed.), *Chinese Grammar: Synchronic and Diachronic Perspectives*. Oxford University Press, Oxford, pp. 266-281.

Matthews, S., Yip, V. (2003). Relative clauses in early bilingual development: Transfer and universals. In Ramat, A. (Ed.), *Typology and Second Language Acquisition*, De Gruyter, Berlin, pp. 39-81.

Matthews, S. Yip, V. (2011). *Cantonese: A Comprehensive Grammar.* Routledge, London.

McCloskey, J. (1990). Resumptive pronouns, A'-Binding and levels of representation in Irish. In: Hendrick, R. (Ed.) *Syntax and Semantics 23: Syntax of Modern Celtic Languages*, Academic Press, New York, pp. 199-248.

McCloskey, J. (2006). Resumption. In: Everaert, M. , van Riemsdijk, H. (Eds.),*The Blackwell Companion to Syntax*, Blackwell, Oxford, pp. 94–117.

McDaniel, D., & Cowart, W. (1999). Experimental evidence for a minimalist account of English resumptive pronouns. *Cognition*, 70(2), B15-B24.

McKee, C., & McDaniel, D. (2001). Resumptive pronouns in English relative clauses. *Language Acquisition*, 9(2), 113-156.

Miyamoto, E. T., Nakamura, M. (2003). Subject/object asymmetries in the processing of relative clauses in Japanese. In Garding, G., Tsujimura, M. (Eds.) *Proceedings of the 22nd West Coast Conference on Formal Linguistics*. Cascadilla Press, Somerville, MA, pp. 342-355.

Moravcsik, E. (2006). *An Introduction to Syntactic Theory.* Continuum, London.

Ng, S. H., Fodor, J. D. (2011). Use your headedness: An exercise in psycholinguistic exploitation. In: Yamashita, H., Hirose, Y, Packard, J. (Eds.) *Processing and Producing Head-final Structures*. Springer, Dordrecht, pp. 299-321.

Ning, L. H. (2008). *The Grammar and Processing of Resumptive Pronouns in Chinese*

Relative Clauses. (Master's thesis). National Cheng-Chi University, Taiwan.

Polinsky, M., Clemens, L. E., Milton, A., Morgan, M. X., Heestand, D. (2013). Resumption in English. In: Sprouse, J., Hornstein, N. (Eds.) *Experimental Syntax and Island Effects*, Cambridge University Press, Cambridge, UK, pp. 341-359.

Prince, E. F. (1990). Syntax and discourse: A look at resumptive pronouns. In: Hall, K., Koenig, J., Meacham, M., Reinman, S. and Sutton, L. (Eds.) *Proceedings of the Sixteenth Annual Meeting of the Berkeley Linguistics Society*, Berkeley Linguistics Society, Berkeley, CA, pp. 482-497.

Ross, J. R. (1986). *Infinite Syntax*. Norwood, NJ: Ablex.

Schriefers, H., Friederici, A. D., Kuhn, K. (1995). The processing of locally ambiguous relative clauses in German. *Journal of Memory and Language*, 34(4), 499-520.

Sells. P. (1984). *Syntax and Semantics of Resumptive Pronouns.* (Doctoral dissertation). University of Massachusetts.

Su, Y. C. (2004). Relatives of Mandarin children. Paper presented at *Generative Approaches to Language Acquisition in North America*, University of Hawaii at Manoa.

Tezel, Z. (1998). *The Acquisition of Restrictive Relative Clause Configurations in English as a Second Language* (Doctoral dissertation). Indiana University of Pennsylvania.

Traxler, M. J., Morris, R. K., Seely, R. E. (2002). Processing subject and object relative clauses: Evidence from eye movements. *Journal of Memory and Language*, 47(1), 69-90.

Ueno, M., Garnsey, S. M. (2008). An ERP study of the processing of subject and object relative clauses in Japanese. *Language and Cognitive Processes*, 23(5), 646-688.

Vasishth, S., Chen, Z., Li, Q., & Guo, G. (2013). Processing Chinese relative clauses: evidence for the subject-relative advantage. *PloS One*, 8(10), e77006.

Yuan, B., Zhao, Y. (2005). Resumptive pronouns in English-Chinese and Arabic-Chinese interlanguages. *International Review of Applied Linguistics in Language Teaching*, 43(3), 219-237.

Appendix: Stimulus sentences for acceptability judgment task, RP conditions[13]

Set 1: *bong1* "help"		
Non-possessive	Subject	**keoi5** bong1 ngo5 go2 go3 neoi5jan2 hou2 hou2jan4 **3sg** help 1sg that Cl woman very kind "The woman who she helped me is very kind."
	Direct Object	ngo5 bong1 **keoi5** go2 go3 neoi5jan2 hou2 hou2jan4 1sg help **3sg** that Cl woman very kind "The woman who I helped her is very kind."
	Coverb Object	ngo5 bong1 **keoi5** maai5 ce1 go2 go3 neoi5jan2 hou2 hou2jan4 1sg help **3sg** buy car that Cl woman very kind. "The woman who I bought a car from her is very kind."
Possessive	Subject	**keoi5** aa3go1 bong1 ngo5 go2 go3 neoi5jan2 hou2 hou2jan4 **3sg** brother help 1sg that Cl woman very kind "The woman who her brother helped me is very kind."
	Direct Object	ngo5 bong1 **keoi5** aa3go1 go2 go3 neoi5jan2 hou2 hou2jan4 1sg help **3sg** brother that Cl woman very kind "The woman who I helped her brother is very kind."
	Coverb Object	ngo5 bong1 **keoi5** aa3go1 maai5 ce1 go2 go3 neoi5jan2 hou2 hou2jan4 1sg help **3sg** brother buy car that Cl woman very kind "The woman who I bought a car from her brother is very kind."

[13] Gap conditions are not shown, but are the same as RP conditions except for the absence of the RP. RPs are in boldface.

Set 2: *doi6* "replace"		
Non-possessive	Subject	**keoi5** doi6 ngo5 go2 go3 tung4si6 hou2 leng3neoi2 **3sg** replace 1sg that Cl colleague very pretty "The colleague who she acted in place of me is very pretty."
	Direct Object	ngo5 doi6 **keoi5** go2 go3 tung4si6 hou2 leng3neoi2 1sg replace **3sg** that Cl colleague very pretty "The colleague who I acted in place of her is very pretty."
	Coverb Object	ngo5 doi6 **keoi5** gin3 haak3 go2 go3 tung4si6 hou2 leng3neoi2 1sg replace **3sg** see client that Cl colleague very pretty "The colleague who I met the client for her is very pretty."
Possessive	Subject	**keoi5** sai3mui2 doi6 ngo5 go2 go3 tung4si6 hou2 leng3neoi2 **3sg** sister replace 1sg that Cl colleague very pretty "The colleague who her sister acted in place of me is very pretty."
	Direct Object	ngo5 doi6 **keoi5** sai3mui2 go2 go3 tung4si6 hou2 leng3neoi2 1sg replace **3sg** sister that Cl colleague very pretty "The colleague who I acted in place of her sister is very pretty."
	Coverb Object	ngo5 doi6 **keoi5** sai3mui2 gin3 haak3 go2 go3 tung4si6 hou2 leng3neoi2 1sg replace **3sg** sister see client that Cl colleague very pretty "The colleague who I met the client for her sister is very pretty."

1367

1368

Set 3: *gan1* "follow"		
Non-possessive	Subject	**keoi5** gan1 ngo5 go2 go3 hok6saang1 hou2 coeng4hei5 **3sg** follow 1sg that Cl student very long-winded "The student who she followed me is very long-winded."
	Direct Object	ngo5 gan1 **keoi5** go2 go3 hok6saang1 hou2 coeng4hei5 1sg follow **3sg** that Cl student very long-winded "The student who I followed her is very long-winded."
	Coverb Object	ngo5 gan1 **keoi5** heoi3 bok5mut6gwun2 go2 go3 hok6saang1 1sg follow **3sg** go museum that Cl student hou2 coeng4hei5 very long-winded "The student who I followed her to the museum is very long-winded."
Possessive	Subject	**keoi5** aa3maa1 gan1 ngo5 go2 go3 hok6saang1 hou2 coeng4hei5 **3sg** mother follow 1sg that Cl student very long-winded "The student who her mother followed me is very long-winded."
	Direct Object	ngo5 gan1 **keoi5** aa3maa1 go2 go3 hok6saang1 hou2 coeng4hei5 1sg follow **3sg** mother that Cl student very long-winded "The student who I followed her mother is very long-winded."
	Coverb Object	ngo5 gan1 **keoi5** aa3maa1 heoi3 bok5mut6gwun2 go2 go3 hok6saang1 1sg follow **3sg** mother go museum that Cl student hou2 coeng4hei5 very long-winded "The student who I followed her mother to the museum is very long-winded."

1369

Set 4: *tung4* "be with" ***This set was omitted from the statistical analyses.***		
Non-possessive	Subject	**keoi5** tung4 ngo5 go2 go3 naam4zai2 hou2 gou1daai6 **3sg** with 1sg that Cl boy very tall "The boy who he is with me is very tall."
	Direct Object	ngo5 tung4 **keoi5** go2 go3 naam4zai2 hou2 gou1daai6 1sg with **3sg** that Cl boy very tall "The boy who I am with him is very tall."
	Coverb Object	ngo5 tung4 **keoi5** sik6 faan6 go2 go3 naam4zai2 hou2 gou1daai6 1sg with **3sg** eat rice that Cl boy very tall "The boy who I had dinner with him is very tall."
Possessive	Subject	**keoi5** gaa1ze1 tung4 ngo5 go2 go3 naam4zai2 hou2 gou1daai6 **3sg** sister with 1sg that Cl boy very tall "The boy who his sister is with me is very tall."
	Direct Object	ngo5 tung4 **keoi5** gaa1ze1 go2 go3 naam4zai2 hou2 gou1daai6 1sg with **3sg** sister that Cl boy very tall "The boy who I am with his sister is very tall."
	Coverb Object	ngo5 tung4 **keoi5** gaa1ze1 sik6 faan6 go2 go3 naam4zai2 1sg with **3sg** sister eat rice that Cl boy hou2 gou1daai6 very tall "The boy who I had dinner with his sister is very tall."

1370

Set 5: *wan2* "seek"		
Non-possessive	Subject	**keoi5** wan2 ngo5 go2 go3 aa3baak3 hou2 maa4faan4 **3sg** seek 1sg that Cl old man very troublesome "The old man who he was looking for me is very troublesome."
	Direct Object	ngo5 wan2 **keoi5** go2 go3 aa3baak3 hou2 maa4faan4 1sg seek **3sg** that Cl old man very troublesome "The old man who I was looking for him is very troublesome."
	Coverb Object	ngo5 wan2 **keoi5** zuk1 kei2 go2 go3 aa3baak3 hou2 maa4faan4 1sg seek **3sg** play chess that Cl old man very troublesome "The old man who I was looking for him to play chess with is very troublesome."
Possessive	Subject	**keoi5** lou5po4 wan2 ngo5 go2 go3 aa3baak3 hou2 maa4faan4 **3sg** wife seek 1sg that Cl old man very troublesome "The old man who his wife was looking for me is very troublesome."
	Direct Object	ngo5 wan2 **keoi5** lou5po4 go2 go3 aa3baak3 hou2 maa4faan4 1sg seek **3sg** wife that Cl old man very troublesome "The old man who I was looking for his wife is very troublesome."
	Coverb Object	ngo5 wan2 **keoi5** lou5po4 zuk1 kei2 go2 go3 aa3baak3 hou2 maa4faan4 1sg seek **3sg** wife play chess that Cl old man very troublesome "The old man who I was looking for his wife to play chess with is very troublesome."

1371