ACQUISITION OF RELATIVE CLAUSES IN CANTONESE:
A MULTI-FACTORIAL ANALYSIS

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ABSTRACT

This dissertation explores the acquisition of Cantonese relative clauses by examining the effects of three factors (the grammatical relation of the relative clause head noun, NP animacy, and the presence of resumptive pronouns) on Cantonese children’s production and comprehension. A prevailing subject preference is observed in both comprehension and production, supporting the hypothesis of universal subject preference. Yet, the study on the effect of grammatical relations reveals that children’s acquisition is not only determined by factors that underlie a universal relative clause processing mechanism, but also by some general learning strategies with respect to the characteristics of the relative clause construction of the particular language. It suggests that topicality of subjects make the subject NP more prominent and more available for relativization; and because of the peculiar relative clause construction in Cantonese, children rely on the word order resemblance to construct their relative clauses. The effect of animacy is mainly observed in the contrastive animacy configurations. The relative ease of relative clauses with an animate subject - inanimate object (AI) configuration comes from children’s strong preference for such animacy configuration; and their strong dispreference for the reverse inanimate subject – animate object (IA) configuration causes children to often respond with a conversion to the preferred AI configuration. Resumptive pronouns do not play a critical role in children’s acquisition, and the only effect observed seems to be rendering the relative clause structure more explicit, reducing ambiguity and mitigating certain errors in comprehension.
# TABLE OF CONTENTS

ACKNOWLEDGEMENTS ........................................ III

ABSTRACT ..................................................... III

TABLE OF CONTENTS ........................................ v

LIST OF FIGURES ........................................ VIII

LIST OF TABLES ........................................... xi

**CHAPTER 1  INTRODUCTION** ........................................ 1

1.1 The scope of this dissertation .................. 3

**CHAPTER 2  LITERATURE REVIEW: FACTORS UNDERLYING RELATIVE CLAUSE PROCESSING AND ACQUISITION** ........................................ 6

2.1 Grammatical relations .......................... 6

2.1.1 The effect of grammatical relations in relative clause processing and acquisition ........................................ 6

2.1.2 The effect of grammatical relations on relative clause processing and acquisition in the Chinese languages .................. 8

2.2 Animacy .................................................. 12

2.2.1 The effect of animacy in relative clause processing and acquisition ........................................ 12

2.2.2 The effect of animacy in Chinese relative clause processing ........................................ 16

2.3 Resumptive pronouns ............................ 18

2.3.1 Use of resumption in adult processing ................ 19

2.3.2 Use of resumption in children processing ................ 21

2.3.3 Use of resumption in Chinese .................. 23

**CHAPTER 3  RELATIVE CLAUSE CONSTRUCTION IN CANTONESE** ........................................ 26

3.1 The Cantonese relative clause construction ........................................ 26

3.2 Relativization strategies .................. 27

3.3 Typological significance of Cantonese relative clauses ........................................ 29
CHAPTER 4  THE ROLE OF GRAMMATICAL RELATIONS 30

4.1 Experiment 1: The role of grammatical relations on the comprehension of Cantonese relative clauses 31
   4.1.1 Method 31
   4.1.2 Results 39
      4.1.2.1 Accuracy 39
      4.1.2.2 Error Analysis 41
   4.1.3 Interim Discussion: Children’s Comprehension 46

4.2 Experiment 2: The role of grammatical relations on the production of Cantonese relative clause 47
   4.2.1 Method 47
   4.2.2 Results & Discussion 51
      4.2.2.1 Adults 51
         4.2.2.1.1 Proportion of target production 51
         4.2.2.1.2 Patterns of adults’ relative clauses 53
      4.2.2.2 Children 70
         4.2.2.2.1 Proportion of target production 70
         4.2.2.2.2 Patterns of relative clause responses 73
      4.2.2.3 Interim discussion: Production of relative clauses of Cantonese adults and children 88

4.3 General Discussion 90
   4.3.1 The discrepancy between comprehension and production: the effect of word order 91
   4.3.2 Implications for theories of relative clause processing/acquisition 96

4.4 Conclusion 102

CHAPTER 5  THE ROLE OF ANIMACY 104

5.1 Experiment 3: The role of animacy on the production of Cantonese relative clause 104
   5.1.1 Method 106
   5.1.2 Results 109
      5.1.2.1 Adults 109
      5.1.2.2 Discussion: Adult production 118
      5.1.2.3 Children 120
      5.1.2.4 Discussion: Children production 129
   5.1.3 Conclusion 137

CHAPTER 6  THE ROLE OF RESUMPTIVE PRONOUNS 139

6.1 Experiment 4: The role of resumptive pronoun on the comprehension of Cantonese relative clauses 140
   6.1.1 Method 140
   6.1.2 Results 143
      6.1.2.1 Accuracy 143
      6.1.2.2 Error Analysis 143
   6.1.3 Discussion 145
6.2 Use of resumptive pronouns in relative clause production 148
  6.2.1 Analysis 149
    6.2.1.1 Object relativization 149
    6.2.1.2 Subject relativization 150
    6.2.1.3 Indirect object, oblique and genitive relativization 151
    6.2.1.4 Relative clauses with resumptive NP (RNP) 153
    6.2.1.5 Internally headed relative clauses (IHRC) 155
  6.2.2 Discussion 156

6.3 Conclusion 158

CHAPTER 7 CONCLUSION 160

7.1 Summary of the experimental findings 160
  7.1.1 The role of grammatical relations 160
  7.1.2 The role of animacy 163
  7.1.3 The role of resumptive pronouns 165

7.2 General research implications 167
  7.2.1 Universal subject relative clause preference 167
  7.2.2 Comprehension vs. Production 168
  7.2.3 Children vs. Adults 169

7.3 Concluding Remarks 170

REFERENCES 174

APPENDIX A
RELATIVE CLAUSE RESPONSES IN CHILDREN'S AND ADULTS ELICITED PRODUCTION ACROSS ALL COMPARISONS IN EXPERIMENT 2 185

APPENDIX B
TEST STIMULI FOR EXPERIMENT 1 AND EXPERIMENT 2 187

APPENDIX C
TARGETED RELATIVE CLAUSES FOR EXPERIMENT 3 190

APPENDIX D
TEST STIMULI FOR EXPERIMENT 4 191
LIST OF FIGURES

FIGURE 1. SAMPLE VISUAL STIMULUS FOR SUBJECT VS. DIRECT OBJECT (S-DO) COMPARISON. 36

FIGURE 2. SAMPLE VISUAL STIMULUS FOR SUBJECT VS. INDIRECT OBJECT (S-IO) COMPARISON WITH BEI2 ‘GIVE’ AS MAIN VERB. 36

FIGURE 3. SAMPLE VISUAL STIMULUS FOR SUBJECT VS. INDIRECT OBJECT (S-IO) COMPARISON WITH DATIVE VERB. 37

FIGURE 4. SAMPLE VISUAL STIMULUS FOR DIRECT OBJECT VS. INDIRECT OBJECT (DO-IO) COMPARISON. 37

FIGURE 5. SAMPLE VISUAL STIMULUS FOR DIRECT OBJECT VS. OBLIQUE (DO-OBL) COMPARISON. 38

FIGURE 6. PROPORTIONS OF CORRECT RESPONSES OF DIFFERENT NP TYPES FOR EACH COMPARISON. 39

FIGURE 7. PROPORTIONS OF DIFFERENT TYPES OF COMPREHENSION ERRORS IN S-DO COMPARISON. 41

FIGURE 8. PROPORTIONS OF DIFFERENT TYPES OF COMPREHENSION ERRORS IN S-IO COMPARISON. 42

FIGURE 9. PROPORTIONS OF DIFFERENT TYPES OF COMPREHENSION ERRORS IN DO-IO COMPARISON. 43

FIGURE 10. PROPORTIONS OF DIFFERENT TYPES OF COMPREHENSION ERRORS IN DO-OBL COMPARISON. 44

FIGURE 11. PROPORTIONS OF DIFFERENT TYPES OF ERRORS IN CHILDREN’S COMPREHENSION. 45

FIGURE 12. PROPORTIONS OF DIFFERENT TYPES OF ERRORS IN CHILDREN’S COMPREHENSION. 46

FIGURE 13. SAMPLE TEST TRIAL FOR PRODUCTION. 48

FIGURE 14. PROPORTIONS OF DIFFERENT TYPES OF RESPONSES ELICITED FROM ADULTS IN DIFFERENT COMPARISONS. 51

FIGURE 15. PROPORTIONS OF ADULTS’ TARGET PRODUCTION ACROSS COMPARISONS. 52

FIGURE 16. DISTRIBUTION OF RELATIVE CLAUSE RESPONSES IN ADULTS’ PRODUCTION. 54

FIGURE 17. PROPORTIONS OF DIFFERENT TYPES OF RESPONSES ELICITED FROM CHILDREN IN DIFFERENT COMPARISONS. 70

FIGURE 18. PROPORTIONS OF CHILDREN’S TARGET PRODUCTION ACROSS COMPARISONS. 71
FIGURE 19. DISTRIBUTION OF RELATIVE CLAUSE RESPONSES IN CHILDREN’S PRODUCTION. 73

FIGURE 20. THE POSITIONS OF ARGUMENTS IN A CANTONESE RELATIVE CLAUSE CONSTRUCTION. 98

FIGURE 21. SAMPLE TEST TRIAL. 108

FIGURE 22. SAMPLE VISUAL STIMULUS FOR THE ANIMATE SUBJECT – INANIMATE OBJECT (AI) CONFIGURATION. 109

FIGURE 23. SAMPLE VISUAL STIMULUS FOR THE INANIMATE SUBJECT – ANIMATE OBJECT (IA) CONFIGURATION. 109

FIGURE 24. SAMPLE VISUAL STIMULUS FOR THE INANIMATE SUBJECT – INANIMATE OBJECT (II) CONFIGURATION. 109

FIGURE 25. PROPORTIONS OF DIFFERENT TYPES OF RESPONSES ELICITED FROM ADULTS IN SUBJECT AND OBJECT RELATIVE CLAUSE ELICITATION CONDITIONS IN DIFFERENT ANIMACY CONFIGURATIONS. 110

FIGURE 26. PROPORTION OF TARGET RELATIVE CLAUSES ELICITED FROM ADULTS IN THE ANIMATE SUBJECT – ANIMATE OBJECT (AA) CONFIGURATION. 111

FIGURE 27. PROPORTIONS OF DIFFERENT TYPES OF RELATIVE CLAUSE RESPONSES ELICITED FROM ADULTS IN THE ANIMATE SUBJECT – ANIMATE OBJECT (AA) CONFIGURATION. 112

FIGURE 28. PROPORTION OF TARGET RELATIVE CLAUSES ELICITED FROM ADULTS IN THE ANIMATE SUBJECT – INANIMATE OBJECT (AI) CONFIGURATION. 112

FIGURE 29. PROPORTIONS OF DIFFERENT TYPES OF RELATIVE CLAUSE RESPONSES ELICITED FROM ADULTS IN THE ANIMATE SUBJECT – INANIMATE OBJECT (AI) CONFIGURATION. 113

FIGURE 30. PROPORTION OF TARGET RELATIVE CLAUSES ELICITED FROM ADULTS IN THE INANIMATE SUBJECT – ANIMATE OBJECT (IA) CONFIGURATION. 113

FIGURE 31. PROPORTIONS OF DIFFERENT TYPES OF RELATIVE CLAUSE RESPONSES ELICITED FROM ADULTS IN THE INANIMATE SUBJECT – ANIMATE OBJECT (IA) CONFIGURATION. 114

FIGURE 32. PROPORTION OF TARGET RELATIVE CLAUSES ELICITED FROM ADULTS IN THE INANIMATE SUBJECT – INANIMATE OBJECT (II) CONFIGURATION. 116

FIGURE 33. PROPORTIONS OF DIFFERENT TYPES OF RELATIVE CLAUSE RESPONSES ELICITED FROM ADULTS IN THE INANIMATE SUBJECT – INANIMATE OBJECT (II) CONFIGURATION. 117

FIGURE 34. PROPORTIONS OF DIFFERENT TYPES OF RESPONSES ELICITED FROM CHILDREN IN SUBJECT AND OBJECT RELATIVE CLAUSE ELICITATION CONDITIONS IN DIFFERENT ANIMACY CONFIGURATIONS. 121
FIGURE 35. PROPORTIONS OF TARGET RELATIVE CLAUSES ELICITED FROM CHILDREN IN DIFFERENT ANIMACY CONFIGURATIONS. 122

FIGURE 36. PROPORTIONS OF DIFFERENT TYPES OF RELATIVE CLAUSE RESPONSES ELICITED FROM CHILDREN IN THE ANIMATE SUBJECT – ANIMATE OBJECT (AA) CONFIGURATION. 123

FIGURE 37. PROPORTIONS OF DIFFERENT TYPES OF RELATIVE CLAUSE RESPONSES ELICITED FROM CHILDREN IN THE ANIMATE SUBJECT – ANIMATE OBJECT (AA) CONFIGURATION. 126

FIGURE 38. PROPORTIONS OF DIFFERENT TYPES OF RELATIVE CLAUSE RESPONSES ELICITED FROM CHILDREN IN THE INANIMATE SUBJECT – ANIMATE OBJECT (IA) CONFIGURATION. 127

FIGURE 39. PROPORTIONS OF DIFFERENT TYPES OF RELATIVE CLAUSE RESPONSES ELICITED FROM CHILDREN IN THE INANIMATE SUBJECT – INANIMATE OBJECT (II) CONFIGURATION. 128

FIGURE 40. PROPORTIONS OF TYPES OF REVERSAL ERRORS BY CHILDREN IN DIFFERENT ANIMACY CONFIGURATIONS. 133

FIGURE 41. VISUAL STIMULUS FOR SUBJECT TYPE AND THE TWO DIRECT OBJECT TYPES OF RELATIVE CLAUSES. 141

FIGURE 42. ACCURACY OF RELATIVE CLAUSE COMPREHENSION 143

FIGURE 43. CODING OF ERROR RESPONSES 144

FIGURE 44. PROPORTIONS OF ERRORS MADE WITH EACH RELATIVE CLAUSE TYPE. 144
LIST OF TABLES

**TABLE 1.** PROPORTIONS OF VARIOUS FORMS OF RELATIVE MARKERS IN ADULTS’ RELATIVE CLAUSES. 69

**TABLE 2.** PROPORTIONS OF VARIOUS FORMS OF RELATIVE MARKERS IN CHILDREN’S RELATIVE CLAUSES. 87

**TABLE 3.** ANIMACY CONFIGURATIONS. 105

**TABLE 4.** PROPORTIONS OF DIFFERENT RELATIVIZATION STRATEGIES IN OBJECT RELATIVIZATION. 149

**TABLE 5.** PROPORTIONS OF DIFFERENT RELATIVIZATION STRATEGIES IN SUBJECT RELATIVIZATION. 150

**TABLE 6.** PROPORTIONS OF DIFFERENT RELATIVIZATION STRATEGIES IN RELATIVIZATION OF LOWER NP POSITIONS 151

**TABLE 7.** PROPORTIONS OF RELATIVE CLAUSES WITH RESUMPTIVE NP. 154

**TABLE 8.** PROPORTIONS OF INTERNALLY HEADED RELATIVE CLAUSES. 155
CHAPTER 1
INTRODUCTION

This dissertation examines the effect of three factors on Cantonese-speaking children's production and comprehension of relative clauses, namely the grammatical relation of the relative clause head noun, NP animacy, and the presence of resumptive pronouns. These three factors are chosen because their effects have been rather well researched in the literature on adults’ comprehension and production of relative clauses in various languages.

Cantonese, with its peculiar relative clause construction, presents an interesting test case for current theories on the acquisition of relative clauses. While the position of the relative clause in most languages is in accord with the head direction of the language (e.g., English has a head initial (VO) word order and its relative clauses are postnominal (i.e. the relative clauses come after the head NP), and Japanese, a head final (OV) language, has prenominal relative clauses), a small proportion of VO languages, such as Cantonese, do not demonstrate such accord. Cantonese has a head-initial word order as English, but a prenominal relative clause configuration as Japanese, and such a configuration is only observed in about 0.6% of the world's languages (WALS, Dryer, 2013).

A major debate in the relative clause literature is whether there is a universal preference for subject relative clauses, making them easier to produce and understand than other types of relative clauses. Because comparisons of this sort often focus on the two most common types of relative clauses, subject and object relative clauses, the preference is commonly described as a “subject-object asymmetry”. English and other European languages are known to have a consistent subject preference, i.e. adults appear to have less difficulty producing and comprehending subject relative clauses while children have been shown to understand and use subject relative clauses earlier and with greater ease than object relative clauses (Bever, 1970; Diessel & Tomasello, 2005; Frauenfelder, Segui & Mehler, 1980; Frazier, 1987; Frazier & Fodor, 1978; Clifton & Frazier, 1989; Gennari & MacDonald, 2009; Gibson, 1998; Kim & O'Grady, 2015; King & Just,
INTRODUCTION

1991; King & Kutas, 1995; Mak, Vonk, & Schriefers, 2002; Reali & Christiansen, 2007; Schriefers, Friederici, & Kuhn, 1995; Traxler, Morris, & Seely, 2002, among many others). Yet, the predictions from different theories are in conflict on whether there is a universal subject preference for languages with different relative clause configurations. One camp of theories appeals to the inherent properties of the grammatical relations involved (Dowty, 1991; Hale, 2003; Hawkins & Keenan, 1987), and upholds a universal subject preference across all languages based on a tendency which emerged from a typological generalization (Keenan & Comrie, 1977): the subject position is usually more accessible to relativization than other NP positions. It is hypothesized that such accessibility also enables subject relative clauses to be easier for processing and acquisition. On the other hand, another camp, based on the effect of configurational properties in processing (e.g. Wanner & Maratsos, 1978; Gibson, 1988, 2000; Clifton & Frazier, 1989), proposes that the relative clause preference should be language-specific, and is determined by the syntactic configuration of the relative clause construction of the respective languages. To date, this is still an unsettled debate, as languages with different relative clause configurations from languages like English do not converge on one conclusion.

Attempts to explain the subject-object asymmetry is complicated by the effects of factors such as NP animacy. Recent research has demonstrated that, even for languages such as English, object relative clauses are not always more difficult to process than subject relative clauses (Mak, Vonk & Schriefers, 2002, 2006; Gennari & MacDonald, 2008; Traxler, Morris & Seely, 2002; Traxler, Williams, Blozis & Morris, 2005). These studies point out that subject relative clauses have always been found easier to process than object relative clauses due to the animacy configuration of the NPs in the relative clauses tested. The form of relative clauses used in the experiments in relative clause research in the past has been (deliberately, so as to ensure reversability) confined to transitive relative clauses in which both NPs are animate, such as (1).

(1) The cat [RC that __ bit the dog] chased the rat.
   (cited from de Villiers, Tager-Flusberg, Hakuta & Cohen, 1979)

Such an animacy configuration fits well to the expectation for subject relative clauses, but has apparently violated the general expectation for object relative clauses, which generally have an animate subject and an
INTRODUCTION

inanimate object (AI) in natural spontaneous speech (Reali & Christiansen, 2007). The mismatch of the expected animacy value of the relative clause NPs makes object relative clauses (with this atypical animacy configuration) more difficult to process. Given the appropriate animacy configuration, the subject-object asymmetry disappears and object relative clauses are no longer found to be more difficult than subject relative clauses (e.g. Mak et al., 2002, 2006; Kidd, Brandt, Lieven & Tomasello, 2007).

Resumptive pronouns are not a legitimate option for relativization in many languages, but may be used as a rescue strategy for relative clauses that are seemingly difficult (Alexopoulou & Keller, 2007; Heestand, Xiang & Polinsky, 2011; McCloskey, 2006) or grammatically impossible (e.g. Ferreira & Swets, 2005; Erteschick-Shir, 1992; Shlonsky, 1992).

(2) We're afraid of things that we don't know what *(they) are.

(cited from Ferreira & Swets, 2005)

It has been proposed that a resumptive pronoun is used to alleviate the difficulty experienced in processing those seemingly impossible relative clauses as it marks the relativized position (Alexopoulou & Keller, 2007; Heestand, Xiang & Polinsky, 2011; Hofmeister & Norcliffe, 2013; McCloskey, 2006). If this is true, relative clauses should be easier to comprehend with the presence of a resumptive pronoun, all else being equal. We can further extend this hypothesis to child language acquisition: children should show facilitation in the comprehension of relative clauses using the resumptive pronoun strategy compared to relative clauses of the same type but using the gap strategy. This can be tested quite easily in Cantonese since object relative clauses in Cantonese allow both strategies interchangeably.

1.1 The scope of this dissertation

By observing children’s production and comprehension of Cantonese relative clauses, this dissertation examines how the three listed factors, namely grammatical relation of the head noun, animacy of the relative clause NPs and resumptive pronouns, modulate Cantonese child acquisition of relative clauses in order to
INTRODUCTION

address the question of whether children’s relative clause acquisition is subject to the same processing principles and mechanisms as adult relative clause processing. Cantonese presents a relative clause configuration (head initial word order with prenominal relative clause construction) that is very different from the relative clause constructions well studied in the literature, and presents a condition that can disentangle the various hypotheses of current theories. Not only will the observations from Cantonese provide additional evidence to inform the debate around the universal subject relative clause preference, it can also assist the investigation of the acquisition of prenominal relative clauses in head initial languages, in particular with regard to the three factors on which we focus, and further the understanding of the general picture of relative clause processing and acquisition. This dissertation conducts three individual studies to test young Cantonese-speaking children on their ability to understand (comprehension) and use (production) relative clauses.

The study on the role of grammatical relations (Chapter 4) evaluates the validity of the universal subject relative clause preference, in particular with reference to the accessibility-based account (cf. Keenan & Comrie, 1977), by examining whether the hierarchy of relative clause preference in Cantonese can be predicted by the hierarchy of NP accessibility. In order to identify children’s preferences, the study performs a series of pairwise comparisons between relative clauses of different NP positions. In addition to the commonly studied subject and direct object types, indirect object and oblique are included in order to establish a more complete hierarchy of relative clause preference.

The study on the role of NP animacy (Chapter 5) investigates the effect of NP animacy in children’s production and comprehension of Cantonese relative clauses. It particularly addresses whether children’s relative clause preference (subject-object asymmetry) will be altered when the animacy of the relative clause NPs changes. Cross-comparisons across the full range of animacy configurations, namely animate subject - animate object (AA), animate subject - inanimate object (AI), inanimate subject - animate object (IA), and inanimate subject - inanimate object (II), is performed.

The study on the role of resumptive pronoun (Chapter 6) examines whether resumptive pronouns have a facilitative role in the acquisition of Cantonese object relative clauses. As Cantonese allows either the gap
strategy or resumptive pronoun strategy in object relativization, relative clauses with a resumptive pronoun can be compared on a legitimate ground with the gapped variants. The study further examines the acquisition pattern of relative clauses that require the use of resumptive pronoun in Cantonese, i.e. indirect object and oblique relative clauses.
The following section will review the research on relative clause processing and acquisition with regard to the three processing factors investigated in this dissertation, namely grammatical relations, animacy and resumptive pronoun. It will also look particularly into the research on Mandarin Chinese to provide a background on the relative clause processing of prenominal relative clauses in head initial languages.

2.1 Grammatical relations

2.1.1 The effect of grammatical relations in relative clause processing and acquisition

One of the central debates in relative clause processing research concerns the processing differences between subject and object relative clauses. Studies of English relative clauses have consistently shown a strong subject preference, often known as the subject-object asymmetry. English subject relative clauses (3) are easier to understand and produce, and are used more often in spontaneous speech than their object counterparts (4) (COMPREHENSION: Bever, 1970; Frazier & Fodor, 1978; Clifton & Frazier, 1989; King & Just, 1991; King & Kutas, 1995; Gibson, 1998; Traxler, Morris, & Seely, 2002, among many others; PRODUCTION: Gennari & MacDonald, 2009; Reali & Christiansen, 2007).

(3) Subject relative clause:

| -------------------- |
| the reporter [RC who __ attacked the senator]

(4) Object relative clause:

| ---------------------------------------------- |
| the reporter [RC who the senator attacked __ ]
Theories developed to account for the locus of this asymmetry may be broadly classified into two prominent camps. One camp appeals to the inherent properties of the grammatical relations involved (Dowty, 1991; Hale, 2003; Hawkins & Keenan, 1987), whereas the other camp appeals to syntactic structure as the locus of complexity in relative clause processing (Wanner & Maratsos, 1978; Gibson, 1988, 2000; Clifton & Frazier, 1989; Stowe, 1989; O’Grady 1997 [Syntactic Development]).

While converging to subject preference for English, the predictions of the two camps diverge on languages with a different configuration in their relative clause construction. The discrepancy lies in the notion of universality for the relative clause preference. Theories that uphold the inherent properties of the grammatical relations as the locus of processing complexity predict a universal subject preference independent of any syntactic differences across languages. The idea of universality is largely based on the implications of the Noun Phrase Accessibility Hierarchy (NPAH, Keenan & Comrie, 1977), a typological universal which shows the universal hierarchical order of grammatical relations with regard to their relative accessibility to relativization. The inherent properties that enable subjects to be more accessible to relativization are predicted to be the same factors that make the NP position more accessible for processing. Therefore, subject relative clauses should be universally favoured. A syntactic explanation (e.g. O’Grady, 1997; Hawkins, 2004) is offered to account for the asymmetry by suggesting that the processing difficulty is modulated by the number of nodes crossed between the head and the relativized position in the relative clause structure. The always less embedded subject position should be easier to process than the more deeply embedded object position.

Experience-based accounts (e.g. Mitchell, Cueto, Corley & Brysbaert, 1995; Hale, 2001) suggest that the relative frequency of each type of relative clauses in spontaneous speech determines its relative processing difficulty. As subject relative clauses tend to occur more frequently, they should be easier to process than object relative clauses. Topicality accounts (e.g. Mak, Vonk, & Schriefers, 2006, 2008; Kim & O’Grady, 2015) state that the processing ease of a relative clause is correlated with its relative topicality: less effort will be required to process a relative clause if the head is of a more prominent topic in the sentence. Since subject tends to be the default topic of a sentence across languages, and direct object comes as a less prominent
secondary topic (Kim & O'Grady, 2015, and the references therein), subject relative clauses should always be the easiest, given all other things being equal.

The other camp of theories can be broadly defined as the working memory-based accounts (Gibson, 1998, 2000; Warren & Gibson, 2002; Vasishth & Lewis, 2006). According to these accounts, the relative complexity of a relative clause is a function of the costs incurred from its processing. The cost is correlated to the need of mental resources during integration (maintaining incomplete dependencies) and retrieval (retrieving information from memory to resolve the dependency). The type of relative clauses that should be more difficult to process would be the one which incurs a heavier burden to the processor. Subject relative clauses (3) are easier to process because of their shorter filler-gap dependency, which demands fewer processing resources to maintain the dependency in working memory during processing, hence a lower processing cost than object relative clauses which have a longer filler-gap dependency (4).

Since the calculation of the processing costs is structure dependent, the cost discrepancy between subject and object relative clauses would be different if the languages have a different syntactic configuration of their relative clause constructions. Therefore, the predictions for the relative clause preference should be language-specific instead of an unanimous universal preference.

2.1.2 The effect of grammatical relations on relative clause processing and acquisition in the Chinese languages

Chinese languages, such as Mandarin Chinese and Cantonese, have a rather rare and peculiar relative clause configuration: prenominal relative clauses (RC-N) with a head initial word order (SVO). The peculiarity lies in the discordance between the head direction of the language and the relative clause construction. Such configuration results in two major differences from the relative clauses of English (and of many other head-initial languages). First, subject relative clauses (5a) have a longer gap-filler dependency than object relative clauses (5b), assuming that length is calculated in terms of the number of intervening words. Second, object
relative clauses share the same ordering of constituents with a simple main clause. The two constructions are disambiguated by the presence of the relative marker *de* at the right boundary of the relative clause.\(^1\)

(5) a. Subject relative clause:

```
|-------------------------|
[gongji jizhe de yiyuan]
```

`'the senator that attacks the reporter'`

b. Object relative clause:

```
[yiyuan gongji de jizhe]
```

`'the reporter that the senator attacked'`


Hsiao and Gibson (2003) was one of the first studies that examined the processing of Chinese relative clauses and reported an object advantage in comprehension. With a self-paced reading task, they found that adults comprehended object relative clauses (5b) faster than subject relative clauses (5a). The results were suggested to support the working memory-based account, as the subject relative clauses involved longer dependencies.

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\(^1\) While the two constructions are disambiguated by the presence of the relative marker *de* at the right boundary of the relative clause to link it to the head noun in Mandarin Chinese, this is not always the case in Cantonese as the relative marker *go2+CL* is homonymous to the distal demonstrative 'that'.
and would require more resources to maintain the incomplete dependencies. Gibson and Wu (2013) further refined the study by using biasing contexts to make relative clauses virtually certain and to minimize the effect of temporary ambiguity, and found robust advantage for object relative clauses.

Chen et al. (2008) replicated Hsiao and Gibson (2003)'s study and further tested the effect of working memory capacity on relative clause processing. Their study confirmed Hsiao and Gibson (2003)'s results only in participants with low working memory capacity but not in those with high working memory. Lin and Garnsey (2011) also reported an object advantage for relative clauses modifying topicalized main clause objects. The authors attributed the relative ease of object relative clauses to the multiple advantages enjoyed by their canonical SVO word order. Due to the isomorphism to a canonical main clause, the constituent order of an object relative clause is more frequent and common in the language, thus easier to process. The configuration also makes the linear distance between the dependencies shorter, thereby reducing the storage and integration costs incurred during processing. Using ERP, Packard, Ye and Zhou (2011) also found a larger P600 amplitude at the relativizer/head noun region in subject relative clause processing, which suggested a heavier cost of syntactic integration.

Lin and Bever (2006) argued that Hsiao and Gibson’s (2003) study was methodologically flawed by confounds from clause embedding and syntactic ambiguity, and the apparent object advantage that they found could not be regarded as evidence for a preference for object relative clauses. In their experiment, Hsiao and Gibson (2003) tested both singly- and doubly-embedded relative clauses. For the singly-embedded relative clauses, the object relative clause was only read faster at the pre-relativizer relative clause region. Due to the prenominal nature of the Chinese relative clause construction, it lacks any indication of an upcoming relative clause structure from the left boundary of the relative clause. This fact led Lin and Bever (2006) question whether the subject-object asymmetry found in the singly embedded relative clauses could be attributed to differences in processing considerations, as the part that had been revealed to the readers were only clausal fragments, readers probably did not know they were reading a relative clause yet. The apparent object advantage at most could only be regarded as evidence for longer reading times needed for clauses with
missing arguments. For the doubly-embedded relative clauses, the results were confounded by the configuration of the gap-filler dependencies. The gap-filler dependencies in a doubly-embedded subject relative clause are in a nested relationship (6a), while the gap-filler dependencies in a doubly-embedded object relative clause are in a serial relationship (6b). The relative ease of doubly-embedded object relative clauses is then probably not due to the intrinsic properties of the type of relative clause, but because serial dependencies (in object relative clauses) are easier to process than nested dependencies (in subject relative clauses).

(6) a. Subject relative clauses embedded in subject relative clauses:

\[
\begin{array}{c}
\text{[GAP$_1$] invite [GAP$_2$] conspire judge DE tycoon DE official have bad intentions}
\end{array}
\]

b. Object relative clauses embedded in object relative clauses:

\[
\begin{array}{c}
tycoon invite [GAP$_2$] DE judge conspire [GAP$_1$] DE official have bad intentions
\end{array}
\]

By using singly-embedded relative clauses with unambiguous verbs, Lin and Bever (2006) found a robust subject preference for processing Chinese relative clauses. The effect was observed at both the relativizer and the head noun, locations where the dependency was supposed to be resolved. A similar subject preference was observed by Chen et al. (2010).

One of the confounds exist in testing Chinese relative clauses is the possible local ambiguities within certain types of Chinese relative clauses, such as the ambiguity between object relative clauses and main clauses due to surface isomorphism. In order to provide a clear picture of relative clause processing in Chinese, Jäger, Chen, Li, Lin and Vasishth (2015) used syntactic contexts to provide explicit cues for readers of an upcoming relative clause in order to eliminate such local ambiguities. Readers were found to process subject relative clauses faster than object relative clauses, and the effects were predicted by the higher surprisal cost in object relative clauses compared to subject relative clauses. This is in line with the predictions of the expectation-based account, which assumes the processing difficulty of a particular structure is inversely correlated with its relative frequency.
The mixed results regarding the relative clause preference in Chinese could be due to the discordance in the head direction of canonical word order and relative clause construction, such that different factors favour different types of relative clauses. Subject relative clauses enjoy the advantage of prominence of the subject position, while object relative clauses enjoy the advantage of being more cost efficient with a shorter gap-filler dependency or having facilitation from the resemblance with the canonical word order (see O’Grady, 2011; Kwon, Polinsky & Kluender., 2013 for further discussion). The tension between the different factors at play could be the underlying reason for the inconsistent preferences shown in the studies for Chinese relative clause processing. On the other hand, Chen et al. (2008) attributed the inconsistent results between studies that found an object advantage (e.g. Hsiao & Gibson, 2003) and those with a subject advantage (e.g. Lin & Bever, 2006) to individual differences in working memory capacity.

2.2 Animacy

2.2.1 The effect of animacy in relative clause processing and acquisition

While the subject-object asymmetry has been established as a phenomenon in relative clause processing, recent studies have begun to show that the preference is not as simple as was once assumed. Besides syntactic factors such as grammatical relations and structural configuration, semantic properties, NP animacy in particular, also play a critical role in modulating the preference. The robust subject-object asymmetry is found to be restricted to relative clauses with an animacy configuration of animate subject and animate object NPs (7). When the object is an inanimate NP, as in (8), the preference for subject relative clauses disappears, and object relative clauses are no longer more difficult than subject relative clauses (Mak, Vonk, & Schriefers, 2002, 2006; Gennari & MacDonald, 2008; Traxler et al., 2002; Traxler, Williams, Blozis, & Morris, 2005).

(7) S: The hiker that [RC _ met the reporter] [S-AA]  
    O: The reporter that [RC the hiker met _] [DO-AA]

(8) S: The hiker that [RC _ climbed the mountain] [S-AI]  
    O: The mountain that [RC the hiker climbed _] [DO-AI]
It seems that the language processor does not simply create an expectation for a particular type of relative clause based on the animacy of the head noun, such as subject relative clause for animate head noun and object relative clause for inanimate head noun (Mak et al., 2006). Instead, the processor seems to favours particularly the animate subject – inanimate object (AI) configuration, which leads to the disappearance of the subject-object asymmetry for relative clauses with that animacy configuration. The difficulty asymmetry between subject and object relative clauses reappears when the contrastive animacy configuration is reversed, i.e. with an inanimate subject and an animate object (IA) configuration, as shown in (9) (Traxler et al., 2002, 2005), or with parallel animacy configurations, whether it is all animate (AA), as observed previously, or all inanimate (II), as shown in (10) (Mak et al., 2006).

(9) a. The movie that [RC __ pleased the director] [S-IA]
   b. The director that [RC the movie pleased __] [DO-IA]

(10) a. Volgens de folder moet de gel, die de lekkages verhelpt, … [S-II]
    ‘According to the brochure the gel, that remedies the leakages, …’
   b. Volgens de folder moeten de lekkages, die de gel verhelpt, … [DO-II]
    ‘According to the brochure the leakages, that remedies the gel, …’

The relative ease of object relative clauses in the favourable animacy configuration (i.e. the AI configuration) may be due to the reduction of difficulty in grammatical role assignment. The differential in semantic values between the relative clause nouns facilitates assignment of grammatical roles to the respective nouns. Traxler et al. (2002, 2005) suggested that the processor has a general preference for animate entities as clausal subjects, which leads the processor to commit to an initial analysis of the head noun as the subject of the relative clause when the head noun is animate, even before the processor encounters the relative clause. As the animate head noun has made itself a likely thematic agent, reanalysis becomes very difficult when it is in fact the object of the predicate. On the other hand, in object relative clauses like the one in (14), the difficulty is greatly reduced because the inanimate head noun is not a plausible thematic agent, and reanalysis becomes relatively easy. Mak et al. (2006) explained the advantage in terms of topicworthiness of the NP, which subsumes topicality and animacy. The head noun is more topicworthy than the relative clause-internal NP, as
it is the topic of the relative clause; and animate entities are also more topicworthy than inanimate entities. As the processor prefers the subject of a relative clause to be an entity of higher topicworthiness, it will spontaneously assume an animate head noun as the subject of the relative clause. For object relative clauses with the animate subject - inanimate object (AI) configuration, the relative clause is made easier as the relative clause contains a more topicworthy entity. Frequency accounts (Fox & Thompson, 1990; Roland, Dick & Elman, 2007) propose that the processor may have developed an object preference when the head noun is an inanimate NP, as object relative clauses are frequently found modifying inanimate head nouns.

The reverse contrastive animacy configuration (i.e. IA configuration), as in (9), does not enjoy the same advantage that the favourable contrastive animacy (AI) configuration does. For the accounts proposed by Traxler et al. (2002, 2005) and Mak et al. (2006), the animate head noun of the object relative clauses with the reverse contrastive animacy (IA) configuration misleads the processor into committing to an initial incorrect assignment of the head noun as the relative clause subject, causing more delay in subsequent reanalysis, hence the difficulty observed. Weckerly and Kutas (1999) explained the difference between the two contrastive animacy configurations through surprisal effect. As the processor has animacy expectations for each syntactic position, such as subjects being associated with more agentive roles being animate, whereas the object is associated with the usually inanimate theme, it is surprised when an inanimate noun is encountered at the subject position of the relative clause. Such surprisal makes the comprehension process of object relative clauses with the reverse contrastive animacy (IA) configuration a more complex task, and therefore does not render the same moderation effect as observed with object relative clauses with the favourable contrastive animacy (AI) configuration.

Gennari and MacDonald (2008) explained the difficulty difference in terms of semantic and syntactic indeterminacy. During online processing, the level of difficulty in processing depends on the extent of indeterminacy, i.e. the number of plausible options, and the competition between plausible options as the sentence unfolds. An animate head noun can be interpreted as the agent, the experiencer, the goal or even the theme of the relative clause predicate. These semantic alternatives in turn create greater degree of
FACTORS UNDERLYING RELATIVE CLAUSE PROCESSING AND ACQUISITION

indeterminacy, and could lead to different expectations with regard to the upcoming relative clause structure. While inanimate entities are typically associated with theme arguments, animate entities are typically associated with agent arguments. It is also more likely for an animate head noun to be assigned an agentive role rather than the other less frequent and less expected roles, e.g. an experiencer role in (9b). Therefore, when the animate head noun in (9b) reveals itself as an object argument, the unexpected thematic assignment requires greater effort for the processor to abandon the more readily available initial misanalysis and activate the less frequent transitive structure with an inanimate subject and an animate object.

Production also shows a similar effect of animacy configuration: speakers have a preference for the subject of the relative clause to be animate. Therefore, when the configuration is an animate subject with an inanimate object, far fewer passive relative clauses are produced (Gennari, Mirkovic, & MacDonald, 2012). Passive voice is also found to be used as a mechanism to reduce the competition between two conceptually similar nouns, such as entities which are both animate. A lower rate of passives is observed when the relative clause NPs contrast in animacy, which suggests that such relative clauses are not so difficult that speakers need to rely on alternative strategies, such as passives, to reduce their relative difficulty.

Children demonstrate the same sensitivity to animacy in their relative clause processing. The distribution of object relative clauses in the speech of young English-speaking and German-speaking children (aged 3 – 4 years old) is modulated by the animacy of the head noun and discourse-based constraints, such as givenness of the relative clause subject NP (Kidd, Brandt, Lieven & Tomasello, 2007). In the spontaneous speech of young children, object relative clauses are often produced with an inanimate head noun and a pronominal relative clause subject, suggesting that children’s early use of object relative clauses is constrained by the animacy of the head noun and the givenness of the relative clause subject, as pronominals often express relatively old information than lexical NPs. Children also perform better, or even equally well in comparison to subject relative clauses, when tested on object relative clauses with a more discourse salient entity (e.g. an animate NP or a pronominal) as subject and an inanimate object (Comprehension: Arosio, Guasti & Stucchi, 2011, Adani, 2012; Production: Kidd et al, 2007; Guasti, Branchini, Arosio & Vernice, 2012).
Children, similar to adults, will first commit to a subject relative clause analysis, but are not as able as adults to revise their misanalysis on realizing that the relative clause is in fact an object relative clause. Arosio et al. (2011) adopted a self-paced listening task and demonstrated that children were able to identify the ungrammaticality of their first analysis, with a longer listening time at the point of disambiguating auxiliary in object relative clauses, but continued to fail to provide a correct answer for the comprehension question at the end of the sentence presentation. This shows that children first engaged in a subject relative clause analysis, and were able to detect the ungrammaticality of their original analysis as the object relative clause unfolded, but failed to perform reanalysis to the correct interpretation.

### 2.2.2 The effect of animacy in Chinese relative clause processing

Studies on Mandarin Chinese relative clause processing (e.g. Wu, Kaiser, & Andersen, 2011; He & Chen, 2013) have demonstrated sensitivity to the animacy status of the head noun and the animacy configuration of the relative clause. Wu et al. (2011) showed that adult Chinese speakers are sensitive to the animacy of the head noun when comprehending relative clauses online, matching the statistical distribution in natural language use (Pu, 2007; Wu, 2009). There is a preference for an animate head in subject relative clauses and an inanimate head in object relative clauses. Yet, the preference for head animacy is not only conditioned by the type of relative clauses, but also interacts with the animacy configuration of the relative clause, in particular for object relative clauses. With an inanimate head noun, object relative clauses are no longer more difficult than subject relative clauses when the relative clause subject is animate, but not when it is inanimate. This suggests that the language processor will find an object relative clause easier under two conditions: (i) when the head noun is animate; and (ii) when the relative clause has the favourable contrastive animacy configuration, which is the animate subject – inanimate object (AI) configuration. This aligns with the observations on Dutch (Mak et al., 2006). Wu et al. further tested the effect of animacy configuration by comparing the performance in the two contrastive animacy configurations, i.e. the favourable animate subject
FACTORS UNDERLYING RELATIVE CLAUSE PROCESSING AND ACQUISITION

– inanimate object (AI) configuration and the reverse inanimate subject – animate object (IA) configuration.

A sample set of their test stimuli is illustrated in (11) to (14).

(11) Subject relative clause with animate subject - inanimate object (AI) configuration: [S-AI]
    [RC — 躲開 石塊] 的 記者 ...
    dodge stone REL reporter
    'The reporter that dodged the stone....'

(12) Object relative clause with animate subject - inanimate object (AI) configuration: [DO-AI]
    [RC 記者 躲開 —] 的 石塊 ...
    reporter dodge REL stone
    'The stone that the reporter dodged....'

(13) Subject relative clause with inanimate subject - animate object (IA) configuration: [S-IA]
    [RC — 砸中 記者] 的 石塊
    hit reporter REL stone
    'The stone that hit the reporter....'

(14) Object relative clause with inanimate subject - animate object (IA) configuration: [DO-IA]
    [RC 石塊 砸中 —] 的 記者
    stone hit REL reporter
    'The reporter that the stone hit....'

Similar to speakers of languages with postnominal relative clauses, the Chinese speakers only showed a reduction in processing difficulty of object relative clauses in the favourable contrastive animacy (AI) configuration (12), while the asymmetry remained significant in the reverse contrastive animacy (IA) configuration. The critical role of animacy configuration in relative clause processing is further confirmed by an interesting comparison between the subject relative clauses with the reverse contrastive animacy (IA) configuration (13) and object relative clauses with the favourable contrastive animacy (AI) configuration (12). The reverse contrastive animacy (IA) configuration was so dispreferred that speakers even found the usually easier subject relative clauses much harder to process in the reverse contrastive animacy (IA) configuration (13) than object relative clauses with the favourable contrastive animacy (AI) configuration (12). He and Chen (2013) suggested that the thematic conflict and the violation of the animacy expectation of the head noun in
the animacy configuration are the causes of the difficulty in the processing of relative clauses with the reverse contrastive animacy (IA) configuration.

### 2.3 Resumptive pronouns

There are two main strategies for relativization in languages of the world: gapping and resumption. The gap strategy leaves the original position of the head NP empty (15), whereas the resumption strategy inserts a resumptive pronoun (16).

(15) Gap strategy: the girl that [RC the boy kissed __ ]

(16) Resumption strategy: * the girl that [RC the boy kissed her ]

Only some languages routinely allow resumption as an option for relativization. The two strategies can alternate freely in certain types of relative clauses in languages such as Hebrew (17).

(17) Hebrew:

```
Tare li et ha-kof [RC she-ha-yeled mexabek (oto) ]
show to-me ACC the-monkey that-the-boy hugs him
‘Show me the monkey that the boy is hugging (it).’
```

The resumption strategy, however, is not allowed in languages like English. For instance, a relative clause such as (16) is ungrammatical in the language. Yet even in these languages, resumptive pronouns are often found in the place of illicit gaps, where they render, for example, the completely ungrammatical wh-violation “more acceptable”, as in (18).

(18) We’re afraid of things that we don’t know what *(they)* are.

(cited from Ferreira & Swets, 2005)

Use of a resumptive pronoun in English is regarded as a last resort strategy for overcoming processing complexity involving long-distance dependencies (Alexopoulou, 2010; Alexopoulou & Keller, 2007; Dickey, 1996; Erteschik-Shir, 1992; Ferreira & Swets, 2005; Hawkins, 2004; Kroch, 1981; Shlonsky, 1992). The
sentence in (18) originally contains an illicit long filler-gap dependency between the head noun *things* and its relativized position, and is purportedly “rescued” by the presence of the resumptive pronoun, as it turns a completely ungrammatical sentence into a marginally acceptable one. The resumptive pronoun is suggested to serve to mark the relativized position in the dependency (Givón, 1973, 1975; Keenan & Comrie, 1977), compensating for the processing difficulty associated with the structure (Alexopoulou & Keller, 2007; Heestand, Xiang & Polinsky, 2011; McCloskey, 2006).

### 2.3.1 Use of resumption in adult processing

If the role of resumptive pronoun is to reduce the processing cost incurred by long and complex dependencies, the use of resumptive pronouns should increase with the complexity of the dependency, and this prediction has garnered support from adult spontaneous speech. Adult speakers of languages that disallow resumptive pronouns have been found to use resumptive pronouns in natural spontaneous speech when they become “trapped” in very long and/or very complex relative clauses (see Foss & Fay, 1975), even though this is not a grammatical option in their language. Extractability has a great impact on adults’ use of resumptive pronouns in production (McKee & McDaniel, 2001). If relativizing an NP from a certain position would render the sentence ungrammatical, adults have a very high tendency to place a resumptive pronoun in the corresponding position to mark the relativized position. In an experimental setting, Ferreira and Swets (2005) elicited an unexpectedly high proportion of island structures with resumptive pronouns. The response patterns demonstrated that the use of resumption in illicit gaps was in fact intentional and planned by the production system. Interestingly, such use seems to be rather costly, and because of that, the system would avoid the difficult resumption structure and opt for syntactically simpler alternatives when limited in processing capacity.

Resumption continues to demonstrate a facilitative role in comprehension in the domain of incremental processing. Hofmeister and Norcliffe (2013) found that resumption sped up the reading rate during online comprehension. The comprehension process slowed down after processing a gap, whereas sped up after a
resumptive pronoun, particularly in complex long-distance dependencies. Heestand et al. (2011) also found a faster reaction time in providing a grammaticality judgment for sentences with resumptive pronouns than those with gaps, even though both were judged equally ungrammatical. From these observations, it seems that, in addition to marking the location of the extraction, a resumptive pronoun acts as a buffer for the processor to handle the necessary steps of information retrieval and integration to complete the dependency before progressing onto receiving new information in the rest of the sentence, thus reducing processing difficulty at the extraction site, and ultimately of the entire sentence. However, the amelioration effect does not render resumptive pronouns acceptable in the grammar of languages with intrusive resumption, such as English. Dependencies with resumptive pronouns, despite their various degrees of extractability, are never rated more acceptable than their gapped counterparts, though increased complexity (in terms of depth of embedding) may reduce the penalty for the resumptive pronoun (Alexopoulou & Keller, 2007; Heestand et al., 2011; Hofmeister & Norcliffe, 2013). The persistent unacceptability of constructions with resumptive pronouns might follow from syntactic violations of the language, yet the reduced penalty in acceptability ratings and the improved efficiency in processing provide strong evidence for a facilitative role of resumptive pronouns in comprehension.

One major assumption in the recent language acquisition literature is that children's language acquisition is guided by the same processing principles and mechanisms as adults' processing (e.g. Frazier & de Villiers, 1990; Fodor, 1998; Seidenberg & MacDonald, 1999; O'Grady, 2013; among many others). Based on such assumptions, children's performance should show similar sensitivity to the processing criteria, and the pattern of acquisition should align with the performance pattern of adults. Therefore, with regard to the acquisition of long-distance dependencies, children’s tendency to use resumptive pronouns should correlate with the complexity of the dependency, and the difficulty experienced in acquiring a particular type of relative clauses should be moderated by the presence of a resumptive pronoun.
2.3.2 Use of resumption in children processing

Children’s production suggests a correlation between the use of resumptive pronouns and processing difficulty: Children show a higher tendency to resort to resumptive pronouns when they are under pressure to produce a presumably more difficult construction. Young English-speaking children were found to use resumptive pronouns more often in the more difficult direct object position than in the subject position, as illustrated in (19) (McKee, McDaniel & Snedeker, 1998).

(19) a. Pick those two up what the dinosaur is eating them. (CT, 2;10)
    b. That one which is Bert patting it. (TX, 3;2)

(Examples of children’s errors from McKee et al. (1998)’s data)

French- and Spanish-speaking children produced similar patterns with the use of resumptive pronouns as the English children (Labelle, 1990; Pérez-Leroux, 1995). Instead of using the required appropriate relative pronoun, all the French relative clauses children produced were linked by the complementizer *que* ‘that’, and the extraction site contained either a pronoun, as in (20a), or a pronominal form of the preposition, as in (20b).

(20) a. Sur la balle [\[RC qu’[l]\] l’attrape]  
    On the ball that-he it-catches  
    ‘On the ball that he catches (it)’

    Target:
    la balle [\[RC qu’il\] attrape]  
    the ball that-he catches  
    ‘the ball that he catches’

b. Sur la boîte [\[RC que le camion rentre dedans\]]  
    On the box that the truck goes inside  
    ‘On the box that the truck goes inside’

    Target:
    la boîte [\[RC dans laquelle le camion rentre\]]  
    the box in which the truck goes  
    ‘the box in which the truck goes’

(Examples of children’s production from Labelle (1990)’s data)
A variant of the resumptive pronoun strategy commonly seen in elicitation tasks places a full noun phrase instead of a pronoun in the relativized position. The noun phrase is often an exact copy of the head noun, as in (21a). There are also occasional cases in which the resumptive NP is a semantically related noun instead of a full copy of the head noun, as in (21b) (English: Finer, 1992; Zukowski, 2005; Mandarin Chinese: Hsu, Hermon & Zukowski, 2009; Korean: Kim & O’Grady, 2015).

(21)  

a. Resumptive NP (copy of the head noun):

\[ \text{Sur la balle } [\text{qu’i(\ell)} \text{ lance la balle }] \]

‘On the ball that he throws (the ball)’

b. Resumptive NP (semantically-related NP):

There's a train worker [that we saw a switchman].

Studies have found that object relative clauses attract greater use of resumptive pronouns, while resumptive pronouns are rarely found in subject relative clauses (Labelle, 1990; McKee & McDaniel, 2001; Pérez-Leroux, 1995). The pattern of resumption appears to correlate with the difficulty of structural complexity: When the dependency is longer and/or the location of extraction is embedded within a deeper position in the structure, there is a higher rate of resumption. Such non-target production suggests performance failure of the child processor. The heavy processing demand associated with the long distance between the filler and the gap poses immense pressure on the child processor, triggering the use of resumption to relieve the processing load.

Those languages that have been studied in the literature mostly forbid the use of resumption in relativization, and the focus of the literature has been on how resumption appears in illicit gaps and its amelioration effect in the processing of difficult long-distance dependencies. A few studies in Hebrew have attempted to examine the effect of resumption on relative clauses which can alternate freely between the gap strategy and the resumption strategy. Ariel (1999) found that the use of resumptive pronoun in conversational Hebrew was correlated with the structural complexity of the relative clause. Adults opted for a resumptive pronoun (over a relativized gap) at a much higher rate in prepositional object relative clauses (41.2%) than object relative
clauses (8.7%). Young children tested for their production showed a stronger preference for the resumptive pronoun strategy (Varlokosta & Armon-Lotem, 1998). Their object relative clauses were usually relativized with the resumptive pronoun strategy (93%); and their subject relative clauses, even though not a legitimate option, were found at a relatively high rate with a resumptive pronoun (25%). Levy and Friedmann (2009) reported a case for a child with syntactic SLI (aged 12;2) who had difficulty with relative clauses, object relative clauses in particular. When the child began to learn to produce relative clauses, he placed a resumptive pronoun in every relative clause. Towards the end of the therapy, the child learned to observe the grammatical constraint on resumptive pronoun in Hebrew relativization: while resumptive pronoun was not found in his subject relative clauses anymore, the child still had a strong preference for the resumptive pronoun strategy in object relativization, and all his object relative clauses were produced with a resumptive pronoun.

On the other hand, resumptive pronouns do not seem to play such a critical role in children’s comprehension as in production. Friedmann, Beletti and Rizzi (2009) tested Hebrew-speaking children on their comprehension of subject and object relative clauses with and without a resumptive pronoun. Using a picture/scenario selection task, children’s performance in subject relative clauses was better than object relative clauses (with or without a resumptive pronoun), and their accuracy in both types of object relative clauses was at chance. The presence of the resumptive pronoun did not improve children’s understanding in object relativization in contrast to the facilitative effect observed in their production.

2.3.3 Use of resumption in Chinese

Further insights into the status of resumption come from a language with prenominal relative clauses. While demonstrating a subject preference, Mandarin Chinese-speaking children show a higher tendency to use resumption in object relative clauses in comparison to subject relative clauses in their elicited production (Cheng, 1995; Chiu, 1996; Hsu et al., 2009; Su, 2004). Su (2004) found that children, especially younger ones, resorted to the resumptive pronoun strategy (at least numerically) more in object than in subject relative
clause formation, even though they patterned alike with adults in the use of relativization strategies with the respective types of relative clauses. This shows the same tendency as adults’ processing, whose preference for the gap strategy begins to diminish in favour of the resumptive pronoun strategy as the syntactic structure of the relative clause becomes more complex (Ning, 2008). Hsu et al. (2009) attribute the tendency for resumption to the processing load associated with holding the planned head noun in working memory during the production of the relatively complex relative clause and resolving the comparatively difficult long-distance dependency.

Similar to those found in English and other languages, resumption in Chinese children's utterances involves both resumptive pronouns and resumptive NPs. An example of a child’s error with a resumptive NP in the object position, cited from Hsu et al. (2009), is shown in (22).

(22) [RC 小女孩 在 看 電視] 的 (那個 電視)
xiao-nühai zai kan dianshi de na ge dianshi
little-girl DUR watch TV REL that CL TV
‘(the TV) that the little girl is watching (the TV)’
(Examples of children’s errors from cited from Hsu et al. (2009))

The resumptive NP usually takes the form of a bare noun phrase, as in (22), but also occasionally the full NP including the demonstrative. It seems that the resumptive NP is a true copy of the head noun, as the form of the resumptive NP follows that of the head noun: when the head noun is demonstrative (with the noun omitted) or the full NP (Dem + N), the resumptive element will also be in the demonstrative or the full NP form (Chiu, 1996). This provides support to Labelle’s (1990) account for children's premature relative clause formation, which suggests that children's relative clauses are predicates of the head noun, which are linked to the head noun by the relativizer. If the relative clauses are predicates of the head noun, children could have formed the relative clauses first as main clauses before linking to the head noun, resulting in the resumptive in the relative clause. The variation among gap, resumptive pronoun and resumptive NP then reflects children's ability in the construction of long distance dependencies, reflecting on how much explicit information the child processor requires to mark the position of extraction for the sake of resolving the long distance dependency.
3.1 The Cantonese relative clause construction

The Cantonese relative clause construction is exemplified in (23).

(23) a. Marked by go2 +classifier:

\[\text{老師 買 \_ \_ \_ 嘅 \_ \_ \_} \]
\[\text{lou5si1 maa5 go2 bun2 syu1} \]
Teacher buy \_ \_ \_ CL \_ \_ \_ 'the book that the teacher buys'

b. Marked by linking particle ge3:

\[\text{老師 買 \_ \_ \_ 嘅 \_ \_ \_} \]
\[\text{lou5si1 maa5 ge3 syu1} \]
Teacher buy REL \_ \_ \_ 'the book that the teacher buys'

Relative clauses in Cantonese precede the head noun, and are marked either by a demonstrative go2 and classifier (23a) or a linking particle ge3 (23b). The classifier construction is commonly found in colloquial Cantonese, while the ge3 construction is used in a more formal register, as it is comparable to the adnominal marker 的 dik1 in literal Chinese, which is equivalent to the de in Mandarin Chinese (24).

(24) Mandarin Chinese:

\[\text{老師 買 \_ \_ \_ 的 \_ \_ \_} \]
\[\text{laoshi mai \_ \_ \_ de syu1} \]
teacher buy REL \_ \_ \_ 'the book that the teacher buys'

A third way to form a relative clause Cantonese is by a combination of the two markers, as shown in (25).

(25) \[\text{老師 買 \_ \_ \_ 嘅 嘅 \_ \_ \_} \]
\[\text{lou5si1 maa5 ge3 go2 bun2 syu1} \]
Teacher buy REL that CL \_ \_ \_ 'the book that the teacher buys'

This type of relative clauses is relatively rare, and is mostly found in very formal registers, such as media broadcasting and official address. Matthews and Yip (2001) has also noted a new “hybrid” form of placing ge3
behind the relative marker \textit{go2 + CL} to mark the relative clauses, which are exclusively found in formal contexts as classical music broadcasts on radio and job interviews.

Children are found to acquire the classifier relative clauses as in (23a) earlier than the relative clauses with \textit{ge3} (23b) (Yip and Matthews, 2007a:159). Therefore, in this dissertation, the classifier construction will be used for all experimental items.

3.2 Relativization strategies

Cantonese basically allows relativization on all NP positions, and adopts two different strategies, namely the gap strategy and the resumptive pronoun strategy, in relativization. Subjects and direct objects are relativized with the gap strategy, where the original position of the head noun in the relative clause is left empty as a gap. Positions other than subject and direct object of the predicate are relativized with the resumptive pronoun strategy, with a resumptive pronoun in the place of the relativized element. Examples (26) to (29) illustrate the relative clause construction of different NP positions, namely subject, object, indirect object and oblique positions respectively.

(26) Subject: 
\[ \text{RC } \text{攬 媽媽 } \text{嗰 個 小朋友 } \text{hugs mommy that CL child} \] 
‘the child that hugs mommy’

(27) Direct Object: 
\[ \text{RC } \text{媽媽 攬 個 小朋友 } \text{攬 係 CL child} \] 
‘the child that mommy hugs’

(28) Indirect object: 
\[ \text{RC 媽媽 送 禮物 俾 佢 } \text{兩個 小朋友 } \text{送 present DAT 3SG that CL child} \] 
‘the child that mommy sends a present to (him)’
RELATIVE CLAUSE CONSTRUCTION IN CANTONESE

(29) Oblique:

\[\{[RC \text{媽媽} \text{企} \text{响} \text{佢} \text{後面}] \text{嘔} \text{個} \text{小朋友}\}\]

\[
\begin{align*}
\text{maa4} & \text{maa1} & \text{sun3} & \text{hoeng2} & \text{keoi5} & \text{hau6} & \text{min6} & \text{go2} & \text{go3} & \text{siu5} & \text{pang4} & \text{jau5} \\
\text{mommy} & \text{send} & \text{at} & \text{3SG} & \text{that} & \text{CL} & \text{child} \\
\end{align*}
\]

‘the child that mommy is standing behind him’

Normally, NP positions can only be relativized with one particular strategy, except for the direct object position, which can alternate freely between the gap strategy (27) and the resumptive pronoun strategy (27)
(Matthews and Yip, 2011).

(27') Direct Object:

\[\{[RC \text{媽媽} \text{攬} \text{佢} \text{個} \text{小朋友}\}\]

\[
\begin{align*}
\text{maa4} & \text{maa1} & \text{laam5} & \text{keoi5} & \text{go2} & \text{go3} & \text{siu5} & \text{pang4} & \text{jau5} \\
\text{mommy} & \text{hugs} & \text{3SG} & \text{that} & \text{CL} & \text{child} \\
\end{align*}
\]

‘the child that mommy hugs (him)’

An experimental study by Francis, Lam, Zheng, Hitz and Matthews (2015) shows that both variants are grammatical in Cantonese, without any particular semantic or pragmatic implications with either variation. Native speakers rated the gapped variant and the resumptive pronoun variant with a relatively high score (gapped: 5.93 vs. RP: 5.67 on a 7-point scale) in a grammaticality judgment task and the scores for the two options are very close, suggesting that Cantonese speakers find both variants acceptable.

As the relative marker go2+CL is homonymous to the distal demonstrative ‘that’ in Cantonese, there is a potential ambiguity between an object relative clause (27) and a simple transitive main clause (30) due to the identical constituent configuration in the surface structure. While a main clause and an object relative clause share the same order of constituents, the demonstrative go2 plays different roles in the two clauses. Go2 is a deictic demonstrative in a main clause, but it loses the deictic sense and becomes a restrictive determiner of the head NP in a relative clause (cf. ‘Those students who can afford it can go to Hawaii.’). The surface identity, however, is broken by the presence of a resumptive pronoun (27'). With the resumptive pronoun in the relativized location, the object relative clause no longer resembles a main clause.
RELATIVE CLAUSE CONSTRUCTION IN CANTONESE

(30) Main clause:

媽媽 攬 嘅 個 小朋友

maa4maa1 laam5 go2 go3 siu5pang4jau5
momy hugs that CL child
‘Mommy hugs that child.’

3.3 Typological significance of Cantonese relative clauses

The prenominal relative clause construction in Cantonese is considered to be typologically peculiar. It is relatively very rare to find prenominal relative clauses in head initial languages. According to WALS (Dryer, 2013), only 5 languages (0.6%), among the world’s languages surveyed (825 languages), share such an unusual configuration. Among those 5 languages, three of them are Chinese languages, namely Cantonese, Mandarin Chinese, and Hakka, while Bai and Amis, the other two languages, are in close contact with Chinese, and might have experienced a significant degree of influence from Chinese.

The unusual configuration of the Chinese relative clause construction has provided new insights and opportunities to disentangle the long unresolved arguments among the competing theories for relative clause processing (e.g. Hsaio and Gibson, 2003 vs. Lin and Bever, 2006). Most studies have focused on Mandarin Chinese, and almost none has explored Cantonese relative clauses. Although the relative clause constructions in the two languages are similar in many aspects, the two should not be assumed to share the same grammar (Matthews, 2013). The Cantonese relative clause construction (23) is different in certain respects from that of Mandarin Chinese (24), notably in sharing the identical surface configuration with a main clause. The ‘surface identity’ is particularly relevant to test the predictions of theoretical accounts on relative clause processing, such as the canonical word order accounts (see Chan, Matthews and Yip, 2011), and the role of resumptive pronoun in Cantonese relative clause processing.
CHAPTER 4
THE ROLE OF GRAMMATICAL RELATIONS

The debate on the explanatory power of the accessibility-based and working memory-based accounts has been locked in a stalemate as most research focused only on the processing difference between subject and object relative clauses. As the accessibility-based account offers a very clear prediction for the relative ease in the processing for relative clauses of different NP positions, this chapter aims at evaluating the validity of the accessibility-based account by establishing a hierarchy of processing difficulty for Cantonese relative clauses and investigates whether it can be predicted by the hierarchy of NP accessibility (Keenan & Comrie, 1977; Hawkins, 2004).

Experiments 1 and 2 examined, respectively, the comprehension and production of relative clauses of different types by Cantonese-speaking children. In addition to the two often contrasted positions, subject and object, it also included two positions lower in the accessibility hierarchy, namely indirect object and oblique. Comparisons were performed between each position to establish a hierarchy of processing/acquisition preference for the Cantonese adults and children. Each position was compared with the other positions, resulting in the following pairs of comparisons:

- Subject (S) vs. Object (DO) in transitive construction
- Subject (S) vs. Indirect object (IO) in ditransitive construction
- Direct object (DO) vs. Indirect object (IO) in ditransitive construction
- Direct object (DO) vs. Oblique (OBL) in locative construction

The contrasts involving subject (S) vs. oblique (OBL) and indirect object (IO) vs. oblique (OBL) could not be tested due to limitations stemming from the grammatical properties of Cantonese and/or the design of the visual stimuli. For example, there is a comitative construction which involves the subject performing an
action with the oblique, however, it is difficult to unambiguously visualize the grammatical role of each character, making the construction inappropriate for the experiment.

### 4.1 Experiment 1: The role of grammatical relations on the comprehension of Cantonese relative clauses

#### 4.1.1 Method

**Participants.** Forty-eight Cantonese-speaking children from a local kindergarten in Hong Kong participated in this experiment. Their ages ranged from 4;05.28 – 6;07.24 (mean age: 5;06.03). The children were provided with a small gift for their participation. Three children were excluded due to the fact that they had been born in Mandarin-speaking regions. Furthermore, one of their parents did not have Cantonese as their native language. The final sample therefore included a total of 45 participants.

**Materials.** The experiment consisted of four pairwise comparisons between relative clauses of different types, namely (1) subject vs. object (S – DO) comparison, (2) subject vs. indirect object (S – IO) comparison, (3) direct object vs. indirect object (DO – IO) comparison and (4) direct object vs. oblique (DO – OBL) comparison. Each comparison consisted of six pairs of stimuli. Each pair of stimuli were carefully manipulated to minimally differ with regard to the relativized position. For example, for the subject vs. object comparison, the two sentences were a subject relative clause and an object relative clause paired with a picture depicting an event involving at least two participants. Details of the design for each comparison are illustrated below.

*Subject vs. direct object (S-DO) comparison*

Relative clauses in the subject vs. direct object (S – DO) comparison consisted of simple transitive constructions, as shown in the sample sentences in (31). The NPs in the relative clause were always animate.
to eliminate any possible effects of variations in NP animacy (For the effect of NP animacy on the acquisition of Cantonese relative clauses, see Experiment 3 in Chapter 5).

(31) a. Subject:

\[
[\text{RC } \_ \text{ 追 女仔 } ] \quad \text{ 嘅 個 男仔}
\]
\[
\text{zoei1 neoi5zai2 go2 go3 naam4zai2}
\]
\[
\text{chase girl that CL boy}
\]
\[
\text{‘the boy that chases the girl’}
\]

b. Direct object:

\[
[\text{RC 男仔 追 } \_ ] \quad \\text{嘅个女仔}
\]
\[
\text{naam4zai2 zoei1 go2 go3 neoi5zai2}
\]
\[
\text{boy chase that CL girl}
\]
\[
\text{‘the girl that the boy chases’}
\]

Subject vs. indirect object (S-IO) comparison

Like English, Cantonese has two different dative constructions: the double object construction (32a) and the prepositional dative construction (32b); but, unlike English, the distribution of the constructions is conditioned by the choice of verb. Bei2 is the verb ‘give’ in Cantonese, which has also been grammaticalized as the dative marker to indicate the indirect object in the prepositional dative construction. For sentences which use bei2 ‘give’ as the main verb, the dative marker bei2 is not required, as the grammatical relations of the two objects can be marked by their relative order in the construction, which is verb – theme (DO) – recipient (IO). In contrast, the prepositional dative construction is used for sentences which use other dative verbs, such as sung3 ‘send’ in (32b). The indirect object in these sentences is marked by the dative marker bei2.

(32) a. Double object construction with main verb bei2 ‘give’:

\[
\text{媽媽 俾 本 書 小朋友}
\]
\[
\text{maa4maa1 bei2 bun2 syu1 siu5pang4jau5}
\]
\[
\text{mother give CL book child}
\]
\[
\text{‘The mother gives the child a book.’}
\]

b. Prepositional dative construction with dative verb:

\[
\text{媽媽 送 本 書 俾 小朋友}
\]
\[
\text{maa4maa1 sung3 bun2 syu1 bei2 siu5pang4jau5}
\]
\[
\text{mother send CL book DAT child}
\]
\[
\text{‘The mother sends a book to the child.’}
\]
Both constructions were included in the experiment, creating a list of relative clauses using dative patterns with the verb 'give' and a list using dative patterns with other verbs. As the relative clauses in this comparison depicted a transfer of possession from the subject to the indirect object, the two NPs were always animate characters, and the direct object an inanimate entity. The examples in (33) and (34) illustrate a pair of sample stimuli for dative patterns with *bei* and with dative verbs. Note that the relativization strategies differ for the subject and indirect object relative clauses. While subject relative clauses use the gap strategy, indirect object relative clauses use the resumptive pronoun strategy. Therefore, in indirect object relative clauses, a resumptive pronoun (*keoi*) is found in the relativized position to mark the original location of the head NP in the relative clause.

(33) a. Subject relative clause with main verb *bei*:

> [subject] 俾 車車 媽媽] 唔 個 仔仔
> bei2 ce1ce1 maa4maa1 go2 go3 zai4zai2
give car mother that CL son
> ‘the son that gives the mother the car’

b. Indirect object relative clause with main verb *bei*:

> [subject] 俾 車車 佢] 唔 個 媽媽
zai4zai2 bei2 ce1ce1 keoi5 go2 go3 maa4maa1
son give car 3SG that CL mother
> ‘the mother that the son gives (her) the car’

(34) a. Subject relative clause with dative verb:

> [subject] 派 波波 俾 哥哥] 唔 個 姐姐
> paaai3 bo1bo1 bei2 go4go1 go2 go3 ze4ze1
give.out balloon DAT brother that CL sister
> ‘the woman that gives out a balloon to the man’

b. Indirect object relative clause with dative verb:

> [subject] 派 波波 俾 佢] 唔 個 哥哥
> ze4ze1 paaai3 bo1bo1 bei2 keoi5 go2 go3 go4go1
sister give.out balloon DAT 3SG that CL brother
> ‘the man that the woman gives out a balloon to (him)’

**Direct object vs. indirect object (DO-IO) comparison**

The direct object vs. indirect object (DO – IO) comparison examined the two object positions in ditransitive
relative clauses. A prepositional dative construction involving three animate characters was adopted to ensure the comparability of the direct object and indirect object. An example is given in (35).

(35) a. Direct object relative clause:

\[
\text{[RC 爸爸 推 俾 弟弟] 唔個 妹妹}
\]
\[
\text{baa4baa1 teoi1 bei2 dai4dai2 go2 go3 mui4mui2}
\]
\[
\text{father push DAT little.brother that CL little.sister}
\]
\[
\text{‘the little sister that the father pushes to the little brother’}
\]

b. Indirect object relative clause:

\[
\text{[RC 爸爸 推 妹妹 俾 佢] 唔個 弟弟}
\]
\[
\text{baa4baa1 teoi1 mui4mui2 bei2 keoi5 go2 go3 dai4dai2}
\]
\[
\text{father push little.sister DAT 3SG that CL little.brother}
\]
\[
\text{‘the little brother that the father pushes the little sister to (him)’}
\]

**Direct object vs. oblique (DO-OBL) comparison**

The relative clauses in the direct object vs. oblique (DO-OBL) comparison consisted of a locative prepositional phrase. While the direct object followed the verb in the relative clause, the oblique was located inside a prepositional phrase. In Cantonese, prepositions of location, such as *in* or *on*, are realized by two components: a grammaticalized verb *hoeng2* ‘at’ and an NP denoting the spatial relation of the noun. The verb *hoeng2* originally means ‘exist, be’, and is grammaticalized to express the prepositional meaning ‘at’. Whether the prepositional phrase bears the meaning of ‘in’, ‘on’, or ‘under’, etc. is determined by the spatial relation in the NP: N + spatial relation (*soeng6min* ‘top’, *baa6min6* ‘below’, *jap6min6* ‘inside’, *cin4min6* ‘front’, *baa6min6* ‘back’, etc). The noun and the spatial relation are expressed by a genitive construction, i.e. the [spatial relation] of the [N]. Therefore, to express the sense of the English preposition ‘on’, the Cantonese counterpart would be *hoeng2* [N] *soeng6min6* ‘at [N]’s top’. An example of the test stimuli is given in (36). The two targeted NPs are both inanimate objects to maintain equivalent animacy status. Similar to positions lower in the accessibility hierarchy as indirect object, oblique relative clauses in Cantonese are also relativized with the resumptive pronoun strategy.
ACQUISITION OF CANTONESE RELATIVE CLAUSES: GRAMMATICAL RELATIONS

(36) a. Direct object relative clause:
\[
[RC \text{ 男仔 擺 — 响 恐龍 後面} \text{ 嘢架車車} \\
\text{naam4zai2 bai2 hoeng2 hung2lung4 hau6min6 go2 gaa3 ce1ce1} \\
\text{boy place at dinosaur back that CL car} \\
\text{‘the car that the boy places behind the dinosaur’}
\]

b. Oblique relative clause:
\[
[RC \text{ 男仔 擺 車車 响 佢 後面} \text{ 嘢 隻 恐龍} \\
\text{naam4zai2 bai2 ce1ce1 hoeng2 keoi5 hau6min6 go2 zek3 hung2lung4} \\
\text{boy place car at 3SG back that CL dinosaur} \\
\text{‘the dinosaur that the boy places the car behind (it)’}
\]

The test items and visual stimuli were designed to ensure that the key contrast between each pair of relative clauses in each comparison was the grammatical relation of the relativized NP. Each test sentence was paired with a visual stimulus which consisted of a pair of pictures. Each picture consisted of two panels, in which the pictures depicted the same event and involved similar pairs of characters. The major difference between the two panels was that the thematic roles of the pair of characters were reversed. An example for each comparison is given in (37) – (41), and their corresponding visual stimulus in Figure 1 – Figure 5. Take the stimulus for the subject – direct object (S-DO) comparison in Figure 1 as an example, there is a girl and a boy in each panel. Moreover, both panels depict an act of chasing, but a boy is chasing a girl on the left panel, whereas a girl is chasing a boy on the right panel. Although similar, the characters in the two panels are different enough to avoid visual confusion. The target character and its location in the test pictures were counter-balanced across all trials and for all participants.

(37) S-DO comparison:

a. Subject relative clause:
\[
[RC \text{ 追 女仔} \text{ 嘢 個 男仔} \\
\text{zeoi1 neoi5zai2 go2 go3 naam4zai2} \\
\text{chase girl that CL boy} \\
\text{‘the boy that chases the girl’}
\]

b. Direct object relative clause:
\[
[RC \text{ 男仔 追 —} \text{ 嘢 個 女仔} \\
\text{naam4zai2 zeo1 go2 go3 neoi5zai2} \\
\text{boy chase that CL girl} \\
\text{‘the girl that the boy chases’}
\]
Figure 1. Sample visual stimulus for subject vs. direct object (S-DO) comparison.

(38) S-IO comparison with *bei2 ‘give’* as main verb:

a. Subject relative clause:

[ac__ 佢 車車 媽媽] 嘅 個 仔仔
bei2 ce1ce1 maa4maa1 go2 go3 zai4zai2
give car mother that CL son
‘the son that gives the mother the car’

b. Indirect object relative clause:

[ac 仔仔 佢 車車 佢] 嘅 個 媽媽
czi4zai2 bei2 ce1ce1 keoi5 go2 go3 maa4maa1
son give car 3SG that CL mother
‘the mother that the son gives (her) a car’

Figure 2. Sample visual stimulus for subject vs. indirect object (S-IO) comparison with *bei2 ‘give’* as main verb.

(39) S-IO comparison with dative verb:

a. Subject relative clause:

[ac派 波波 佢 哥哥] 嘅 個 姐姐
paa3 bo1bo1 bei2 go4go1 go2 go3 ze4ze1
give.out balloon DAT brother that CL sister
‘the woman that gives out a balloon to the man’

b. Indirect object relative clause:

[ac 姐姐 派 波波 佢 佢] 嘅 個 哥哥
ze4ze1 paa3 bo1bo1 bei2 keoi5 go2 go3 go4go1
sister give.out balloon DAT 3SG that CL brother
‘the man that the woman gives out a balloon to (him)’
Figure 3. Sample visual stimulus for subject vs. indirect object (S-IO) comparison with dative verb.

(40) DO–IO comparison:

a. Direct object relative clause:
   
   [RC 父爸 推 — 俾 弟弟] 嚅 個 妹妹
   baa4baa1 teoi1 bei2 dai4dai2 go2 go3 mui4mui2
   father push DAT little.brother that CL little.sister
   ‘the little sister that the father pushes to the little brother’

b. Indirect object relative clause:
   
   [RC 父爸 推 妹妹 俾 佢] 嚅 個 弟弟
   baa4baa1 teoi1 mui4mui2 bei2 keoi5 go2 go3 dai4dai2
   father push little.sister DAT 3SG that CL. little.brother
   ‘the little brother that the father pushes the little sister to (him)’

Figure 4. Sample visual stimulus for direct object vs. indirect object (DO-IO) comparison.

(41) DO-OBL comparison:

a. Direct object relative clause:
   
   [RC 男仔 擺 — 向 恐龍 後面] 嚅 架 車車
   naam4zai2 bai2 hoeng2 hung2lung4 hau6min6 go2 gaa3 ce1ce1
   boy place at dinosaur back that CL car
   ‘the car that the boy places behind the dinosaur’

b. Oblique relative clause:
   
   [RC 男仔 擁 — 向 恐龍 後面] 嚅 架 車車
   naam4zai2 bai2 hoeng2 hung2lung4 hau6min6 go2 gaa3 ce1ce1
   boy place at dinosaur back that CL car
   ‘the car that the boy places behind the dinosaur’
Three tokens were created for each type of relative clauses in each comparison, which made a total of 30 target trials in the experiment. Filler items were sentences of different syntactic constructions and interspersed among the target items. Four lists in pseudo-randomized orders were created, and counter-balanced across participants.

**Procedure.** A character selection task was adopted. It was a modified version of the common picture selection tasks, in which participants were required to choose a character instead of a picture. This modification was introduced to ensure that the response would correctly reflect the understanding of the function of a relative clause (which is to pick out an individual, not an event) and to minimize the possibility of a response based on semantic cues from the picture, picking the picture that merely matches the event described by the relative clause.

Participants were invited to participate in a ‘lucky star’ game. They were instructed that one of the four characters (or objects) should be given a star. The experimenter invited the participant to be the presenter, and their task was to give out the star to the character (or object) described by the sentence. In each trial, participants were presented first with the visual stimulus, and introduced to each character/object and the event depicted in the picture by the experimenter. They were then given the test item, and told to give the star to the appropriate person or object.

Each session was administered on an individual basis in a quiet separate room. Practice trials were given to the participants to ensure that they understand the task requirements.
Scoring and error coding. Participants’ responses were coded according to the location of the star on the picture. While a star on the target character was marked as a correct response, incorrect responses were categorized into three types of errors: Head error, Reversal error and Other error. Head errors involve the wrong choice of head noun — for example, pointing to a girl rather than a boy in response to a test item such as ‘the boy who is chasing the girl’. Reversal errors involve misinterpreting the grammatical role of the relativized element — for example, choosing the boy who the girl is chasing in response to a test item such as ‘the boy who is chasing the girl’. Other errors include choices of other irrelevant characters or objects in the picture, for example, the chasing girl.

4.1.2 Results

4.1.2.1 Accuracy

Children’s accuracy for each comparison is shown in Figure 6. Children achieved high accuracy in subject relative clauses, ranging from 76% to about 90%. The accuracy rates for direct object, indirect object and oblique relative clauses were at a comparable range, ranging from 43% - 55%.

Figure 6. Proportions of correct responses of different NP types for each comparison.

Four separate repeated measures ANOVAs were used to analyze the accuracy of each type of relative clause in each comparison. The results of each comparison are discussed in individual sessions below.
ACQUISITION OF CANTONESE RELATIVE CLAUSES: GRAMMATICAL RELATIONS

Subject vs. direct object (S-DO) comparison

With RC type (S vs. DO) as the within-subject variable, the analysis revealed a significant effect for RC type (F(1, 43) = 13.34, p<.001). This shows that children had a significantly higher rate of accuracy in the comprehension of transitive subject relative clauses than transitive direct object relative clauses.

Subject vs. indirect object (S-IO) comparison

Since both types of dative construction (depending on the type of dative verb in the sentence) were tested, the analysis included verb type (give vs. dative verb) as another within-subject variable in addition to RC type (S vs. IO). The effect of RC type was significant (F(1, 43) = 44.58, p<.001), but neither the effect of verb type (F(1, 43) = .8, p=.38) nor its interaction with RC type (F(1, 43) = 1.61, p=.21) was significant. This suggests that children found subject relative clauses easier to comprehend than indirect object relative clauses, and the two different ditransitive constructions did not yield any difference in performance. As the difference between the two verb types was not significant, the two different verb types in the S-IO comparison were collapsed into a single category in subsequent analyses.

Direct object vs. indirect object (DO-IO) comparison

With RC type (DO vs. IO) as the within-subject variable, the analysis revealed a non-significant effect for RC type (F(1, 43) = .27, p=.61). This suggests that neither direct object relative clauses nor indirect object relative clauses manifested an advantage over the other in children’s comprehension.

Direct object vs. oblique (DO-OBL) comparison

With RC type (DO vs. OBL) as the within-subject variable, the analysis revealed a non-significant effect for RC type (F(1, 43) = 1.66, p=.2). This suggests that children’s accuracy in the direct object and oblique relative clauses was not different from each other.
4.1.2.2 Error Analysis

The types of comprehension errors children committed in each comparison are discussed in individual sessions below.

Subject vs. direct object (S-DO) comparison

Figure 7a presents the proportion of different types of errors committed by children in the S – DO comparison. More head errors were observed in the direct object relative clause condition than in the subject relative clause condition (z=8.96, p<.001), and more reversal errors were found in the subject condition than in the direct object condition (z=5.84, p<.001).

Head errors were the predominant type of errors children committed in the direct object relative clause condition (z=11.23, p<.001). On the other hand, head errors were very rare in the subject relative clause condition, and reversal errors were the predominant type of errors children committed in the subject condition (z=3.36, p<.001).

Figure 7b further illustrates the distribution of subject and non-subject errors among children’s head errors.

As the events of the relative clauses in the S – DO comparison involved only two characters, all of the head errors in the direct object relative clause condition involved misinterpreting the subject as the target, whereas all of the head errors in the subject relative clause condition involved misinterpreting the direct object (the non-subject) as the target.

![Figure 7. Proportions of different types of comprehension errors in S-DO comparison.](image-url)
Subject vs. indirect object (S-IO) comparison

Figure 8a presents the proportion of different types of errors committed by children in the S – IO comparison. There were more head errors in the indirect object relative clause condition than in the subject relative clause condition ($z=10.42, p<.001$). Reversal errors, on the other hand, were only found in subject relative clause condition but not in the indirect object relative clause condition ($z=5.09, p<.001$).

While children had a strong tendency to commit head errors in the indirect object relative clause condition ($z=15.82, p<.001$), they did not show any tendency for the two types of errors in the subject relative clause condition ($z=.3, p=.76$), which basically had an extremely low proportion of errors.

Among the head errors children committed, all the head errors in the subject relative clause condition involved misinterpreting the indirect object as the target, and the head errors in the indirect object relative clause condition were (almost) exclusively misinterpretations of the subject as the target ($z=15.94, p<.001$).

a. Different types of errors:

b. Head errors:

Figure 8. Proportions of different types of comprehension errors in S-IO comparison.

Direct object vs. indirect object (DO-IO) comparison

Figure 9a presents the proportion of different types of errors committed by children in the DO – IO comparison. There were more head errors in the indirect object relative clause condition than in the direct object relative clause condition ($z=6.73, p<.001$). On the contrary, more reversal errors were found in the direct object relative clause condition than indirect object relative clause condition ($z=3.68, p<.001$).
Children showed a higher tendency to commit head errors than reversal errors in the indirect object relative clause condition \((z=6.73, p<.001)\). The tendency for committing reversal errors than for head errors was marginally higher in the direct object relative clause condition \((z=1.61, p=.05)\). Misinterpreting the subject as the target was also the predominant type of head errors for both types of relative clauses in the DO – IO comparison \((DO: z=6.17, p<.001; IO: z=4.45, p<.001)\). The tendency of misinterpreting the subject (than misinterpreting other non-subject characters in the event) as the target was significantly stronger in the direct object relative clause condition than in the indirect object relative clause condition \((z=2.21, p=.02)\), even though the indirect object relative clause condition had a higher proportion of subject errors than the direct object relative clause condition due to the greater number of errors elicited from children \((z= 4.67, p<.001)\).

Figure 9. Proportions of different types of comprehension errors in DO-IO comparison.

**Direct object vs. oblique (DO-OBL) comparison**

Figure 10a presents the proportion of different types of errors committed by children in the DO – OBL comparison. Although the oblique relative clause condition elicited numerically more head errors and reversal errors than the direct object relative clause condition, the difference was insignificant in both types of errors (head errors: \(z=.91, p=.36\); reversal errors: \(z=.03, p=.98\)).
ACQUISITION OF CANTONESE RELATIVE CLAUSES: GRAMMATICAL RELATIONS

There was a stronger tendency for children to commit reversal errors in the direct object relative clause condition \((z=2.06, p=.04)\), however, both types of errors were equally prevalent in the oblique relative clause condition \((z=1.35, p=.18)\).

As for the composition of the head errors, children had a marginally higher tendency to misinterpret the subject as the target referent in the direct object relative clause condition than in the oblique relative clause condition \((z=1.95, p=.05)\). In the direct object relative clause condition, the subject was misinterpreted as the target more frequently than the non-subject argument \((z=2, p=.04)\). Yet, there was a slight prevalence for misinterpreting a non-subject argument as the target for the oblique relative clause condition \((z=1.91, p=.05)\), of which children unanimously chose the inanimate direct object as the target.

a. Different types of errors:  

b. Head errors:

Figure 10. Proportions of different types of comprehension errors in DO-OBL comparison

Summary of the error analysis

Figure 11 presents the proportion of different types of errors committed by children across the four comparisons.
Head errors were the predominant type of errors children committed, and were mainly found in relative clauses that involved relativization of lower positions in the hierarchy: DO in the S – DO comparison, IO in the S – IO comparison, and IO in the DO – IO comparison, except in the DO – OBL comparison, which the difference between DO and OBL in the DO – OBL comparison was not significant. At the same time, these lower positions also had a stronger tendency for head errors, except for OBL in the DO – OBL comparison, which the difference between the two types of errors was not significant.

On the contrary, reversal errors were more prevalent in relative clauses of higher positions: S in S – DO comparison S in S – IO comparison, and DO in DO – IO comparison, except in the DO – OBL comparison, where the difference was not significant. Relative clauses of higher positions also showed a higher tendency for reversal errors: S in S – DO comparison and DO in DO – OBL comparison, and merely significant in DO in DO – IO comparison, except in S – IO comparison, which basically had an extremely low proportion of errors.

More than 80% of the head errors involved the children treating the subject of the relative clause as the target referent. Figure 12 shows the distribution of subject and non-subject errors among the different types of relative clauses across the four comparisons. The head errors for both of the non-subject relative clauses in the S – DO and S – IO comparisons, i.e. direct object and indirect object relative clauses, were (almost)
exclusively subject errors. Misinterpreting subject as the target referent was also the predominant type of head errors for both types of relative clauses in the DO – IO comparison. Children were more likely to misinterpret the subject as the head in the direct object condition than in the indirect object condition. Whereas children were more likely to misinterpret the subject as the target in the direct object relative clause condition in the DO – OBL comparison, they were more likely to choose the inanimate direct object as the target in the oblique relative clause condition.

Figure 12. Proportions of different types of errors in children’s comprehension.

4.1.3 Interim Discussion: Children’s Comprehension

The experiment has established the following asymmetries in the four pairwise comparisons in relative clause comprehension by Cantonese-speaking children, as shown in (42).

(42) Contrasts in relative clause comprehension for Cantonese children:

a.  S > DO

b.  S > IO

c.  DO = IO

d.  DO = OBL

A dichotomy was observed in children’s errors: head errors were most prevalent in patterns that relativized lower positions (direct object relative clauses in the S – DO comparison, indirect object relative clauses in the S – IO comparison, and indirect object relative clauses in the DO – IO comparison), whereas reversal errors
were more prevalent in patterns that relativized higher positions (subject relative clauses in S – DO comparison, direct object relative clauses in DO – IO comparison and direct object relative clauses in DO – OBL comparison). Most head errors involved reinterpreting a head as a subject. Except for oblique relative clauses, which showed a stronger tendency for errors that involved misinterpreting the head as a direct object, a tendency to misinterpret the head as subject dominated in all other types of relative clauses. In fact, the dichotomy of children’s comprehension errors seems to be better explained by the constituent order of the relative clauses. Those types of relative clauses in which head errors were more prevalent had a surface resemblance with main clauses, whereas those in which reversal errors were more prevalent had a surface dissemblance with main clauses. The underlying mechanisms of the acquisition of relative clauses by Cantonese children and their respective patterns of errors will be further discussed in § 4.3.

4.2 Experiment 2: The role of grammatical relations on the production of Cantonese relative clause

In order to investigate whether children have the same preference for subject relative clauses and experience the same hierarchy of processing difficulty in their production, Experiment 2 explored children’s production of Cantonese relative clauses with an elicited production task. Adults were also tested to provide a basis for reference of the properties of Cantonese relative clauses.

4.2.1 Method

Participants. Adult participants were thirty-four undergraduate students of the University of Hong Kong. They had all been born in Hong Kong, and Cantonese was their first language. They were compensated for their participation.

56 Cantonese-speaking children from a local kindergarten in Hong Kong participated in this experiment. Among the 56 children, 48 of them had also participated in Experiment 1. The children’s ages ranged from 4;05.24 – 7;08.05 (mean age: 5;07.20). Children were provided with a small gift for their participation. Six
children failed to complete the task, and one child only repeated the probe sentences. Counting the children who were excluded because of their language background (two also failed to complete the task), a total of eight children were excluded, bringing the sample to a total of 48 participants in subsequent analysis.

**Materials.** The sentences targeted in the elicited production task were the same set of linguistic stimuli used in Experiment 1. Adopting the pictures from the character selection task as the base picture, the visual stimuli in the current experiment consisted of a set of three pictures: background description, target and prompt, as shown in Figure 13 and the target sentence in (43). The Background Description picture (a) presented the context for each trial. In the Target picture (b), an event occurred involving only the target character. In the example, the Little Fairy appeared and pointed at the target character with the wand. This set-up provided a felicitous condition to motivate children to use restrictive relative clauses to describe the target referent (Hamburger and Crain, 1982). The Prompt picture was used to encourage children to resort to a verbal response in communication with the computer character instead of just pointing at the target on the screen to show the answer to the experimenter.

(43) Subject relative clause:

\[
\text{[RC 追 女仔] 嚐 個 男仔} \\
\text{zeoi1 neoi5zai2 go2 go3 naam4zai2} \\
\text{chase girl that CL boy} \\
\text{‘the boy that chases the girl’}
\]

Figure 13. Sample test trial for production.
**Procedure.** Participants took part in a game designed to elicit relative clauses, a modified version of the protocol in McDaniel et al. (1998), Zukowski, (2009) and Hsu et al. (2009). The modified version replaced the original naïve observer experimenter with a computer character. The computer character (for example, Bunny in Figure 13c) communicated with the participants through voice chatting. This modification enabled the successful execution of an elicited production task even with one experimenter.

Participants were invited to have a video chat with the computer character, Bunny, in front of the computer and tell the computer character what they see on the screen. There were a few practice trials to familiarize the participants with the experimental procedure and to ensure they are immersed in the mode of communication with the computer character. The experimenter began each trial by first describing the scene to the participants. All descriptions were simple declarative sentences, providing the participants with the necessary vocabulary, including the labels for each character and the action for each event, to form the relative clauses. The corresponding lead-in sentences and prompt questions used for each phase of the example given in Figure 13 are illustrated in the captions. Participants were told that the computer character could not see what was happening on their side, for example what was shown on the screen and where their finger was pointing at. Since the computer character could not see what the participants saw, the participants were compelled to produce highly informative verbal descriptions throughout the experiment — hence the need for relative clauses. All trials required the participants to identify a particular character in the picture, and the most effective way to depict the target was to use a relative clause. The computer character would ask for a better description from the participants if they responded by pointing or their response did not provide a description that could clearly depict the target character, such as a simple NP (e.g. ‘the boy’), the side of appearance (e.g. ‘the left one’), or order of mention (e.g. ‘the second one’). Positive feedback from both the experimenter and the computer character were given after every trial, regardless of whether the response was target-like.

Those who participated in both the comprehension (Experiment 1) and production experiment (the current experiment) were always tested on their production first to avoid any priming effect from the test sentences.
ACQUISITION OF CANTONESE RELATIVE CLAUSES: GRAMMATICAL RELATIONS

in the comprehension experiment. There was an interval of at least a week (up to a month) between the two tasks to minimize influence from previous task.

**Scoring and error coding**: Participants’ utterances were transcribed by the experimenter, and checked by another researcher unaware of the goals of the study. Following Arnon (2009), if more than one answer was given, the utterance coded for a particular trial was the first response that uniquely described one of the entities, regardless of whether a relative clause was included. Therefore, if a child produced four responses for a particular test item, as given in (44), the third response would be coded as the response for that particular trial as that was the first response that described a particular referent.

(44) Response 1: This one. (a deitic phrase)
   Response 2: The boy chases the girl. (a simple matrix clause)
   Response 3: The boy that he chases the girl (ungrammatical RC)
   Response 4: The boy that chases the girl (grammatical RC)
   ⇒ Response coded for this trial: Response 3

Responses were then scored for their "accuracy": 1 for grammatical on-target responses, and 0 for non-target and incorrect responses. An accurate response was defined as a response that included a relative clause that matched the target type of the elicitation condition.

Responses that are considered as non-target included both non-target relative clause responses and non-relative clause responses. Non-relative clause responses did not contain a relative clause, such as matrix clauses, genitive NPs (e.g. *the girl’s mother*), and adjectivals (e.g. *the white boy, the one at the back*). Non-target relative clause responses contained a non-target type of relative clause. Although usually pragmatically appropriate, these relative clauses often involved a change of relative clause type, which suggested the speakers’ intention to strategically avoid the targeted relative clause type and their preference for the produced relative clause type. These included relative clauses with an alternative syntactic structure (e.g., a passivized subject RC instead of a direct object RC), and a predicate change that led to the change in type of relative
clause (e.g. verb of receiving instead of verb of giving). Another type of non-target responses was those with an unorthodox construction, such as internally headed relative clauses. This type was also treated as non-target because such constructions are not considered grammatical in Cantonese.

Incorrect responses failed to fulfill the function of linguistically discriminating the target. In addition to ungrammatical sentences or incorrect reference to the distractor, this category also included responses that did not clearly identify the target, such as head naming (e.g. girl) and demonstratives (e.g. this one).

4.2.2 Results & Discussion

4.2.2.1 Adults

4.2.2.1.1 Proportion of target production

Figure 14 shows the types of responses elicited from adults in the different types of relative clause elicitation conditions in each comparison. A high proportion of relative clause responses (RC), including both target and non-target relative clauses, was successfully elicited in each condition. Only a small proportion of responses consisted of matrix clauses or adjectivals (Adj, e.g. the blue boy). Genitive NPs (GEN NP, e.g. the girl's mother), topicalization constructions (TOP) and errors (e.g. demonstrative or simple NP) were not found in adults’ production.

Figure 14. Proportions of different types of responses elicited from adults in different comparisons.

Figure 15 shows the proportion of target production in different types of relative clauses across the five comparisons. All three types of subject relative clause conditions elicited a large proportion of target
Production from adults, achieving more than 70% of target responses. Success on the other three types of relative clauses was relatively low. Direct object relative clauses ranged from about 13% to 17% in different constructions, while indirect object relative clauses ranged from 18% to 28%. Oblique relative clauses had the lowest target production, which was only about 8%.

Figure 15. Proportions of adults’ target production across comparisons.

Four separate repeated measures ANOVAs were used to analyze the accuracy of each type of relative clauses in each comparison. The results of each comparison are discussed in individual sessions below.

Subject vs. direct object (S-DO) comparison

With RC type (S vs. DO) as the within-subject variable, the analysis revealed a significant effect for RC type (F(1, 35) = 119.5, p < .001). This shows that adults produced significantly more target subject relative clauses than direct object relative clauses.

Subject vs. indirect object (S-IO) comparison

With RC type (S vs. IO) and verb type (give vs. dative verb) as within-subject variables, the analysis revealed a significant effect for RC type (F(1, 35) = 45.65, p < .001), but neither the effect of verb type (F(1, 35) = .03, p=.87) nor its interaction with RC type (F(1, 43) = 1.2, p=.28) was significant. This suggests that, despite the difference in the two ditransitive construction, adults had more target subject relative clauses than indirect object relative clauses. As the difference between the two verb types was not significant, the two comparisons
which involved different verb types in the S-IO comparison were collapsed as one single category in subsequent analyses.

*Direct object vs. indirect object (DO-IO) comparison*

With RC type (DO vs. IO) as the within-subject variable, the analysis revealed a non-significant effect for RC type ($F(1, 35) = .78, p=.29$). This suggests that the proportion of target production for direct object and indirect object relative clauses for adults was at a comparable level.

*Direct object vs. oblique (DO-OBL) comparison*

With RC type (DO vs. OBL) as the within-subject variable, the analysis revealed a non-significant effect for RC type ($F(1, 35) = 2.43, p=.13$). This suggests that the proportion of target production in direct object and oblique relative clauses did not differ.

### 4.2.2.1.2 Patterns of adults’ relative clauses

Relative clause responses are those responses which contain a target or non-target relative clause. Target relative clauses conform to the expected target form. Variations which are acceptable in the language are allowed, such as headlessness, variations in relative marker (e.g. varying among $ge2+CL, ge3, CL,$ etc.), or variations in constituents (e.g. noun or verb) that did not alter the syntactic structure of the relative clause, such as *naam4tsai* ‘boy’ → *sin5pang4jaau5* ‘kid’ and *laai1* ‘pull’ → *to1* ‘drag’. Non-target relative clauses manifest a change of the relative clause type, such as a subject relative clause in the direct object relative clause condition, a change in the syntactic structure, such as passivized subject relative clauses and gap-type indirect object relative clauses (instead of using a resumptive pronoun), and unorthodox relative clause constructions that are not acceptable in Cantonese, such as internally headed relative clauses (IHRC) and relative clauses with resumptive NPs (RNP).
ACQUISITION OF CANTONESE RELATIVE CLAUSES: GRAMMATICAL RELATIONS

Figure 16 shows the distribution of different types of relative clause responses in each comparison.

![Figure 16. Distribution of relative clause responses in adults’ production.](image)

The types of responses are listed from left to right according to the proposed ranking on the accessibility hierarchy, with the two unorthodox relative clause constructions (IHRC and RNP) on the right end. The relative clauses produced by adults were substantially subject relative clauses. Subject (of transitive and ditransitive) and passivized subject relative clauses dominated adults’ relative clause production. The following sections will examine individually the patterns of the various types of relative clause responses in each comparison.

Subject vs. direct object (S-DO) comparison

While subject relative clauses in the subject condition (87.5%, 91 out of 104 relative clause responses) were predominantly target relative clauses (95.6%, 87/91), the subject relative clauses produced in the direct object condition (78.7%, 78 out of 99 relative clause responses) were predominantly passivized subject relative clauses (97.4%, 76/78). An example is given in (15). The original direct object in the relative clause is promoted to the subject position by passivization, resulting a subject relative clause in production.

(45) Passivized subject relative clause in DO condition:

```
[rc_  俾  男仔 追  _] 嗎 個 女仔  
bei2  naam4zai2 zeoi1 go2 go3 neoi5zai2 
PASS  boy chase that CL  girl  
'the girl that is chased by the boy'
```
The passive voice construction in Cantonese is marked by the passive marker *bei2*, and the *bei2* phrase is considered the counterpart to the English by-phrase (Lau, 2011). Unlike English, the *bei2* phrase is obligatory in the passive voice construction².

Although most of the subject relative clauses were target relative clauses, there were a few non-target subject relative clauses in which participants only described the properties of the head NP (4.4%, 4/91). These involved an intransitive expressing the location or the state of the entity (46a), or a transitive describing the appearance of the entity, which usually involves an inanimate direct object, such as glasses in (46b).

(46) a. [RC ___ 喺 後便] 嘅 個 男仔
   hai2 haaü6bin6 go2 go3 naam4zai2
   ‘the boy that is at the back’

   Target:
   [RC ___ 追 女仔] 嘅 個 男仔
   zeo1 neoi5zai2 go2 go3 naam4zai2
   ‘the boy that chases the girl’

   Target:
   [RC ___ 戴 眼鏡] 嘅 個 
   daai3 ngaan5geng5 go2 go3
   ‘the one that wears glasses’

   Target:
   [RC ___ 叫 婆婆] 嘅 個 伯伯
   giu3 po4po2 go2 go3 baak3baak3
   ‘the old man that calls granny’

---
² The demoted subject in the *bei2* phrase is allowed to be omitted in literal Chinese, which is equivalent to the passive voice construction in Mandarin Chinese, e.g. nühai beí (nanhai) zhuí-le ‘the girl is chased (by the boy)’. Out of the 99 relative clause responses in the DO elicitation, two instances of the literal Chinese passives were found, and they were coming from the same participant.
Subject vs. indirect object (S-IO) comparison

As was the case with S–DO comparison, subject relative clauses in the subject condition (90.7%, 88 out of 97 relative clause responses in the give condition; 89.7%, 87 out of 97 relative clause responses in the dative verb condition) were largely target relative clauses (88.6%, 78/88 in the give condition; 86.2%, 75/87 in the dative verb condition). There were also a few instances of intransitives of existence, as in (46), and transitives describing the action of the target referent, as in (47) (4.5%, 4/88 in the give condition; 8%, 7/87 in the dative verb condition).

(47) [RC __ 擔住 四 個 氣球] 嗯 姐姐
    lo2zyu6 sei3 go3 hei3kau4 ge3 ze4ze1
    hold-CONT four CL balloon REL sister
    ‘the woman that is holding four balloons’

Target:

[RC __ 派 波波 俾 哥哥] 嘅 個 姐姐
    paa1 bo1bo1 bei2 go4go1 go2 go3 ze4ze1
    give.out balloon DAT brother that CL sister
    ‘the woman that gives out a balloon to the man’

Yet, a type of non-target subject relative clauses involved transitivizing the ditransitive verb and removed the indirect object, as shown in (48) (6.8%, 6/88 in the give condition; 5.7%, 5/87 in the dative verb condition).

The resulting transitive clause implies that the agent is performing the dative action without a targeted recipient.

(48) [RC __ 派 波波] 嘅 個 姐姐
    paa1 bo1bo1 go2 go3 ze4ze1
    give.out balloon that CL sister
    ‘the woman that gives out balloons’

Target:

[RC __ 派 波波 俾 哥哥] 嘅 個 姐姐
    paa1 bo1bo1 bei2 go4go1 go2 go3 ze4ze1
    give.out balloon DAT brother that CL sister
    ‘the woman that gives out a balloon to the man’

Adults also manifested a strong tendency to respond using subject relative clauses in response to indirect
object elicitation (52.6%, 50 out of 95 relative clause responses in the give condition; 49%, 49 out of 100 relative clause responses in the dative verb condition); however, instead of using the passivization strategy as observed in transitive direct object relative clauses, these subject relative clauses often use a verb of receiving in lieu of the dative verb (94%, 47/50 in the give condition; 91.8%, 45/49 in the dative verb condition). This changes the focus from the agent (the original subject) to the recipient (the original indirect object) and turns the recipient into the subject of the resulted relative clause. Examples of subject relative clauses using a verb of receiving are given in (49a) – (49c).

(49) a. Transitive subject relative clause:

\[
\text{[RC } \text{收心心] 嘅 男仔}
\]
\[
sau1 \text{ sam1sam1 ge3 naam4zai2 receive heart REL boy}
\]

‘the boy that receives a heart’

b. Transitive subject relative clause with original subject as the possessor of the direct object:

\[
\text{[RC } \text{收女仔個心心] 嘅個男仔}
\]
\[
sau1 neoi5zai2 go3 sam1sam1 go2 go3 naam4zai2 receive girl CL heart that CL boy
\]

‘the boy that receives the girl’s heart’

c. Transitive subject relative clause with an embedded direct object relative clause:

\[
\text{[RC } \text{收到}[\text{RC}2 女仔 們] 嘅心心]} 嘅男仔
\]
\[
sau1 dou3 neoi5zai2 bei2 ge3 sam1sam1 ge3 naam4zai2 receive girl give REL heart REL boy
\]

‘the boy that receives the heart that the girl gives’

d. Transitive subject relative clause with an embedded indirect object relative clause:

\[
\text{[RC } \text{等緊}[\text{RC}2 女仔 們] 們}} 嘅個男仔
\]
\[
dang2gan2 neoi5zai2 bei2 go3 sam1 keoi5 go2 go3 naam4zai2 receive girl give CL heart 3SG that CL boy
\]

‘the boy that is waiting for the girl to give (him) the heart’

Target:

\[
\text{[RC 女仔 們心心}} 們}} 嘅個男仔
\]
\[
neoi5zai2 bei2 sam1sam1 keoi5 go2 go3 naam4zai2 girl give heart 3SG that CL boy
\]

‘the boy that the girl gives (him) a heart’

Several strategies were used by the adults to handle the original agent in the new relative clause. One way is to completely omit the agent, resulting in a transitive clause with only an object argument, as shown in (49a).
Another is to encode the agent as a possessor of the object (e.g. the girl’s heart) in the transitive relative clause, as shown in (49b). The third way is to modify the object with a relative clause using the original relative clause (e.g. the heart that the girl is giving), which renders a dual relative clause construction, in which a relative clause is embedded in another relative clause, as shown in (49c). This may make it easier to process the relative clause by breaking down the more complex ditransitive relative clause into two simple transitive relative clauses. An additional strategy is illustrated in (49d), in which the intended indirect object relative clause is converted into a subject relative clause. All these variations suggest that what motivates these alternations is not the complexity of the clause but rather a preference for the head NP to be subject of the relative clause.

The low rate of passivized subject relative clauses in the S – IO comparison (6%, 3/50 in the give condition; 6.1%, 3/49 in the dative verb condition) is possibly due to the marginal acceptability of upgrading an indirect object to subject in Cantonese. The examples in (50) give two instances of relative clauses produced by adults upgrading the indirect object. The difference between (50a) and (50b) is the relativization strategy used for the indirect object position. (50a) marks the indirect object position with a resumptive pronoun, whereas (50b) leaves it as a gap.

(50) a. [rc __ 俾 女仔 俾 個 心 佢] 嘅 個 男仔
    beii2 neoi5zai2 beii2 go3 sam1 keoi5 go2 go3 naam4zai2
    PASS girl give CL heart 3SG that CL boy
    ‘the boy that is given a heart to (him) by the girl’

    Target:
    [rc 女仔 俾 心心 佢] 嘅 個 男仔
    neoi5zai2 beii2 sam1sam1 keoi5 go2 go3 naam4zai2
    girl give heart 3SG that CL boy
    ‘the boy that the girl gives a heart to (him)’

b. [rc __ 俾 兔仔 送 禮物 __] 嘅 個 熊仔
    beii2 tou3zai2 sung3 lai5mat6 go2 go3 hung4zai2
    PASS bunny send gift that CL teddy
    ‘the teddy that is sent a gift to by the bunny’

    Target:
Gap-type indirect object relative clauses are supposedly not allowed in Cantonese; however, quite a significant proportion of such patterns were found in adults' production (9.5%, 9 out of 95 relative clause responses in the give condition; 14%, 14 out of 100 relative clause responses in the dative verb condition). The relativized position in these relative clauses is left empty, instead of being marked by a resumptive pronoun. The gap could be an NP gap with the dative marker bei2 being left stranded, as in (51a) or (51c). It could also be a PP gap, for which the entire bei2-phrase is omitted, as in (51b) or (50b).

(51) Gap-type indirect object relative clause with main verb 'give':
   a. [RC 有 個 仔 俾 架 車 佢 __] 咦 個 媽咪
      jau5 go3 zai2 bei2 gaa3 ce1 bei2 gc3 go2 go3 maa1mi4
      exist CL son give CL car DAT REL that CL mommy
      ‘the mommy that a son gives a car to’

   b. [RC 細路仔 個 車車 __] 唸 個 媽媽
      sai3lou6zai2 bei2 ce1ce1 go2 go3 maa4maa1
      child give car that CL mother
      ‘the mother that the child gives a car’

Target:
   [RC 仔仔 俾 架 車 佢] 咦 個 媽咪
   zai4zai2 bei2 gaa3 ce1 keoi5 go2 go3 maa4maa1
   son give CL car 3SG that CL mother
   ‘the mother that the boy gives (her) a car’

Gap-type indirect object relative clause with dative verb 'send':
   c. [RC 兔兔 送 禮物 俾 __] 嚇 隻 熊仔
      tou3tou3 sung3 lai5mat6 bei2 go2 go3 hung4zai2
      bunny send gift DAT that CL teddy
      ‘the teddy that the bunny sends a gift to’

Target:
   [RC 兔仔 送 禮物 俾 佢] 嚇 隻 熊仔
   tou3zai2 sung3 lai5mat6 bei2 keoi5 go2 zek3 hung4zai2
   bunny send gift DAT 3SG that CL teddy
   ‘the teddy that the bunny sends a gift to (it)’
Direct object vs. indirect object (DO-IO) comparison

As was the case with the transitive direct object relative clause condition in the S – DO comparison, passivized subject relative clauses were the most prevalent type of responses in the ditransitive direct object relative clause condition in this comparison (70.3%, 71 out of 101 relative clause responses). Among the passivized subject relative clauses, more than half was detransitivizing a transitive predicate (instead of the original ditransitive predicate) with the indirect object removed (62%, 44/71), as in (52a); in other instances, the full ditransitive clause was passivized (38%, 30/71), as in (52b). In a few instances, the indirect object becomes an oblique in a directional prepositional phrase, indicating the goal of the action, as in (52c). The prepositional phrase allows the relative clause to become a simple transitive passive construction, while still accurately describing the scene.

(52) a. \[rc __ 俾 爸爸 推 ___ 嘅 男仔 \]
\[bei2 baa4baa1 teoi1 ge3 naam4zai2 PASS father push REL boy \]
‘the boy that is pushed by the father’

b. \[rc __ 俾 爸爸 推住 ___ 俾 個 女仔] 嘅 男仔 \]
\[bei2 baa4baa1 teoi1zyu6 bei2 go3 neoi5zai2 ge3 naam4zai2 PASS father push-CONT DAT CL girl REL boy \]
‘the boy that is pushed to the girl by the father’

c. 小朋友 係 \[rc __ 俾 爸爸 推緊 ___ 向 個 女仔] 嘅 男仔 \]
\[siu5pang4jau5 hai6 bei2 baa4baa1 teoi1gan2 hoeng3 go3 neoi5zai2 ge3 child be PASS father push-PROG towards CL girl REL \]
‘the child is the one that is being pushed by the father towards the girl’

Target:
\[rc 爸爸 推 ___ 俾 女仔] 嘅 個 男仔 \]
\[baa4baa1 teoi1 bei2 neoi5zai2 go2 go3 naam4zai2 father push PASS girl that CL boy \]
‘the boy that the father pushes to the girl’

A minor type of non-target relative clauses found in the direct object relative clause condition is the omission of the indirect object in the relative clause (4%, 4 out of 101 relative clause responses), resulting in transitive direct object relative clauses, as shown in (53).
ACQUISITION OF CANTONESE RELATIVE CLAUSES: GRAMMATICAL RELATIONS

(53) 
\[
\begin{align*}
\text{Target:} & \quad [\text{RC: 大笨象 擒住 } \_ \_ ] \quad 喀 \quad 熊仔 \\
& \quad \text{daai6ban6zoeng6} \quad lo2zyu6 \quad ge3 \quad hung4zai2 \\
& \quad \text{elephant} \quad \text{hold} \quad \text{REL} \quad \text{teddy}
\end{align*}
\]
\begin{align*}
\text{‘the teddy that the elephant is holding’}
\end{align*}

As for the indirect object relative clause condition, a significant proportion of responses were subject relative clauses (38.1%, 37 out of 97 relative clause responses), as was the case in the indirect direct object condition in the S – IO comparison. Similar strategies were used in treating (or incorporating the original subject) into the relative clause. An example of the strategies used is given in (54).

(54) a. Intransitive subject relative clause:
\[
\begin{align*}
\text{[RC: 喀 地下] 喀 個} \\
& \quad \text{hai2} \quad \text{dei6haa2} \quad \text{go2} \quad \text{go3} \\
& \quad \text{locate} \quad \text{ground} \quad \text{that} \quad \text{CL}
\end{align*}
\]
\begin{align*}
\text{‘the one that is on the ground’}
\end{align*}

b. Transitive subject relative clause with verb of receiving:
\[
\begin{align*}
\text{[RC: 接住 豬豬] 喀 隻 大笨象} \\
& \quad \text{zip3zyu6} \quad \text{zyu1zyu1} \quad \text{go2} \quad \text{zek3} \quad \text{daai6ban6zoeng6} \\
& \quad \text{catch-CONT} \quad \text{piggy} \quad \text{that} \quad \text{CL} \quad \text{elephant}
\end{align*}
\]
\begin{align*}
\text{‘the elephant that is catching the piggy’}
\end{align*}

c. Transitive subject relative clause with embedded direct object relative clause:
\[
\begin{align*}
\text{[RC1: 接住 [RC2: 熊貓 俾] 喀 豬] 喀 隻 大笨象} \\
& \quad \text{zip3zyu6} \quad \text{hung4maau1} \quad \text{bei2} \quad \text{ge3} \quad \text{zyu1} \quad \text{ge3} \quad \text{daai6ban6zoeng6} \\
& \quad \text{catch-CONT} \quad \text{panda} \quad \text{DAT} \quad \text{REL} \quad \text{piggy} \quad \text{REL} \quad \text{elephant}
\end{align*}
\]
\begin{align*}
\text{‘the elephant that is receiving the piggy that the panda gives’}
\end{align*}

\begin{align*}
\text{Target:} & \quad [\text{RC: 熊貓 吊 豬豬 俾 佢} \_ \_ ] \quad 喀 隻 大笨象 \\
& \quad \text{zung6zoeng6} \quad byun1 \quad \text{bei2} \quad \text{lou2fu5} \quad \text{go2} \quad \text{zek3} \quad \text{hung4zai2} \\
& \quad \text{panda} \quad \text{hang} \quad \text{piggy} \quad \text{DAT} \quad 3SG \quad \text{that} \quad \text{CL} \quad \text{elephant}
\end{align*}
\begin{align*}
\text{‘the elephant that the panda hangs down the piggy to (him)’}
\end{align*}

d. Transitive subject relative clause with embedded indirect object relative clause:
\[
\begin{align*}
\text{[RC1: 等緊 [RC2: 個 熊貓 推個 豬 俾 佢] 喀 熊仔} \\
& \quad \text{dang2gan2} \quad \text{go3} \quad \text{hung4maau1} \quad \text{teo1} \quad \text{go3} \quad \text{zyu1} \quad \text{bei2} \quad \text{keoi5} \quad \text{ge3} \quad \text{hung4zai2} \\
& \quad \text{wait-PROG} \quad \text{CL} \quad \text{panda} \quad \text{push} \quad \text{CL} \quad \text{piggy} \quad \text{DAT} \quad 3SG \quad \text{REL} \quad \text{teddy}
\end{align*}
\]
‘the teddy that is waiting for the panda to push the piggy to (him)’

Target:

\[ \text{RC} \text{熊貓 托 豬豬 俾 佢]
hung4maau1 tok3 zyu1zyu1 bei2 keoi5 go2 zek3 hung4zai2
panda lift piggy DAT 3SG that CL teddy
‘the teddy that the panda lifts piggy to (him)’

Besides the passivized subject relative clauses with a full ditransitive construction (40%, 6/15), as in (55), a larger proportion of the passivized subject relative clauses (53.3%, 8/15) elicited in the indirect object relative clause condition (15.5%, 15 out of 97 relative clause responses) consisted of a negated predicate, with either mou5 ‘not have’ or m4 hai6 ‘not be’, as shown in (56). Instead of depicting the scene using a ditransitive construction, adults chose to contrast between the two non-agent entities.

(55) [RC 俾 大象 捧住 隻 熊仔 俾 佢] 嗰 個
bei2 daai6zoeng6 pung2zyu6 zek3 hung4zai2 bei2 keoi5 go2 go3
PASS elephant hold CL teddy DAT 3SG that CL
‘the one that is given the teddy holding by the elephant’

Target:

[RC 象象 搬 熊仔 俾 佢] 嗰 隻 老虎
zoeng6zoeng6 bun1 hung4zai2 bei2 keoi5 go2 zek3 lou2fu5
elephant deliver teddy DAT 3SG that CL tiger
‘the tiger that the elephant delivers the teddy to (it)’

(56) a. [RC 唔係 俾 人 捧住 一] 嗰 個
m4hai6 bei2 jan4 pung2zyu6 go2 go3
not.be PASS person hold that CL
‘the one that is not held up by someone’

b. [RC 有 俾 爸爸 托 一] 嗰 個 男仔
mou5 bei2 baa4baa1 tok3 go2 go3 naam4zai2
not.be PASS father support that CL boy
‘the boy that is not supported by father’

Target:

[RC 爸爸 抬 女女 俾 佢] 嗰 個 仔仔
baa4baa1 toi4 neoi4neoi2 bei2 keoi5 go2 go3 zai4zai2
father lift daughter DAT 3SG that CL son
‘the son that the father lifts the daughter to (him)’

Gap-type indirect object relative clauses were also found in this comparison (10.3%, 10 out of 97 relative clause responses). An NP gap was more common than a PP gap, of which there were only two instances. Examples of an NP gap variant and a PP gap variant are given in (57a) and (57b) respectively.
(57) a. Gap-type indirect object relative clauses with NP gap:

\[
\begin{array}{ll}
\text{[RC 隻 熊貓 吊緊 隻 豬仔 俾 未 象象]} & \text{喺 一 隻 大笨象} \\
\text{zek3 hung4maau1 diu3gan2 zek3 zyu1zai2 bei2 go2 jat1 zek3 daai6ban6zoeng6} \\
\text{CL panda hang-PROG CL piggy DAT that one CL elephant} \\
\end{array}
\]

‘the elephant that the panda is hanging down the piggy to’

b. Gap-type indirect object relative clauses with PP gap:

\[
\begin{array}{ll}
\text{[RC 熊貓 俾緊 隻 豬 未]} & \text{喺 個} \\
\text{hung4maau1 bei2gan2 zek3 go2 go3} \\
\text{panda give-PROG CL piggy DAT that} \\
\end{array}
\]

‘the one that the panda is giving the piggy’

Target:

\[
\begin{array}{ll}
\text{[RC 熊貓 吊 豬 豬仔 俾 佢 象象]} & \text{喺 一 隻 大笨象} \\
\text{hung4maau1 diu3 zyu1 zyu1 bei2 keoi5 go2 zek3 zoeng6zoeng6} \\
\text{panda hang piggy DAT 3SG that CL elephant} \\
\end{array}
\]

‘the elephant that the panda hangs down the piggy to (him)’

There were several genitive relative clauses in the indirect object relative clause condition (3.1%, 3 out of 97 relative clause responses), as shown in (58). The genitive occurs inside the subject NP in (58a), and occurs within a locative oblique in (58b).

(58) a. Genitive subject relative clause:

\[
\begin{array}{ll}
\text{[RC 個 頭 有 橙色 髮飾] 佢 女仔} \\
\text{go3 tau4 jau5 caang2sik1 faat3sik1 ge3 neoi5zai2} \\
\text{CL head have orange ornament REL girl} \\
\end{array}
\]

‘the girl whose head has an orange ornament’

Target:

\[
\begin{array}{ll}
\text{[RC 哥哥 抱 男仔 俾 佢 女仔} \\
\text{go4go1 pou2 naam4zai2 bei2 keoi5 go2 go3 neoi5zai2} \\
\text{brother hold boy PASS 3SG that CL girl} \\
\end{array}
\]

‘the girl that the man holds the boy to (her)’

b. Genitive relative clause:

\[
\begin{array}{ll}
\text{[RC 個 爸爸 推 個 男仔 去 未 喺 度] 佢 個} \\
\text{go3 baa4baa1 teoi1 go3 naam4zai2 heoi3 go2 dou6 go2 go3} \\
\text{CL father push CL boy to there that} \\
\end{array}
\]

‘the one that the father pushes the boy to her location’

Target:

\[
\begin{array}{ll}
\text{[RC 爸爸 推 男仔 俾 佢 女仔} \\
\text{baa4baa1 teoi1 naam4zai2 bei2 keoi5 go2 go3 neoi5zai2} \\
\text{father push boy PASS 3SG that CL girl} \\
\end{array}
\]

‘the girl that the father pushes the boy to (her)’
Direct object vs. oblique (DO-OBL) comparison

A large proportion of the responses became subject relative clauses in both direct object and oblique relative clause conditions (DO: 52.6%, 51 out of 97 relative clause responses; OBL: 37.1%, 33 out of 89 relative clause responses). Due to the nature of the verb predicate, the subject relative clauses focused on the spatial relationship between the two objects, indicating, for example, that A is in front of B. In these subject relative clauses, the agent was either completely removed from the predicate, resulting an intransitive of existence, as shown in (59a) and (59b), or backgrounded, resulting a middle voice construction, as shown in (60).

(59) a. Subject relative clause in direct object relative clause condition:

[rc  ___  喺  恐龍  後面]  喀  車車
hai2 hung2lung4 hau6min6 ge3 ce1ce1
exist dinosaur back REL car
‘the car that is behind the dinosaur’

Target:

[rc 男仔  擺  —  喀  恐龍  後面]  喀  架  車車
naam4zai2 baai2 hoeng2 hung2lung4 hau6min6 go2 gaa3 ce1ce1
boy place at dinosaur back that CL car
‘the car that the boy places behind the dinosaur’

b. Subject relative clause in oblique relative clause condition:

[rc  ___  喀  架  車  前面]  喀  恐龍
hai2 gaa3 ce1 cin4min6 ge3 hung2lung4
exist CL car front REL dinosaur
‘the dinosaur that is in front of the car’

Target:

[rc 男仔  擺  車車  向  佢  後面]  喀  隻  恐龍
naam4zai2 baai2 ce1ce1 hoeng2 keoi5 hau6min6 go2 zek3 hung2lung4
boy place car at 3SG back that CL dinosaur
‘the dinosaur that the boy places the car behind (it)’

(60) Middle voiced subject relative clause:

[rc  ___  擺  喀  恐龍  後面]  喀  車車
baai2 hai2 hung2lung4 hau6min6 ge3 ce1ce1
place at dinosaur back REL car
‘the car that is placed behind the dinosaur’

Target:
One might suggest that the relative clause in (60) has a direct object gap and a pro subject, which is allowed in Cantonese. However, based on the oblique relative clauses adults produced, as shown in (61), the middle construction in the oblique relative clause clearly suggests the subject of such pattern is the promoted object.

The original agent subject is not overtly expressed, and is only implied through the semantics.

(61) Middle voiced oblique relative clause:

[RC 男仔 擺 — 嘅 恐龍 後面] 喺 架 車車
naam4zai2 baa2 hoeng2 hung2lung4 hau6min6 go2 gaa3 ce1ce1
boy place at dinosaur back that CL car
'the car that the boy places behind the dinosaur'

Target:

[RC 女仔 放 本書 嘅 佢 上面] 喪 個 盒
neoi5zai2 fong3 bun5 syu1 hai2 keoi5 soeng6min6 ge3 hap2
CL book place at 3SG top REL box
'the box that the girl places on (its) top'

Another type of common responses is the passivized subject relative clauses. They are found in both direct object and oblique relative clause conditions (DO: 19.6%, 19 out of 97 relative clause responses; OBL: 10.1%, 9 out of 89 relative clause responses). An example is given in (62).

(62) a. Passivized subject relative clause in direct object relative clause condition:

[RC 俾 男仔 放 — 嘅 恐龍 後面] 喺 架 車
bei2 naam4zai2 fong3 hai2 hung2lung4 hau6min6 go2 gaa3 ce1
PASS boy place at dinosaur back that CL car
'the car that is placed behind the dinosaur by the boy'

Target:

[RC 男仔 擺 — 嘅 恐龍 後面] 喪 架 車車
naam4zai2 baa2 hoeng2 hung2lung4 hau6min6 go2 gaa3 ce1ce1
boy place at dinosaur back that CL car
'the car that the boy places behind the dinosaur'

b. Passivized subject relative clause in oblique relative clause condition:

恐龍 係 [RC 俾 個 男仔 擺緊 架 車 嘅 — 後面] 喪
hung2lung4 hai3 bei2 go3 naam4zai2 baa2gan2 gaa3 ce1 hai2 hau6min6 ge3
dinosaur be PASS CL boy place-PROG CL car at back REL
'the dinosaur is the one behind which the boy is placing a car'

Target:
ACQUISITION OF CANTONESE RELATIVE CLAUSES: GRAMMATICAL RELATIONS

[RC 男仔 擺 車車 喻 佢 後面] 嚮 隻 恐龍
naam4zai2 baa2 ce1ce1 hoeng2 keoi5 hau6min6 go2 zek3 hung2lung4
boy place car at 3SG back that CL dinosaur
‘the dinosaur that the boy places the car behind (it)’

Target production was rather low in both conditions (DO: 14.8%, 14 out of 97 relative clause responses; OBL: 8.3%, 9 out of 89 relative clause responses). It seems to be less favourable for adults to use the full locative construction, in particular for oblique relative clauses, to depict the scene (DO: 87.5%, 14/16; OBL: 27.3%, 9/33). In addition to middle or passive voice constructions mentioned above, adults would also convert the locative clause to an (in)transitive clause (DO: 12.5%, 2/16; OBL: 72.7%, 24/33). An example is given in (63).

(63) Oblique relative clause with an intransitive construction:

[RC 有 本 書 喻 — 上面] 嘱 箱
jau5 bun5 syu1 hai2 soeng6min6 ge3 soeng1
have CL book at top REL box
‘the box that there is a book on top of’

Target:

[RC 女仔 放 本 書 喻 佢 上面] 嘱 個 盒
neoi5zai2 fong3 bun5 syu1 hoeng2 keoi5 soeng6min6 go2 go3 hap2
girl place CL book at 3SG top that CL box
‘the box that the girl places a book on (it)’

Another point to note is that adults seem to allow certain obliques to be relativized with the gap strategy, as observed in indirect object relative clauses. Comparing the two oblique relative clauses in (61) and (63), the relativized position is occupied by a resumptive pronoun in (61) and left empty in (63).

Unorthodox relative clauses

In all comparisons, there were a small proportion of unorthodox relative clauses: relative clauses with a resumptive NP and internally headed relative clauses (IHRC). The proportion for IHRC ranges from 2% to 5.8% in the S – DO, S – IO and DO – IO comparisons, but become significantly prevalent in the DO – OBL comparison (DO: 25.8%; OBL: 17.6%). Similarly, the proportion of relative clauses with a resumptive NP remained low in the S – DO, S – IO and DO – IO comparisons, ranging between 1% to 8%, but became
more prevalent in the DO – OBL comparison (DO: 16.1%; OBL: 22.1%). An example of a relative clause with a resumptive NP and an internally headed relative clauses are given in (64).

(64) a. Relative clause with resumptive NP:

\[
[\text{RC 貓貓 拖住 豬] 嚏 隻 貓貓} \\
\text{maau1maau1 to1zyu6 zyu1 go2 zek3 maa1maau1} \\
\text{kitty drag-CONT piggy that CL kitty}
\]

‘the kitty that the kitty is dragging the piggy’

Target:

\[
[\text{RC } \_ \_ \text{拖 豬豬] 嚏 隻 貓貓} \\
\text{to1 zyu1zyu1 go2 zek3 maa1maau1} \\
\text{drag piggy that CL kitty}
\]

‘the piggy that the kitty drags’

b. Internally-headed relative clause:

\[
[\text{RC 貓貓 拖住 豬仔] 嚏 隻 貓貓} \\
\text{maau1maau1 to1zyu6 zyu1zi2 go2 zek3} \\
\text{kitty drag-CONT piggy that CL kitty}
\]

‘the one that the kitty is dragging the piggy’

Target:

\[
[\text{RC 貓貓 拖 } \_ \_ \text{ 豬豬} \\
\text{maau1maau1 to1 go2 zek3 zyu1zyu1} \\
\text{kitty drag that CL piggy}
\]

‘the piggy that the kitty is dragging’

Relative clauses with a resumptive NP, as in (64a), were responses in which a copy of the head NP is found internal to the relative clause at the relativized position. The clause-internal head NP is usually found in its bare form, although a full NP [that+CL+N] is occasionally observed. On the other hand, internally headed relative clauses (IHRC) are responses in which the head NP was also found internal to the relative clause, making the relative clause a full clause without any gaps, as shown in (64b). The clause-internal head NP for IHRCs was either in its bare form or with a classifier, the full NP [that+CL+N] was relatively much rarer.

The difference between internally headed relative clauses and relative clauses with a resumptive NP is the head NP: internally headed relative clauses were all headless, leaving a “hanging” relative marker (go2+CL).

P.S. "Adults’ relative clause construction"
As shown from the examples above, adults allow both headed and headless relative clauses. Out of the 814 relative clauses adults produced (excluding the unorthodox relative clauses, i.e. the internally headed relative clauses and relative clauses with a resumptive NP), adults produced 642 headed relative clauses (78.9%), and 96 headless relative clauses (11.8%). An example of the headed and headless relative clauses is given in (65a) and (65b) respectively. Due to the nature of the probe questions (e.g. Which [target] is Little Fairy pointing at?), some relative clause responses use a copular construction with a stranded relative clause. The head NP becomes the subject of the copular construction and the relative clause is left stranded. As shown in (65c), the head NP the kitty becomes the subject, leaving the relative clause to be stranded to the right of the copula verb hai6. Out of the 814 relative clauses, there were 77 relative clauses in such presentational construction (9.5%).

(65) a. Headed relative clause:

```
[rc_ 拖住 猪] 嘅 貓
  to1zyu6  zyu1  ge3  maau1
  drag-CONT piggy REL  kitty
'the kitty that is dragging the piggy'
```

b. Headless relative clause:

```
[rc_ 拖住 豬豬] 嘅 隻
  to1zyu6  zyu1zyu1  go2  zek3
  drag-CONT piggy that CL
'the one that is dragging the pigg'
```

c. Presentational construction with a stranded relative clause:

```
隻 貓 係 [rc_ 拖住 隻 猪] 嘅
  zek3  maau1  hai6  to1zyu6  zek3  zyu1  ge3
  CL  kitty be  drag-CONT  CL piggy REL
'the kitty is the one that is dragging the piggy'
```

Variations were also observed in the forms of the relative marker. The relative marker ge3 and the demonstrative + classifier (go2 + CL) form illustrated in (35a) and (35b) are the two most common forms of relative marker used by adults, which are also noted in the Cantonese grammars as the typical relative marker in Cantonese relativization (Matthews and Yip, 2011; Matthews, 2013). Example (36) illustrates the other variations found in adults’ production in this experiment.

(66) a. CL:

```
```

68
ACQUISITION OF CANTONESE RELATIVE CLAUSES: GRAMMATICAL RELATIONS

b. ge3 + go2 + CL:

\[
[rc._ __ \text{追緊} \text{女仔}] \text{嘅} \text{個} \text{男仔}
\]

\[
\text{zeoi1gan2 neoi5zai2 ge3 go2 go3 naam4zai2 chase-PROG girl REL that CL boy}
\]

‘the boy that is chasing the girl’

c. ge3 + CL:

\[
[rc._ \text{俾} \text{男仔} \text{追住} \text{__}] \text{嘅} \text{個} \text{女仔}
\]

\[
\text{bei2 naam4zai2 zeo1zyu6 ge3 go3 neoi5zai2 PASS boy chase-CONT REL CL girl}
\]

‘the girl that is chasing by the boy’

d. go2 + CL + ge3:

\[
[rc._ \text{個} \text{男仔} \text{擺} \text{佢} \text{喺} \text{恐龍} \text{後面} \text{__}] \text{嘅} \text{架} \text{車車}
\]

\[
\text{go3 naam4zai2 baai5 keoi2 hai2 hung2hung4 hau6min6 go2 gaa3 ge3 ce1ce1 CL boy place 3SG at dinosaur back that CL REL car}
\]

‘the car that the boy places (it) behind the dinosaur’

Table 1 gives the distribution of the various forms of relative markers in adults’ relative clause responses. One item was removed from the current analysis as it involved a dual relative clause, and that gives a total of 813 relative clauses for this analysis.

**Table 1. Proportions of various forms of relative markers in adults’ relative clauses.**

<table>
<thead>
<tr>
<th>Relative Marker</th>
<th>Proportions</th>
</tr>
</thead>
<tbody>
<tr>
<td>嘅 go2 + CL</td>
<td>48.6% (395/813)</td>
</tr>
<tr>
<td>嘅 ge3</td>
<td>38.4% (312/813)</td>
</tr>
<tr>
<td>CL</td>
<td>2.7% (22/813)</td>
</tr>
<tr>
<td>ge3 + go2 + CL</td>
<td>9.5% (77/813)</td>
</tr>
<tr>
<td>ge3 + CL</td>
<td>0.12% (1/813)</td>
</tr>
<tr>
<td>go2 + CL + ge3</td>
<td>0.73% (6/813)</td>
</tr>
</tbody>
</table>
Adults produced a greater proportion of classifier relative clauses than *ge3* relative clauses, but the two were still the most preferred form adults used in relativization. Adults also occasionally combined *ge* and *go2 + CL* to mark relative clauses; both orders were observed: *ge3* coming before the demonstrative + CL marker (*ge3 + go2 + CL*), or *ge3* coming after the demonstrative + CL marker (*go2 + CL + ge3*). The *ge3*-first option, i.e. *ge3* + *go2 + CL*, is much more common than the *ge3*-last option. That is probably due to the fact that the former has a grammatical counterpart in literary Chinese and Mandarin Chinese. The latter option *go2 + CL + ge3* is probably an idiosyncratic variation, as four out of the six observed instances came from a single participant. The reduced form to classifiers as relative markers comprised of a much smaller proportion in comparisons to the other variations.

4.2.2.2 Children

4.2.2.2.1 Proportion of target production

The elicited production task also successfully elicited a high proportion of relative clause responses (including target and non-target relative clauses) from children. Figure 17 shows the types of responses elicited from children in the different types of relative clause elicitations in each comparison.

The proportion of errors (e.g. demonstrative or simple NP) was extremely low, showing that children were aware of the expectation of using a meaningful description to depict the target referent. Other types of
responses such as topicalization construction and genitive NPs were also rare in children’s responses. Matrix clauses were the more common type of non-RC responses. Besides mere imitations of the probe sentence, the matrix clause responses also included some ambiguous cases. Those were the responses usually aiming for relative clauses that have a surface resemblance to main clauses. Without a clear indication, such as a proper relative marker, it is difficult to distinguish whether the utterance is a matrix clause or a relative clause. In order to provide a better picture of children’s acquisition of relative clauses, a stricter criterion was applied and these ambiguous cases were treated as matrix clause responses.

In general, children had a rather low proportion of target production. Most of their responses were non-target relative clauses. Figure 18 shows the proportion of target production in different types of relative clauses across the five comparisons. As was the case with adults, the subject relative clause condition produced a comparatively high proportion of target relative clauses. Interestingly, direct object also showed a comparable level of target production to subject relative clauses in the S – DO comparison; yet, the proportion of target production for direct object dropped drastically in the DO – IO and DO – OBL comparisons. While direct object maintained a higher proportion of target relative clauses than indirect object in the DO – IO comparison, it was lower than oblique in the DO – OBL comparison. Indirect object relative clauses remained low in all comparisons.

Figure 18. Proportions of children’s target production across comparisons.
Four separate repeated measures ANOVAs were used to analyze the accuracy of each type of relative clauses in each comparison. The results of each comparison are discussed in individual sessions below.

Subject vs. direct object (S-DO) comparison

With RC type (S vs. DO) as the within-subject variable, the effect for RC type was insignificant ($F(1, 47) = .86, p=.36$). This shows that the proportion of target relative clauses in the subject and direct object conditions did not differ in children’s production.

Subject vs. indirect object (S-IO) comparison

With RC type (S vs. IO) and verb type (give vs. dative verb) as within-subject variables, the analysis revealed a significant effect for RC type ($F(1, 47) = 24.9, p<.001$), but neither the effect of verb type ($F(1, 47) = .67, p=.42$) nor its interaction with RC type ($F(1, 47) = .03, p=.87$) was significant. This suggests that children produced more target subject relative clauses than indirect object relative clauses, despite the differences in construction between the two verb types. As the difference between the two verb types was not significant, the two comparisons which involved different verb types in the S-IO comparison were collapsed as one single category in subsequent analyses.

Direct object vs. indirect object (DO-IO) comparison

With RC type (DO vs. IO) as the within-subject variable, the analysis revealed a significant effect for RC type ($F(1, 47) = 4.95, p=.03$). This suggests that the proportion of target production in the direct object condition is higher than in the indirect object condition.
Direct object vs. oblique (DO-OBL) comparison

With RC type (DO vs. OBL) as the within-subject variable, the effect for RC type was approaching significance ($F(1, 47) = 3.78$, $p=.06$). This suggests that proportion of target relative clauses in the oblique condition may be meaningfully higher than in the direct object condition.

4.2.2.2 Patterns of relative clause responses

Figure 19 shows the distribution of the relative clause responses in each comparison.

![Figure 19. Distribution of relative clause responses in children’s production.](image)

Children also demonstrated a strong tendency to use subject relative clauses to respond in all types of relative clause elicitations. Yet, unlike adults, children rarely produced passivized subject relative clauses. Moreover, direct object relative clauses seemed to be as available an option for children as subject relative clauses. Children showed a lower tendency to switch to subject relative clauses when the target was a direct object relative clause. Furthermore, children had a larger proportion of internally headed relative clauses and relative clauses with resumptive NP in all types of relative clauses. The following sections will examine individually the patterns of the various types of relative clause responses produced by children in each comparison.

Subject vs. direct object (S-DO) comparison

The high frequency of subject relative clauses in the subject relative clause condition (58%, 58 out of 100 relative clause responses) was inflated by the appearance of non-target subject relative clauses (39.7%, 23/58).
They were either (in)transitives describing the state (67a) or the action (67b) of the target character. The description is sometimes based on a contrast with the distractor character using *jau5* ‘have’ or *mou5* ‘not have’ as in (67c).

(67) a. Subject relative clause with description of the physical appearance:

\[
\begin{array}{c}
\text{[RC]} \ \ \text{著 紫色 衫} \ \ \text{唔 媽媽} \\
\text{zoe\text{\text{\sik3 z\text{\text{sik1 saam1 ge3 maa4maa1}}} \ \ \text{wear purple clothes REL. mother}}}
\end{array}
\]

‘the mother that is wearing purple clothes’

Target:

\[
\begin{array}{c}
\text{[RC]} \ \ \text{攬住 女女} \ \ \text{嘅 媽媽} \\
\text{naam5zyu6 neoi4neoi2 go2 go3 maa4maa1} \\
\text{hug-PROG daughter that CL mother}
\end{array}
\]

‘the mother that is hugging the daughter’

b. Subject relative clause with description of action:

\[
\begin{array}{c}
\text{[RC]} \ \ \text{揮手} \ \ \text{喺 個 伯伯} \\
\text{fai1sau2 go2 go3 baak3baak3} \\
\text{wave.hand that CL uncle}
\end{array}
\]

‘the old man that waves’

c. Subject relative clause of contrast between target referent and non-target referents:

\[
\begin{array}{c}
\text{[RC]} \ \ \text{有 戴 眼鏡} \ \ \text{喺 個 公公} \\
\text{jau5 daai3 ngaan5geng2 go2 go3 gung1gung1} \\
\text{have wear glasses that CL grandpa}
\end{array}
\]

‘the old man that is wearing glasses’

Target:

\[
\begin{array}{c}
\text{[RC]} \ \ \text{叫 婆婆} \ \ \text{喺 個 伯伯} \\
\text{giu3 po4po2 go2 go3 baak3baak3} \\
\text{call granny that CL uncle}
\end{array}
\]

‘the old man that is calling granny’

The state- or action-description made up all the subject relative clauses found in the direct object relative clause condition (22.2%, 22 out of 99 relative clause responses). An example is given in (68).

(68) a. State-describing subject relative clause:

\[
\begin{array}{c}
\text{[RC]} \ \ \text{眯埋 眼} \ \ \text{喺 個 男仔} \\
\text{mei1maai4 ngaan5 go2 go3 naam4zai2} \\
\text{close eye that CL boy}
\end{array}
\]
'the boy that closes his eyes'

Target:
\[\text{RC 女仔 錫 男仔} \quad \text{neoi5zai2 sek3 go2 go3 nam4zai2}
   \text{girl kiss that CL boy}
\]

‘the boy that the girl kisses’

b. Action-describing subject relative clause:
\[\text{RC 劍住 杯 茶} \quad \text{zaa1zyu6 bui1 caa4 go2 go3}
   \text{hold-PROG CL tea that CL}
\]

‘the one that is holding the cup of tea’

Target:
\[\text{RC 伯伯 叫 婆婆} \quad \text{baak3baak3 giu3 go2 go3 po4po2}
   \text{uncle call that CL granny}
\]

‘the old man that is calling granny’

There were also a small proportion of passivized subject relative clauses in the direct object relative clause condition (7.1%, 7 out of 99 relative clause responses), as in (69). In comparison to adults (76.8%), passivized subject relative clauses were not as preferred in children’s production.

(69) Passivized subject relative clause with an explicit original subject:
\[\text{RC 俾 女仔 錫} \quad \text{bei2 neoi5zai2 sek3 go2 go3 nam4zai2}
   \text{PASS girl kiss that CL boy}
\]

‘the boy that is kissed by the girl’

Target:
\[\text{RC 女仔 錫 男仔} \quad \text{neoi5zai2 sek3 go2 go3 nam4zai2}
   \text{girl kiss that CL boy}
\]

‘the mother that is hugging the daughter’

Most of the direct object relative clauses in the direct object relative clause condition (27.3%, 27 out of 99 relative clause responses) were target relative clauses (96.3%, 26/27). The rate of target production for direct object relative clauses was comparable to that of subject relative clauses. In addition, children did not resort to using subject relative clauses in response as much as in other conditions or as observed in adults. These
together suggest that children did not find direct object relative clauses more difficult to produce than subject relative clauses, hence, they did not have a strong urge to avoid using direct object relative clauses and convert to subject relative clauses.

There were also a few genitive relative clauses, which described the state of the body parts of the target referent; hence, the original head NP became the genitive (possessor) of the subject of the resulted relative clause. These were found in both subject and direct object relative clause conditions (S: 2%, 2 out of 100 relative clause responses; DO: 2%, 2 out of 99 relative clause responses). An example is given in (70).

(70) Genitive relative clause:

| keoi2 zek3 sau2 zai1 hai2 dou6 ge3 go4go1 |
| 3SG CL hand place exist LOC REL brother |

‘the man whose hands are placed here’

Target:

| ze4ze1 naau6 go2 go3 go4go1 |
| sister scold that CL brother |

‘the man that the woman scolds’

**Subject vs. indirect object (S-IO) comparison**

As observed in the S – DO comparison, children’s subject relative clauses from the indirect object relative clause condition (33%, 32 out of 94 relative clause responses in the give condition; 29%, 29 out of 100 relative clause responses in the dative verb condition) and the non-target subject relative clauses from the subject relative clause condition (27.2%, 28 out of 103 relative clause responses in the give condition; 39.6%, 44 out of 111 relative clause responses in the dative condition) consisted of descriptions of physical appearance (71a), and contrasts between target referent and non-target referent (71b). There were also transitive clauses which involved a change of the relative clause verb (71c) and transitive constructions reduced from the original ditransitive (71d).

(71) a. Subject relative clause with description of state:
ACQUISITION OF CANTONESE RELATIVE CLAUSES: GRAMMATICAL RELATIONS

b. Subject relative clause with contrast:

[ac__ 有 撿 氣球] 喱 個
jau5 lo2 hei3kau4 go2 go3
‘the one that has the balloons’

c. Transitive subject relative clause:

[ac__ 掃住 波波] 喱 個 姐姐
zaa1zyu6 bo1bo1 go2 go3 ze4ze1
‘the woman that is holding the balloons’

d. Reduced transitive subject relative clause:

[ac__ 派 氣球] 嘱 姐姐
paa1hei3kau4 ge3 ze4ze1
give.out balloon REL sister
‘the woman who is giving out balloons’

Target:

[ac__ 派 波波 佢 哥哥] 喱 個 姐姐
paa1 bo1bo1 bei2 go4go1 go2 go3 ze4ze1
give.out balloon DAT brother that CL sister
‘the man that the woman gives out a balloon to (him)’

[ac__ 姐姐 派 波波 佢 哥哥] 喱 個 哥哥
ze4ze1 paa1 bo1bo1 bei2 keoi5 go2 go3 go4go1
sister give.out balloon DAT 3SG that CL brother
‘the man that the woman gives out a balloon to (him)’

The transitive subject relative clauses (71c) involved conversion of the ditransitive verb to a transitive verb, such as *zaa1* ‘hold’, which does not involve any sense of possession transfer. However, the reduced transitive subject relative clauses (71d) use the same ditransitive verb in a transitive manner. A similar pattern has also been observed in adults’ production. The transitive use is allowed in Cantonese when a specific recipient is not involved in the event.
Instead of using the resumptive pronoun strategy, children seemed to prefer to use the gap strategy for indirect object relative clauses (28.7%, 27 out of 94 relative clause responses in the give condition; 25%, 25 out of 100 relative clause responses in the dative verb condition), as observed in adults. Both NP gaps and PP gaps were found in children’s production, as shown in (72a) and (72b) respectively.

(72)  
  a. Gap-type indirect object relative clause with NP gap:  
  \[
  [\text{RC 熊仔 送 花 俾 __] 嘅 個 兔仔} \\
  \text{hung4zai2 sung3faa1 bei2 go2 go3 tou3zai2} \\
  \text{teddy send.flower DAT that CL bunny} \\
  \text{‘the bunny that the teddy sends flower to'}
  \]
  Target:  
  \[
  [\text{RC 熊熊 送 花 俾 佢} 嘅 隻 兔仔} \\
  \text{hung4hung2 sung3 zaa6 faa1 bei2 keoi5 go2 zek3 tou3zai2} \\
  \text{teddy send CL flower DAT 3SG that CL bunny} \\
  \text{‘the bunny that the teddy sends a bunch of flower to (it)’}
  \]
  b. Gap-type indirect object relative clause with PP gap:  
  \[
  [\text{RC 小白兔 送 礼物 俾 __] 嘅 個 熊仔} \\
  \text{siu5baak6tou3 sung3 lai5mat6 go2 go3 hung4zai2} \\
  \text{bunny send gift that CL teddy} \\
  \text{‘the teddy that the bunny sends a gift to’}
  \]
  Target:  
  \[
  [\text{RC 兔兔 送 礼物 俾 佢} 嘅 隻 熊仔} \\
  \text{tou3tou3 sung3 lai5mat6 bei2 keoi5 go2 zek3 hung4zai2} \\
  \text{bunny send gift DAT 3SG that CL teddy} \\
  \text{‘the teddy that the bunny sends a gift to (it)’}
  \]

The preposition stranding form was also found in indirect object relative clauses with give as the main verb when children used the double bei2 construction. An example is given in (73).

(73)  
  a. Gap-type indirect object relative clause with NP gap:  
  \[
  [\text{RC 爸爸 俾 恐龍 __] 嘅 個 男仔} \\
  \text{baa4baa1 bei2 hung2lung4 go2 go3 naam4zai2} \\
  \text{father DAT dinosaur that CL boy} \\
  \text{‘the boy that the father gives a dinosaur to’}
  \]
  b. Gap-type indirect object relative clause with preposition stranding:  
  \[
  [\text{RC 爸爸 俾 恐龍 俾 __] 嘅 個 男仔} \\
  \text{baa4baa1 bei2 hung2lung4 bei2 go2 go3 naam4zai2} \\
  \text{father give dinosaur DAT that CL boy} \\
  \]
ACQUISITION OF CANTONESE RELATIVE CLAUSES: GRAMMATICAL RELATIONS

‘the boy that the father gives a dinosaur to’

Target:

[RC 爸爸 個 佢 恐龍 個 佢 男仔]

baa4baa1 bei2 hunglung4 bei2 keoi5 go2 go3 naam4zai2

father give dinosaur DAT 3SG that CL boy

‘the boy that the father gives a dinosaur to (him)’

Direct object vs. indirect object (DO-IO) comparison

Consistent with the first two comparisons, children’s subject relative clauses in either of the elicitation conditions in the DO – IO comparison (DO: 25.5%, 26 out of 102 relative clause responses; IO: 42%, 42 out of 100 relative clause responses) consisted of descriptions of physical appearance, and contrasts between target referent and non-target referents. There were also some instances of a middle voice construction, as illustrated in (74). Although the example in (74a) might be analyzed with a direct object gap and a pro relative clause subject, the intransitive relative clause in (74b) suggests a middle voice analysis for these types of responses, as observed in adult production.

(74)  a. Subject relative clause with middle voice construction:

[RC__ 吊 佢 大象] 呢 個 豬豬
diu3 bei2 dai6zoeng6 go2 zek3 zyu1zyu1

hang DAT elephant that CL piggy

‘the piggy that is hung down to the elephant’

Target:

[RC 熊貓 吊 豬豬 佢 佢] 呢 個 象象
hung4maau1 diu3 zyu1zyu1 bei2 keoi5 go2 zek3 zoeng6zoeng6

panda hang piggy DAT 3SG that CL elephant

‘the elephant that the panda hangs down the piggy to (him)’

b. [RC__ 抱起身] 呢 個 男仔
pou5hei2san1 go2 go3 naam4zai2

hold.up.body that CL boy

Target:

[RC 哥哥 抱__ 佢 女仔] 呢 個 男仔
go4go1 pou2 bei2 neoi5zai2 go2 go3 naam4zai2

brother hold DAT girl that CL boy

‘the boy that the man holds to the girl’

79
In addition to the patterns mentioned above, a common type of subject relative clauses found in the indirect object relative clause condition was a transitive construction involving a verb of receiving (instead of a verb of giving) (19%, 8/42). Children changed the dative verb into a receiving verb, so that the recipient of the original relative clause became the agentive subject of the resulting relative clause. An example is given in (75).

(75) Subject relative clause with verb of receiving:

 pandemic hang piggy DAT 3SG that CL elephant
‘the elephant that the panda hangs down the piggy to (him)’

All of the non-target direct object relative clauses (78%, 32/41) observed in the direct object relative clause condition (40.2%, 41 out of 102 relative clause responses) were transitive. Children dropped the dative phrase, and the clause became transitive. An example is given in (76).

(76) Transitive subject relative clause:

 pandemic hang piggy DAT 3SG that CL elephant
‘the elephant that the panda hangs down the piggy to (him)’
The direct object relative clauses observed in indirect object relative clause condition (9%, 9 out of 100 relative clause responses) also had a form similar to the transitive direct object relative clause in (76); the dative phrase was often realized as part of the main clause however, as shown in (77). The sentence resulted in some kind of a patient-subject construction, with the boy being given to the girl. The difference between (76) and (77) demonstrates that children are aware of the necessary information to be included in order to produce a relative clause that will depict the target referent, but the best they can do seems to be resorting to different strategies, such as inserting the dative phrase in the main clause when targeting the indirect object, to compensate for their inability to form an indirect object relative clause with the full ditransitive construction.

(77)  Direct object relative clause:
[bc 爸爸 抱住 ___] 呢個 男仔 俾 女女
baa4baa1 pou2zyu6 go2 go3 naam4zai2 bei2 neoi4neoi2
father hold that CL boy PASS daughter
‘the boy that the father holds is given to the daughter’

Target:
[bc 哥哥 抱 男仔 俾 佢] 呢個 女仔
go4go1 pou2 naam4zai2 bei2 keoi5 go2 go3 neoi5zai2
brother hold boy PASS 3SG that CL girl
‘the girl that the man holds the boy to (her)’

The ambiguity between the demonstrative and the relative marker might make it hard to decide whether the sentence in (77) is a true relative clause. The similar construction in (78), which used ge3 as the relative marker for the relative clause, provides an unambiguous example demonstrating that children modify the subject with a transitive direct object relative clause in such responses.

(78)  Direct object relative clause with transitive construction:
[bc 熊貓 拎起 ___] 嘅 豬豬 俾 大象
hung4maau1 ling1hei2 ge3 zyu1zyu1 bei2 daai6zoeng6
panda hang REL piggy DAT elephant
‘The piggy that the panda lifts up is given to elephant.’

Target:
[bc 熊貓 吊 豬豬 俾 佢] 嘅 隻 象象
hung4maau1 diu3 zyu1zyu1 bei2 keoi5 go2 zek3 zoeng6zoeng6
panda hang piggy DAT 3SG that CL elephant
‘the elephant that the panda hangs down the piggy to (him)’
Passivized subject relative clauses were mainly found in the direct object relative clause condition (9.8%, 10 out of 102 relative clause responses). Those that were found in the direct object relative clause condition were all reduced to a transitive relative clause without the indirect object, as shown in (79).

(79) Passivized subject relative clause:

\[
[RC\_ 俾 爸爸 推 ___] 嘅 個
\]
bei2 baa4baa1 teoi1 go2 go3
PASS father push that CL

‘the one that is pushed by the father’

Target:

\[
[RC 爸爸 推 ___ 俾 女女] 嘅 個 仔仔
\]
baa4baa1 teoi1 bei2 neoi5neoi5 go2 go3 zai4zai2
father push PASS girl that CL son

‘the son that the father pushes to the daughter’

There were also two instances found in the indirect object condition. Similar to those found in the direct object condition, the relative clause predicate became transitive; but for these which targeted the original indirect object, the relative clause contrasted the indirect object with the direct object by describing what did not happen to the indirect object with the help of the negative mou5 ‘not have’. An example is given in (80).

(80) Passivized subject relative clause:

\[
[RC\_ 有 俾 爸爸 抬 ___] 嘅 個 仔仔
\]
mou5 bei2 baa4baa1 toi4 go2 go3 naam4zai2
not.have PASS father lift that CL boy

‘the boy that is not lifted by the father’

Target:

\[
[RC 爸爸 抬 女女 俾 佢] 嘅 個 仔仔
\]
baa4baa1 toi4 neoi4neoi2 bei2 keoi5 go2 go3 zai4zai2
father lift girl DAT 3SG that CL son

‘the son that the father lifts the daughter to (him)’

Gap-type indirect object relative clauses were also found in the indirect object relative clause condition (11%, 11 out of 100 relative clause responses). As observed in other gap-type indirect object relative clauses, there were NP gaps, as shown in (81a) and (81b), and PP gaps, as in (81c).
(81) a. Gap-type indirect object relative clause (NP gap):

\[
[\text{熊貓} \quad \text{俾} \quad \text{豬豬} \quad \text{個} \quad \text{熊熊}]
\]

\[
\text{hung4maau1} \quad \text{bei2} \quad \text{zyu1zyu1} \quad \text{go2} \quad \text{go3} \quad \text{hung4hung2}
\]

\[
\text{panda} \quad \text{DAT} \quad \text{CL} \quad \text{piggy} \quad \text{that} \quad \text{CL} \quad \text{teddy}
\]

‘the teddy that the panda gave a piggy to’

b. Gap-type indirect object relative clause (NP gap):

\[
[\text{熊貓} \quad \text{推} \quad \text{豬豬} \quad \text{個} \quad \text{熊仔}]
\]

\[
\text{hung4maau1} \quad \text{teoi1} \quad \text{zyu1zyu1} \quad \text{go2} \quad \text{zek3} \quad \text{hung4zai2}
\]

\[
\text{panda} \quad \text{push} \quad \text{piggy} \quad \text{DAT} \quad \text{that} \quad \text{CL} \quad \text{teddy}
\]

‘the teddy that the panda push the piggy to’

c. Gapped indirect object relative clause (PP gap):

\[
[\text{爸爸} \quad \text{托} \quad \text{豬豬} \quad \text{個} \quad \text{熊仔}]
\]

\[
\text{baa4baa1} \quad \text{tok3} \quad \text{zyu1zyu1} \quad \text{go2} \quad \text{zek3} \quad \text{hung4zai2}
\]

\[
\text{father} \quad \text{support} \quad \text{piggy} \quad \text{DAT} \quad \text{3SG} \quad \text{that} \quad \text{CL} \quad \text{teddy}
\]

‘the teddy that the panda shoves the piggy to (it)’

Target:

\[
[\text{爸爸} \quad \text{托} \quad \text{豬豬} \quad \text{個} \quad \text{熊仔}]
\]

\[
\text{baa4baa1} \quad \text{tok3} \quad \text{zyu1zyu1} \quad \text{go2} \quad \text{go3} \quad \text{naam4zai2}
\]

\[
\text{father} \quad \text{lift} \quad \text{up} \quad \text{girl} \quad \text{that} \quad \text{CL} \quad \text{boy}
\]

‘the boy that the father lifts the girl to’

Target:

\[
[\text{爸爸} \quad \text{抬} \quad \text{女女} \quad \text{個} \quad \text{仔仔}]
\]

\[
\text{baa4baa1} \quad \text{toi4} \quad \text{neoi4neoi2} \quad \text{go2} \quad \text{go3} \quad \text{zai4zai2}
\]

\[
\text{father} \quad \text{lift} \quad \text{girl} \quad \text{DAT} \quad \text{3SG} \quad \text{that} \quad \text{CL} \quad \text{son}
\]

‘the son that the father lifts the daughter to (him)’

Direct object vs. oblique (DO-OBL) comparison

Subject relative clauses elicited in both of the conditions in the DO – OBL comparison (DO: 45.2%, 28 out of 62 relative clause responses; OBL: 39.9%, 21 out of 68 relative clause responses) were largely either intransitives of location, as in (82a), or middle voice construction, as in (82b).

(82) a. Intransitive subject relative clause:

\[
[\text{熊貓} \quad \text{喺} \quad \text{盒} \quad \text{上} \quad \text{便} \quad \text{個} \quad \text{書}]
\]

\[
\text{hai2} \quad \text{hap2} \quad \text{soeng6bin6} \quad \text{go2} \quad \text{byun2} \quad \text{syu1}
\]

\[
\text{exist} \quad \text{box} \quad \text{top} \quad \text{that} \quad \text{CL} \quad \text{book}
\]

‘the book that is on the box’
b. Middle-voiced subject relative clause:

\[
\text{[ac— 擺嘅 箱 上便] 吠 會}
\text{baai2hai2 soeng1 soeng6bin6 ge3 syu1}
\text{place.at box top CL book}
\]

‘the book that is placed on the box’

Target:

\[
\text{[ac 女仔 放 — 嘌 個 盒 上面] 吠 本書}
\text{neoi5zai2 fong3 hoeng2 go3 hap2 soeng6min6 go2 byun2 syu1}
\text{girl place at CL box top that CL book}
\]

‘the book that the girl places on the box’

As the focus had shifted to the original oblique object in the subject relative clauses elicited from the oblique condition, the original direct object were either omitted (83a) or became the oblique in the resulted relative clause (83b).

(83) a. Middle-voiced subject relative clause (with the original direct object omitted):

\[
\text{[ac— 擺嘅 前便] 吠 封 信}
\text{baai2hai2 cin4bin6 go2 fung1 soen3}
\text{place.at front that CL letter}
\]

‘the letter that is placed in front’

b. Intransitive subject relative clause (with the original direct object becoming the oblique):

\[
\text{[ac— 嘌 相 前便] 吠 個}
\text{hai2 soeng2 cin4bin6 go2 go3}
\text{exist photo front that CL}
\]

‘the one that is in front of the photo’

Target:

\[
\text{[ac 男仔 攝 張 相 嘌 佢 後面] 吠 封 信}
\text{naam4zai2 sip3 soeng1 soeng2 hoeng2 keoi2 haau6min6 go2 fung1 soen3}
\text{boy slide CL picture at 3SG back that CL letter}
\]

‘the letter that the boy slide a picture behind (it)’

There were also several instances of subject relative clauses that described the appearance of the target referent, as in (84).

(84) Subject relative clause (description of appearance):

\[
\text{[ac— 有 筱] 吠 個}
\text{jau5 ding3 go2 go3}
\text{have stalk that CL}
\]

‘the one that has a stalk’

Target:
There was only one target-like direct object relative clause in the direct object condition. The non-target direct object relative clauses in both conditions (DO: 4.8%, 3 out of 62 relative clause responses; OBL: 8.8%, 6 out of 68 relative clause responses) were transitive relative clauses, which were usually descriptions of the act of the subject (85a), but there were also a few which described the relationship between the direct object and oblique (85b).

(85) a. Direct object relative clause:

\[
[\text{姐姐} \quad \text{拎住} \quad \text{毛巾}]
\]

\[
\text{Target:} \quad [\text{姐姐} \quad \text{放} \quad \text{衫衫} \quad \text{上面}] \quad \text{毛巾}
\]

b. Direct object relative clause:

\[
[\text{橙} \quad \text{抬住} \quad \text{蘋果}]
\]

\[
\text{Target:} \quad [\text{男仔} \quad \text{疊} \quad \text{橙} \quad \text{上面}] \quad \text{蘋果}
\]

Among the oblique relative clauses children produced (17.6%, 12 out of 68 relative clause responses), about 41.7% (5/12) were target-like. The non-target ones were mostly in the middle voiced construction, with a few in the intransitive existential construction. The relativized position in the oblique relative clauses, either in the full locative construction or the middle voiced construction, were often marked by a gap instead of a
resumptive pronoun. An example is given in (86). This is similar to the gap-type indirect object relative clauses found in other comparisons.

(86) Gap-type oblique relative clause:

\[ \text{[RC 女仔 擺 本書 — 上面] 喘個 盒} \]
\[ \text{neoi5zai2 bai2 byun2 syu1 soeng6min6 go2 go3 hap2} \]
\[ \text{girl place CL book top that CL box} \]
\[ \text{‘the box that the girl places the book on’} \]

Target:

\[ \text{[RC 女仔 放 本書 喚 佢 上面] 喘個 盒} \]
\[ \text{neoi5zai2 fong3 byun2 syu1 hoeng2 keoi2 soeng6min6 go2 go3 hap2} \]
\[ \text{girl place CL book at 3SG top that CL box} \]
\[ \text{‘the box that the girl places the book on (it)’} \]

Unorthodox relative clauses

There was a larger proportion of internally headed relative clauses (IHRC) and relative clauses with a resumptive NP (RNP) in children’s production in comparison to that of the adults. While adults did not show a strong distinction, children almost unanimously used the \text{go2+CL} as the relative marker for internally headed relative clauses (96.8\%, 153/158), with a few using the \text{ge3} relative marker (3.2\%, 5/158). All the NPs in the IHRCs are often in their bare form. There is no explicit marker in the child’s IHRCs to indicate which NP is the head. On the other hand, the resumptive NP in the RNP patterns sometimes would appear as a full NP together with the classifier or the demonstrative + CL [(dem) + CL + N]. This suggests that children had made a full copy of the head NP at the relativized position in those relative clauses with a resumptive NP.

Children’s relative clause constructions

Children in general produced more headed relative clauses than headless relative clauses. Out of the 637 relative clause responses children produced (excluding the unorthodox relative clauses), children produced a total of 502 headed relative clauses (78.8\%), and 135 headless relative clauses (21.2\%). Interestingly, the stranded relative clause construction was not found in children’s production. Their responses were either
simply the relative clause (87a), or a relative clause embedded in a full main clause, as in (87b), or a copular construction, as in (87c).

(87) a. Bare relative clause response:

\[
\begin{array}{c}
\text{[rc — 擺花] 唔 隻 熊仔} \\
\text{lo2faa1 go2 zek3 hung4zai2} \\
\text{hold.flower that CL teddy}
\end{array}
\]

‘the teddy that is holding flowers’

b. Full main clause response:

\[
\begin{array}{c}
\text{小仙子 指住 [rc — 擺住 花] 個 熊仔} \\
\text{siu5sin1zi5 zi2zyu6 lo2zyu6 faa1 go3 hung4zai2} \\
\text{Little fairy point-CONT hold-CONT flower CL teddy}
\end{array}
\]

‘Little fairy is pointing at the teddy that is holding flowers’

c. Copular construction response:

\[
\begin{array}{c}
\text{係 [rc — 擺住 花] 唔 隻 熊仔} \\
\text{hai6 lo2zyu6 faa1 go2 zek3 hung4zai2} \\
\text{be hold-CONT flower that CL teddy}
\end{array}
\]

‘It is the teddy that is holding flowers’

As for the relative marker, children showed similar variations as adults, but the preferences between children and adults were very different. Table 2 shows the distribution of the various forms of relative marker used in children’s production.

Table 2. Proportions of various forms of relative markers in children’s relative clauses

<table>
<thead>
<tr>
<th>Relative Marker</th>
<th>Proportions</th>
</tr>
</thead>
<tbody>
<tr>
<td>go2 + CL</td>
<td>78.2% (498/637)</td>
</tr>
<tr>
<td>ge3</td>
<td>16% (102/637)</td>
</tr>
<tr>
<td>CL</td>
<td>4.1% (26/637)</td>
</tr>
<tr>
<td>ge3 + go2 + CL</td>
<td>0.47% (3/637)</td>
</tr>
<tr>
<td>ge3 + CL</td>
<td>0.16% (1/637)</td>
</tr>
<tr>
<td>go2 + CL + ge3</td>
<td>0.78% (5/637)</td>
</tr>
<tr>
<td>zero</td>
<td>0.31% (2/637)</td>
</tr>
</tbody>
</table>

Children overwhelmingly preferred the demonstrative go2 + CL in their relative clauses. The relative marker ge3 was not as popular as with adults. Both forms of the combination of ge3 and go2 + CL were very rare in
children’s relative clauses. There were two instances in which the relative marker was not used to link up the relative clause and the head NP: one case was the relative marker was preposed to the front of the relative clause, making the relative clause embedded between the relative marker and the head noun, as shown in (88a); another case was the relative clause was formed without any relative marker, as shown in (88b).

(88) Relative clause without relative marker:
   a. 唐條 [RC__ 擺 唔衫 唐度] 頸巾
gen2 tiu4 baai5 hai2 saam1 that.LOC geng2gan1
   that CL place at clothes there scarf
   ‘the scarf that is placed on the clothes’

   b. [RC__ 擺 唔個 毛巾] 女仔
   baai5 go2 go3 mou4gan1 neoi5zai2
   place that CL towel girl
   ‘the girl that places that towel’

4.2.2.3 Interim discussion: Production of relative clauses of Cantonese adults and children

Given the proportion of target production, the following asymmetries can be established for the four comparisons for children and adults, as shown in (89). A summary of the patterns of relative clauses produced by adults and children is given in Appendix A.

(89) Contrasts in relative clause production for Cantonese children and adults:

<table>
<thead>
<tr>
<th>CHILD</th>
<th>ADULT</th>
</tr>
</thead>
<tbody>
<tr>
<td>e. S = DO</td>
<td>S &gt; DO</td>
</tr>
<tr>
<td>f. S &gt; IO</td>
<td>S &gt; IO</td>
</tr>
<tr>
<td>g. DO &gt; IO</td>
<td>DO = IO</td>
</tr>
<tr>
<td>h. DO ~&lt; OBL</td>
<td>DO = OBL</td>
</tr>
</tbody>
</table>

Both adults and children showed a strong tendency to use subject relative clauses in production, even some of them, especially in children’s responses, might be intransitives of existence and psychological state (e.g. being on the box, being unhappy), or simple transitives of appearance and actions (e.g. wearing glasses,
drinking tea). Adults strongly favoured subject relative clauses in all conditions, as evident by the prevalent conversion to subject and passivized subject relative clauses. Children had a comparable proportion of target production between subject and direct object in the S–DO comparison, and showed a stronger preference to use direct object relative clauses when they were the target.

Relative clauses with an alternative syntactic construction were more commonly found in adults’ production. Passivized subject relative clauses were the most prevalent of all syntactic alternations. They were also observed in children’s production, but constituted a comparatively minor strategy used by children. Predicate change was the more common strategy opted for by children, in addition to the internally headed relative clauses and relative clauses with a resumptive NP.

Adults and children also seemed to prefer simpler syntactic structures, e.g. a transitive, over a more complex one, e.g. a ditransitive or a locative. This is particularly evident in conditions involving relative clauses with a ditransitive or locative construction. Instead of following the probe sentences in using the full ditransitive or locative construction, the trivalent predicate was often converted or reduced to a bivalent form. Ditransitives becoming transitives without either the direct object or the indirect object, and locative constructions becoming intransitives of existence or middle-voiced constructions were commonly observed in both adults’ and children’s production.

Another interesting observation in children’s production involves their preference for the relativization strategy. For direct object relative clauses which allow both strategies, children continued to show a unanimous preference for the gap strategy. Gap-type indirect object and oblique relative clauses were found in both adults’ and children’s production, even though these types of relative clauses supposedly require the resumptive pronoun strategy. Taken together, these facts suggest that both Cantonese adults and children seem to have a stronger preference for the gap strategy, and allow the gap strategy for relativization of lower positions in the accessibility hierarchy. One point to note is that, even though there is a stronger preference for the gap strategy, there were also a few instances of subject and direct object relative clauses with resumptive pronoun in both adults’ and children’s production. It seems that for both Cantonese adults and
children the requirement of using the resumptive pronoun strategy for relativization of lower positions in the accessibility hierarchy, such as indirect object and oblique, is not as stringent as described in the Cantonese grammar. Rather than required in the lower positions and excluded in subject position (as stated in the Cantonese grammars), resumptive pronouns are more likely to be used in the lower positions in the accessibility hierarchy.

4.3 General Discussion

The difficulty asymmetries observed in Cantonese-speaking children’s comprehension and production are summarized in (90).

(90) Difficulty asymmetries in relative clause acquisition of Cantonese children: (Asymmetries observed for adult production are given in the brackets)

<table>
<thead>
<tr>
<th>COMPREHENSION</th>
<th>PRODUCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>S &gt; DO</td>
<td>S = DO (S &gt; DO)</td>
</tr>
<tr>
<td>S &gt; IO</td>
<td>S &gt; IO (S &gt; IO)</td>
</tr>
<tr>
<td>DO = IO</td>
<td>DO &gt; IO (DO = IO)</td>
</tr>
<tr>
<td>DO = OBL.</td>
<td>DO ~&lt; OBL (DO = OBL)</td>
</tr>
</tbody>
</table>

The asymmetries observed in comprehension demonstrate a two-tiered hierarchy, with better performance on subject patterns than on lower positions (direct object and indirect object), and performance on direct object is comparable to success on lower positions (indirect object and oblique). Children’s production demonstrates a slightly different pattern: there is no difference in the rate of target production between subject and direct object, and both subject and direct object are higher than indirect object. Oblique is comparable to direct object (and possibly slightly more preferred than direct object) in the rate of target production. Interestingly, the asymmetries in adults’ production differ from children’s production, but resemble that of children’s comprehension.
The differences in the preferences in children’s comprehension and production suggest that different factors are playing a role in children’s production and comprehension at this stage of acquisition. The following section will first explain the discrepancy between children’s comprehension and production, showing that children exploit their knowledge of canonical word order to facilitate their formation of relative clauses, which in turn creates an interaction with the prevailing subject preference. The discussion will then move onto the implications of the current results for theories of relative clause processing and acquisition.

4.3.1 The discrepancy between comprehension and production: the effect of word order

The discrepancy between children’s comprehension and production raises the question of whether the two processes are guided by different processing mechanisms. Yet, with a closer look at children’s production, there are several interesting phenomena which might explain why production manifests the pattern of asymmetries that it does. First, subject and direct object relative clauses had a comparable proportion of target production. Second and nonetheless, the subject pattern was the most prevalent type of relative clauses in children’s production. Third, the rate of target production of oblique was comparable to that of direct object relative clauses. Fourth, gapped relative clauses were preferred over relative clauses with resumptive pronouns, and the gapped variants appeared to be acceptable in relative clauses that would normally require the resumptive pronoun strategy, i.e. indirect object and oblique relative clauses. All these phenomena seem to suggest that children rely on the resemblance to the canonical word order as well as on a subject preference in their production of relative clauses.

In Cantonese, transitive direct object relative clauses, as in (91a), have a surface isomorphism with main clauses. Although the resemblance with main clauses for indirect object (91b) and oblique relative clauses (91c) is broken by the presence of the resumptive pronoun, the relative clause itself still resembles a main clause. In contrast, subject relative clauses such as (92a) and direct object relative clauses with a ditransitive construction such as (92b) or a locative construction such as (92c) do not resemble the constituent order of
main clauses, as the head NP originates from the center of the relative clause and is postposed to the right end of the clause.

(91) a. Direct object relative clause with transitive construction:

\[
\begin{align*}
S & \quad \text{V} & \quad \text{DO} \\
[\text{RC}] & \quad \text{男仔 追 ___] 嘲 個 女仔} \\
& \quad \text{naam4zai2 zeoi1 go2 go3 neoizai2} \\
& \quad \text{boy chase that CL girl} \\
& \quad \text{‘the girl that the boy chases’}
\end{align*}
\]

b. Indirect object relative clause:

\[
\begin{align*}
S & \quad \text{V} & \quad \text{DO} \quad \text{RP} \quad \text{IO} \\
[\text{RC}] & \quad \text{姐姐 派 波波 俾 佢] 嘰 個 哥哥} \\
& \quad \text{ze4ze1 paa3 bo1bo1 bei2 keoi5 go2 go3 go4go1} \\
& \quad \text{sister give out balloon DAT 3SG that CL brother} \\
& \quad \text{‘the man that the woman gives out a balloon to (him)’}
\end{align*}
\]

c. Oblique relative clause:

\[
\begin{align*}
S & \quad \text{V} & \quad \text{DO} \quad \text{RP} \quad \text{LOC} \quad \text{OBL} \\
[\text{RC}] & \quad \text{男仔 擺 車車 响 佢 後面] 嘰 隻 恐龍} \\
& \quad \text{naam4zai2 baa2 ce1ce1 hoeng2 keoi5 hau6min6 go2 zek3 hung2lung4} \\
& \quad \text{boy place car at 3SG back that CL dinosaur} \\
& \quad \text{‘the dinosaur that the boy places the car behind (it)’}
\end{align*}
\]

(92) a. Subject relative clause:

\[
\begin{align*}
\text{V} \quad \text{DO} \quad \text{S} \\
[\text{RC} ___ 追 女仔] 嘰 個 男仔 \\
& \quad \text{zeoi1 neoizai2 go2 go3 naam4zai2} \\
& \quad \text{chase girl that CL boy} \\
& \quad \text{‘the boy that chases the girl’}
\end{align*}
\]

b. Direct object relative clause with ditransitive construction:

\[
\begin{align*}
S & \quad \text{V} \quad \text{IO} \quad \text{DO} \\
[\text{RC}] & \quad \text{爸爸 推 ___ 俾 弟弟] 嘰 個 妹妹} \\
& \quad \text{baa4baa1 teoi1 bei2 dai4dai2 go2 go3 mui4mui2} \\
& \quad \text{father push DAT little. brother that CL little. sister} \\
& \quad \text{‘the girl that the father pushes to the boy’}
\end{align*}
\]

c. Direct object relative clause with locative construction:

\[
\begin{align*}
S & \quad \text{V} \quad \text{OBL} \quad \text{LOC} \quad \text{DO} \\
& \quad \text{‘the girl that the father pushes to the boy’}
\end{align*}
\]
Such a dichotomy in the constituent order of the relative clauses matches the pattern of target production in children. Children seem to find it easier to produce relative clauses whose constituent order matches that of a main clause. Simple transitive direct object relative clauses are therefore as easy to produce as subject relative clauses; oblique relative clauses also enjoy a comparable (or even of a higher) degree of ease of production as direct object relative clauses with a locative construction. This hypothesis might seem incompatible with the higher proportion of target production of ditransitive direct object relative clauses (which do not have a main clause resemblance) compared to the indirect object relative clauses. Yet, with a closer look at children’s relative clauses, there was a significant proportion of gap-type indirect object relative clauses in the indirect object conditions. Including the gapped variants, the proportion of indirect object relative clauses was actually comparable to that of ditransitive direct object relative clauses in children’s production (DO: 8.8%, 9/102; IO: 12%, 12/100). The omission of the resumptive pronoun in most of the cases results to a surface isomorphism of the indirect object relative clauses with ditransitive main clauses, and this may be why children favoured the gapped variants for indirect object relativization according to the hypothesis that resemblance to main clause word order facilitates children’s formation of relative clauses.

Why would children prefer the gapped variant over the resumptive pronoun variant in indirect object relativization? One possible explanation might be the referential nature of the resumptive pronoun. Processing theories (e.g. Warren & Gibson, 2002) propose that intervening discourse referents, including pronouns, would incur costs during the processing of long distance dependencies. Although the use of resumptive pronouns has been regarded as a last resort strategy to ease the difficulty during the processing of very complex filler-gap dependencies (e.g. Alexopoulou & Keller, 2007; Heestand, Xiang & Polinsky, 2011; McCloskey, 2006), children, and adults, might not have found the indirect object (and oblique) relativization in the current experiment to be so difficult as to call for the use of resumptive pronoun. On the other hand, its presence might only increase the costs of processing because of the referential dependency that it
introduces (Hofmeister & Norcliffe, 2013). For further discussion on the role of resumptive pronoun in the acquisition of Cantonese relative clause, please refer to Chapter 6 of this thesis, which particularly examines the effect of resumptive pronouns in Cantonese children’s comprehension and production.

Resemblance with main clauses helps children compose relative clauses based on their acquired knowledge of the language’s canonical word order. They can follow the basic word order in main clauses to piece the constituents together to form the relative clauses. Therefore, relative clauses which have a constituent order similar to main clauses seem to be easier to produce for children.

However, the facilitation effect of word order resemblance seems to be limited only to production; a resemblance with main clauses does not alleviate the relative difficulty of these types of relative clauses in comprehension, and appears to be the culprit that led children to misinterpret the referent of the relative clause. Because of the resemblance with a main clause, children might have analyzed the relative clauses using the canonical word order schema (as suggested by Bever (1970)). As relative clauses are used to provide information about the head NP and because subjects are usually the default topic of a sentence, children might have, by default, treated the subject of the relative clause as the head NP, and that is why head errors, in particular those which involved misinterpreting the subject as the target referent, were more prevalent in these types of relative clauses. For relative clauses that do not have a main clause resemblance, children seem to have misanalysed the constituent order of the relative clause using the canonical word order sequence, thereby committing reversal errors. The reversal errors were most prevalent in the direct object relative clauses of the DO – IO comparison, the direct object and oblique relative clauses of the DO – OBL comparison, and the subject relative clauses of the S – DO comparison. All these types of relative clauses share a common property: a dissimilarity with matrix clauses in the order of constituents, as shown in (93).

(93) a. Transitive subject relative clause:
In reversal errors, children appeared to rely on the canonical order of the nominals in main clauses to interpret the respective grammatical roles of the NPs in the relative clause. For example, children mistook the original subject head noun of the transitive subject relative clause in (93a), which comes second in the sequence of nominal elements after relativization, as the direct object of the relative clause. Similarly, the original direct object head noun in the ditransitive relative clause in (93b) was mistaken as the indirect object, as it comes as the last NP in the relative clause, which conforms to the position of the recipient in the usual sequence of a ditransitive construction in Cantonese (subject (S) – theme (T) – recipient (R)).

The situation was less straightforward in the direct object and oblique relative clauses with a locative construction. In both types of relative clauses, (93c) and (93d), children misinterpreted the relative clause as ‘the boy put the dinosaur behind the car’, even though oblique relative clauses actually have a different sequence of nominal constituents with the misinterpretation ‘boy (subject) – car (direct object) – RP – back (spatial relation) – dinosaur (oblique)’. This might be due to misanalysis of the reference of the resumptive pronoun on top of the previously discussed interpretation effect of the nominal sequence. The pronominal
might have been associated with the immediately preceding noun, making the car in (63d) the antecedent for the resumptive pronoun of the relative clause, thereby misinterpreting the spatial relation *hoeng2 kei5 baau6min6* ‘at its back’ as ‘the car’s back’ instead of ‘the dinosaur’s back’. Along the same logic, this might explain why children have a dispreference for the resumptive pronoun in indirect object and oblique relativization as it introduces a long-distance referential dependency that must then be resolved.

In children’s comprehension, the resemblance with main clauses misleads children into assuming that the relative clause is about the subject, thereby creating a head error. On the other hand, children apply the main clause schema to interpret relative clauses that do not have a main clause resemblance, thereby committing reversal errors. Therefore, the reliance on the canonical word order, together with the subject preference, results in the error patterns observed in children’s comprehension, in contrast to the alleviation effect observed in their production.

The effect of word order explains the discrepancy between children’s comprehension and production; the next task is to explain the prevailing subject preference observed in both comprehension and production. In addition to the strong subject preference observed in children’s comprehension, children and adults also showed a unanimous subject preference in their overall production of different types of relative clauses. The next section will examine what underlies the prevailing subject preference in the acquisition of Cantonese relative clauses and further explain how different factors contribute to the acquisition of Cantonese relative clauses.

### 4.3.2 Implications for theories of relative clause processing/acquisition

The pattern observed in children’s comprehension and production demonstrated (i) a prominent subject preference in the acquisition of Cantonese relative clauses, and (ii) the process of relative clause acquisition is modulated by multiple factors. The subject advantage observed in Cantonese children lends support to a universal subject preference in the processing/acquisition of relative clauses. Not all accounts advocating a
universal subject preference can provide a satisfactory explanation for the prevailing subject preference over all other positions, except the topicality account.

The topicality account suggests that the processing ease of a relative clause is correlated with its relative topicality (e.g. Mak, Vonk, & Schriefers, 2006, 2008; Kim & O'Grady, 2015). The function of a relative clause is to provide specific information about a particular entity in the speech context; children could have expected any information provided in the sentence to be about the topic of the sentence, which is usually the subject. Therefore, when the relative clause describes the subject, the default topic of the sentence, the consistency with the expectations facilitates processing of the relative clause, and hence the relative ease of subject relative clauses. In addition to the high accuracy in comprehension and high rate of target production, the hypothesis that children have a preference for the subject to be the head of relative clause is supported by the large number of head errors found in children’s comprehension, of which children often mistakenly chose the subject of the relative clause as the target. It is further supported by the strong tendency of children (and adults) to use subject relative clauses in response to all types of elicitations, even though the resulting relative clause would involve a more complex syntactic structure, such as a passive voice construction, or a reduced transitive or middle voice construction.

Other accounts failed in various ways to explain the observed asymmetries in difficulty, and the structural account is among one of them. The structural account states that the source of difficulty stems from the depth of the filler–gap dependency, and predicts the hierarchy of processing difficulty would correlate with their relative embeddedness in the relative clause structure, as shown in Figure 20. Subject is predicted to be the easiest to process compared to the more embedded direct object and indirect object gaps. By the same reasoning, direct object should be easier to process than the deeply embedded oblique. However, in the current results, the supposedly more embedded indirect object and oblique were found to be no different from the direct object in children’s comprehension, and oblique relative clauses were marginally easier to produce than direct object relative clauses in children’s production.
The working memory-based account (Gibson, 1998, 2000; Warren and Gibson, 2002; Vasishth and Lewis, 2006), which predicts an object advantage in Cantonese, does not only fail to predict the subject advantage in Cantonese, but also fails to explain the dichotomy observed. The calculations of the processing costs by the working memory-based account are illustrated in (94). Subject relative clauses, which are predicted to be the most difficult type to process as they always have a longer filler-gap dependency, is proven to be the easiest and the most preferred type. On the other hand, the account predicts a difference in difficulty between direct object and indirect object for ditransitive relative clauses, and between direct object and oblique for relative clauses with a locative construction, as direct object relative clauses have a longer gap-filler dependency than indirect object and oblique relative clauses. Yet, such difference was not observed. Even if the calculation of the effect of distance further assumes the gap is first integrated with the verb in prenominal relative clauses (Gibson & Wu, 2013; Miyamoto & Nakamura, 2003), the memory-based account still fails to explain the prevalence of subject relative clauses over other positions.

(94) a. S vs. DO comparison:

S: | -------1------- 2 ------------------ |

[rc 追 女仔] 嚇 個 男仔
zeoi1 neo5zai2 go2 go3 naam4zai2
chase girl that CL boy
‘the boy that chases the girl’

DO: | ------------------ |

[rc 男仔 追 -----] 嚇 個 女仔
naam4zai2 z eo1 go2 go3 neo5zai2
boy chase that CL girl

Figure 20. The positions of arguments in a Cantonese relative clause construction.

a. Ditransitive construction; b. locative construction.
b. S vs. IO comparison:

\[
\begin{array}{c|c|c|c|}
& 1 & 2 & 3 \\
\hline
S: [rc — 派 波波 俾 哥哥] 唱 個 姐姐 \\
& paa3 bo1bo1 bei2 go4go1 go2 go3 ze4ze1 \\
& give.out balloon DAT brother that CL sister \\
& 'the woman that gives out a balloon to the man'
\end{array}
\]

\[
\begin{array}{c|c|c|c|}
& 1 & 2 & 3 \\
\hline
IO: [rc 姐姐 派 波波 俾 哥哥] 唱 個 哥哥 \\
& ze4ze1 paa3 bo1bo1 bei2 keoi5 go2 go3 go4go1 \\
& sister give.out balloon DAT 3SG that CL brother \\
& 'the man that the woman give out a balloon to (him)'
\end{array}
\]

c. DO vs. IO comparison:

\[
\begin{array}{c|c|c|c|}
& 1 & 2 & 3 \\
\hline
DO: [rc 爸爸 推 — 俾 弟弟] 唱 個 姐妹 \\
& baa4baa1 teoi1 bei2 dai4dai2 go2 go3 mui4mui2 \\
& father push DAT little.brother that CL sister \\
& 'the little sister that the father push to little brother'
\end{array}
\]

\[
\begin{array}{c|c|c|c|}
& 1 & 2 & 3 \\
\hline
IO: [rc 爸爸 推 姐妹 俾 哥哥] 唱 個 弟弟 \\
& baa4baa1 teoi1 mui4mui2 bei2 keoi5 go2 go3 dai4dai2 \\
& father push little.sister DAT 3SG that CL little.brother \\
& 'the little brother that the father push the little sister to (him)'
\end{array}
\]

d. DO vs. OBL comparison:

\[
\begin{array}{c|c|c|c|}
& 1 & 2 & 3 \\
\hline
DO: [rc 男仔 擺 — 响 恐龍 後面] 唱 架 車車 \\
& naam4zai2 baa2 hoeng2 hung2lung4 hau6min6 go2 gaa3 ce1ce1 \\
& boy place at dinosaur back that CL car \\
& 'the car that the boy place behind the dinosaur'
\end{array}
\]

\[
\begin{array}{c|c|c|c|}
& 1 & 2 & 3 \\
\hline
OBL: [rc 男仔 擺 車車 响 佢 後面] 唱 隻 恐龍 \\
& naam4zai2 baa2 ce1ce1 hoeng2 keoi5 hau6min6 go2 zek3 hung2lung4 \\
& boy place car at 3SG back that CL dinosaur \\
& 'the dinosaur that the boy put the car behind (it)'
\end{array}
\]

The working memory-based account is further refuted by the children’s performance in the different types of subject and object relative clauses. The subject and object relative clauses tested in the current experiment involved different constructions, namely transitive, ditransitive and locative constructions. Ditransitive and
locative constructions are inevitably more complex than simple transitive clauses with the presence of an additional prepositional phrase. According to the account’s calculation of processing difficulty, which depends on the number of discourse referents (nouns and verbs) intervening within the dependency (Warren and Gibson, 2002), the additional prepositional phrase in ditransitive and locative clauses should incur a higher processing cost as it introduces at least one extra discourse referent (the prepositional object) within the dependency (putting aside the verbal nature of the Cantonese prepositions which could be considered as another extra discourse referent). Yet, accuracy in comprehension was even higher for the trivalent subject relative clauses (84.4% in the give condition and 89% in the dative verb condition) than the bivalent subject relative clauses (76.3%).

Another account that predicts an object advantage for Cantonese is the word order account. It predicts an advantage for relative clauses whose constituent configuration shares the same order as main clauses, and therefore a direct object relative clause (or even for indirect object and oblique) advantage should be found in Cantonese, as these types of relative clauses have a resemblance with the main clause. Contrary to the prediction, subject relative clauses, which do not resemble the constituent order of main clauses, were easier to process than all those relative clauses that have a surface resemblance with main clauses.

The word order account might have failed to explain the observed asymmetry in processing difficulty, but, as discussed in § 4.3.1, the word order effect explains the alleviated difficulty in the production of relative clauses which have a main clause resemblance. It also explains the error patterns in children’s comprehension: head errors appear because children have misinterpreted the relative clauses with a main clause word order schema, and mistaken the head of the relative clause to be the subject; on the other hand, reversal errors appear because children apply the main clause word order schema to interpret relative clauses which do not resemble a main clause.

Similarly, the effects of structural complexity (in terms of valency) and discourse referentiality are not found in determining the relative clause preference in the acquisition of Cantonese relative clauses. However, both factors play a significant role in children’s production. Children tend to avoid using the full ditransitive and
locative constructions, which are structurally more complex, in their relative clauses; instead, they prefer the structurally simpler transitive construction, leading to a significant proportion of reduced ditransitive and simple transitive relative clauses in the indirect object and oblique conditions. Furthermore, children (and adults) were found occasionally to represent other non-head NPs in the relative clause with an indefinite nominal as a measure of defocus to avoid any interference effect from the discourse referents within the long distance dependency. The example in (95) uses the indefinite nominal jan4 ‘person’ without a specific referent to represent the demoted subject in a passivized subject relative clause. If the presence of discourse referents within a long distance dependency will interfere with its resolution and thereby increase processing costs (Warren & Gibson, 2002), then reducing the information load of the intervening NP might help to reduce the processing load during children’s production.

(95) Passivized subject relative clause with an explicit original subject:

\[
\begin{align*}
\text{RC} & \quad \text{俾人} \quad \text{啞個} \quad \text{男仔} \\
\text{bei2} & \quad \text{jan4} \quad \text{sek3} \quad \text{go2} \quad \text{go3} \quad \text{naam4zai2} \\
\text{PASS} & \quad \text{person} \quad \text{kiss} \quad \text{that} \quad \text{CL} \quad \text{boy} \\
\text{‘the boy that is kissed by someone’}
\end{align*}
\]

Target:

\[
\begin{align*}
\text{RC} & \quad \text{女仔} \quad \text{啞個} \quad \text{男仔} \\
\text{neoi5zai2} & \quad \text{sek3} \quad \text{go2} \quad \text{go3} \quad \text{naam4zai2} \\
\text{girl} & \quad \text{kiss} \quad \text{that} \quad \text{CL} \quad \text{boy} \\
\text{‘the mother that is hugging the daughter’}
\end{align*}
\]

Consistent with the NPAH, children in the current study find subject relative clauses easiest to understand and to produce than other types of relative clauses (i.e. direct object, indirect object and oblique); but apart from that, the predicted accessibility hierarchy, in particular for the lower positions, is not borne out by the asymmetries observed in children’s comprehension and production. The incompatibility with the full NPAH suggests that the acquisition of relative clause is not only shaped by the factors that underlie the accessibility (or the inferred processing difficulty) to relativization, but also by factors such as, general learning strategies. This hypothesis is in line with the multifactorial analysis proposed by Diessel and Tomasello (2005) and Hawkins (2007). The topicality of subject explains the overwhelming subject preference in both comprehension and production, which makes subject relative clauses easier to understand and to produce,
and the preferred type when using a relative clause to depict a referent. The word order resemblance helps children make use of their previously acquired knowledge of the language’s canonical word order to construct the relative clause. At the same time, they tend to mistake the subject, the default topic of a sentence, as the head.

Except for the prevailing subject preference, the asymmetries observed in the current study are inconsistent with the hierarchy observed in existing cross-linguistic studies, such as English, German and Korean (Diessel and Tomasello, 2005; Kim and O’Grady, 2015). The discrepancy observed in Cantonese could be due to the difference in various linguistic properties of the relative clause construction between Cantonese and other languages. In Cantonese, the head direction (head-initial) and relative clause position (prenominal) are in discordance, which contrasts with the parallel head direction in languages such as English and Korean. Cantonese relativization uses different relativization strategies for different types of relative clauses, while English and Korean use the gap strategy for all types of relative clauses. The prepositional markers in Cantonese are grammaticalized verbs, such as the dative marker bei2 ‘give’ and the locative marker hoeng2 ‘exist, be’, so the counterpart to the English or Korean prepositional phrases in Cantonese are somehow co-verb phrases. How these linguistic features in Cantonese relativization modulate the processing and acquisition of relative clauses in Cantonese awaits further research.

Among the accounts which support a universal subject advantage, there is also the experience-based account, which advocates that the processing difficulty of a particular type of relative clause is determined by its relative frequency in the language. It would be worth pursuing further whether relative clauses in spontaneous Cantonese demonstrate a parallel pattern of frequency of use as the observed asymmetries in the current study in order to evaluate the experience-based account.

4.4 Conclusion
This study explored the acquisition of Cantonese relative clause acquisition by examining children’s comprehension and production of relative clauses. In hand with previous cross-linguistic research, the results
of the current experiments support a universal subject preference. They also suggest that the topicality of the subject makes it more accessible for relativization than other NP positions, hence the prevailing subject preference in both children’s comprehension and production, as well as adults’ production. Although other proposed processing factors, such as word order, structural complexity and the occurrence of an intervening NP between a gap and the corresponding filler, failed to account for the observed asymmetries of processing difficulty, they also seem to play a role in children’s acquisition of relative clauses, in particular in their still-developing production. The study supports a multifactorial analysis for the acquisition of relative clauses, and it is important to continue the quest for identifying the factors that contribute to the acquisition and processing of relative clauses and the role each of them undertake in the process.
5.1 Experiment 3: The role of animacy on the production of Cantonese relative clause

Current proposals for the animacy effect are made based on observations from postnominal relative clauses, of which the first word the processor encounters is the head noun. The head animacy in postnominal relative clauses provides critical information about the upcoming relative clause structure. For example, an animate head noun is more likely to be the subject of a sentence, and so the relative clause following an animate head is more likely to be a subject relative clause. This kind of predictive processing allows the processor to be prepared for subsequent structure and reduces the possibility of misanalyses resulting from false predictions. However, such advantage enjoyed by the postnominal relative clauses from the semantic information of the head noun might not be applicable to the prenominal Cantonese relative clauses, whose head comes after the relative clause. Being prenominal, the first constituent in the Cantonese relative clause construction is either the relative clause verb in a subject relative clause, as in (96), or the relative clause subject in an object relative clause, as in (97).

(96) Subject (S):

\[\text{抱住} \text{BB} \quad \text{個} \quad \text{媽媽} \quad \text{bi4bi1} \quad \text{go2} \quad \text{go3} \quad \text{maa4maa1} \]

\[\text{hold} \quad \text{baby} \quad \text{that} \quad \text{CL} \quad \text{Mother} \]

\'the mother that holds the baby'  

(97) Object (DO):

\[\text{媽媽} \quad \text{抱住} \quad \_ \quad \text{個} \quad \text{BB} \quad \text{bi4bi1} \quad \text{go2} \quad \text{go3} \quad \text{maa4maa1} \]

\[\text{Mother} \quad \text{hold} \quad \text{that} \quad \text{CL} \quad \text{baby} \]

\'the baby that the mother holds'  

The language processor cannot make use of the animacy cue of the head noun to predict the upcoming relative clause structure as it comes after the relative clause. However, this does not mean animacy cannot play a role in Cantonese relative clause processing. The facilitation effect of animacy should be observed in
the stage of referential resolution. While processing the relative clause, the language processor should have established certain expectations about the upcoming head noun. If the relative clause is a subject relative clause, the processor should be more likely to predict an animate head noun, as animate entities are more topicworthy and tend to be subjects. On the other hand, if the pattern that is being processed is an object relative clause, then the processor should be expecting an inanimate head noun, as objects tend to be inanimate. Similar animacy mismatch effects observed in postnominal relative clause processing should be reflected in children’s performance with prenominal Cantonese relative clauses, so that they find relative clauses whose head noun does not match the expected animacy value to be more difficult.

Experiment 3 examined the effect of animacy on the production of Cantonese relative clauses. While previous research on the effect of animacy on relative clause processing had not systematically tested the effect of all possible animacy configurations, the current experiment aimed at providing a full picture of the processing of prenominal relative clauses under different animacy configurations by cross-comparing the effect of all possible animacy configurations, as illustrated in Table 1. Manipulations were made to the animacy of the NP in each syntactic position of the relative clause, i.e. the subject and object positions, resulting in the full range of animacy configurations, namely animate subject - animate object (AA), animate subject - inanimate object (AI), inanimate subject - animate object (IA), and inanimate subject - inanimate object (II), in the current observation.

<table>
<thead>
<tr>
<th>RC Subject</th>
<th>RC Object</th>
<th>Animacy</th>
<th>Inanimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animate</td>
<td>AA</td>
<td>AI</td>
<td></td>
</tr>
<tr>
<td>Inanimate</td>
<td>IA</td>
<td>II</td>
<td></td>
</tr>
</tbody>
</table>

Table 3. Animacy configurations
5.1.1 Method

Participants. Twenty undergraduate students of the University of Hong Kong participated in the experiment. They were all born in Hong Kong and Cantonese was their first language. They were compensated for their participation.

Twenty-two Cantonese-speaking children from a local kindergarten in Hong Kong also participated in this experiment. Their ages ranged from 4;02.29 – 5;10.00 (mean age: 5;00.18). Children were awarded a gift for their participation. Seven children were excluded due to unbalanced trials in one set of test materials, and an additional child was excluded due to high rate of failed attempts, bringing the sample to a total of 14 participants in subsequent analysis.

Materials. The target sentences were manipulated for animacy in each syntactic position in the relative clause (animate vs. inanimate). This resulted in a total of four animacy configurations, with two parallel animacy configurations, namely animate subject - animate object (AA), and inanimate subject - inanimate object (II), and two contrastive animacy configuration, namely animate subject - inanimate object (AI), and inanimate subject - animate object (IA), to be examined. Six sets of test sentences were created for each animacy configuration, giving a total of twenty-four sets. Each set consisted of a comparable pair of subject and object relative clauses. Both sentences depicted the same transitive event, differing only in the relativized position of the head noun in the relative clause (subject vs. object). The transitive event depicted by the sentence always involved an agentive subject and a patient object, even for those with an inanimate subject. An example set of target sentences from each animacy configuration is given in (98) to (101). Unlike the usual design of test sentences in relative clause research, the thematic roles of the characters involved in the relative clause event were not always reversible. For example, a girl can throw a ball, but the reverse is not plausible.

(98) Animate subject - animate object (AA):
   a. Subject (S):
      [RC — 抱住 BB] 嗰 個 媽媽
      pou2zyu6 bi4bi1 go2 go3 maa4maa1
      hold-CONT baby that CL mother
      'the mother that is holding the baby'
b. Object (DO):

[rc 媽媽 拥住 _ ] 嚇 個 BB
maa4maa1 pou2zyu6 go2 go3 bi4bi1
mother hold-CONT that CL baby
'the baby that the mother is holding'

(99) Animating subject - inanimate object (AI):

a. Subject (S):

[rc _ 拋緊 波波 ] 嚇 個 女仔
paau1gan2 bo1bo1 go2 go3 neoi5zai2
throw-PROG ball that CL girl
'the girl that is throwing the ball'

b. Object (DO):

[rc 女仔 拋緊 _ ] 嚇 個 波波
neoi5zai2 paau1gan2 go2 go3 bo1bo1
girl throw-PROG that CL ball
'the ball that the girl is throwing'

(100) Inanimate subject - animate object (IA):

a. Subject (S):

[rc _ 砸住 男仔] 嚇 個 電視
zaak6zyu6 naam4zai5 go2 go3 din6si6
crush.CONT boy that CL TV
'the TV that is crushing the boy'

b. Object (DO):

[rc 電視 砸住 _ ] 嚇 個 男仔
din6si6 zaak6zyu6 go2 go3 naam4zai5
TV crush.CONT that CL boy
'the boy that the TV is crushing'

(101) Inanimate subject - inanimate object (II):

a. Subject (S):

[rc _ 夹住 張 纸] 嚇 個 夹
gaap6zyu6 zoeng1 zi5 go2 go3 gep2
clip.CONT CL paper that CL clip
'the clip that is clipping the paper'

b. Object (DO):

[rc 個 夹 夹住 _ ] 嚇 張 纸
go3 gep2 gaap6zyu6 go2 zoeng1 zi5
CL clip clip.CONT that CL paper
'the paper that the clip is clipping'
The design of the visual stimuli in Experiment 3 basically followed that of Experiment 2, except for a slight modification to the distractor picture due to the thematic irreversibility in certain animacy configurations. Instead of using a scene of reversed thematic roles between the target character and the non-target character as the distractor picture, the two pictures differed from each other in the non-target character involved in the event. An example of the visual stimulus is given in Figure 21 with the corresponding test sentence in (102).

As in the example, with the baby as the head noun, one baby is carried by the mother in the target picture whereas the other baby is carried by the father in the distractor picture in the Background Description picture. Other parts of the visual stimulus, such as the Target picture and the Prompt picture followed the same principle of design in Experiment 2.

\[(102) \quad [\text{RC} \text{媽媽} \, \text{抱住} \, \_ \, ] \quad \text{嗰個} \quad \text{BB} \quad \text{bi4} \text{bi1} \quad \text{baby} \]

\(\text{媽媽} \, \text{pou2} \text{yu6} \quad \text{母亲} \, \text{hold} \quad \text{that} \quad \text{CL} \, \text{baby}
\]

\'the baby that the mother holds\'

\[\begin{array}{c}
a. \text{First screen: Background Description.} \\
\text{There are two babies. Mother is holding one baby and Father is holding the other baby.} \\
\text{Figure 21. Sample test trial.}
\end{array}
\]

\[\begin{array}{c}
b. \text{Second screen: Target.} \\
\text{Oh! Little Penguin is looking at the baby. Which baby is Little Penguin looking at?} \\
\text{Target: “the baby that Mommy is holding”}
\end{array}
\]

\[\begin{array}{c}
c. \text{Third screen: Prompt.} \\
\text{Can you tell Bunny which baby it is?} \\
\text{Target: “the baby that Mommy is holding”}
\end{array}
\]

The above example shows a sample test trial for the animate subject – animate object (AA) configuration. Figure 22 to Figure 24 are going to show respectively the base picture of a sample test sentence for each of the other animacy configurations, namely the animate subject – inanimate object (AI), the inanimate subject – animate object (IA) and the inanimate subject – inanimate object (II) configurations.
Target (S): 'the girl that is throwing the ball'

Figure 22. Sample visual stimulus for the animate subject – inanimate object (AI) configuration.

Target (S): 'the TV that is crushing the boy'

Figure 23. Sample visual stimulus for the inanimate subject – animate object (IA) configuration.

Target (S): 'the clip that is clipping the paper'

Figure 24. Sample visual stimulus for the inanimate subject – inanimate object (II) configuration.

Stimuli were pseudo-randomized, creating four orders of presentation. Each order consisted of 24 test sentences (3 tokens for each condition) and 6 filler items. The target character and its location were counter-balanced across all trials and for all participants.

Procedure. The procedure as well as the scoring method followed the paradigm illustrated in Experiment 2.

5.1.2 Results

5.1.2.1 Adults

Figure 25 shows the types of responses elicited from adults in the subject and object relative clause elicitation conditions in different animacy configurations. A high proportion of relative clause responses (RC), including both target and non-target relative clauses, was successfully elicited in each condition. Only a small
The proportion of responses were errors (e.g. demonstrative or simple NP), matrix clauses, adjectivals (Adj, e.g. *the blue boy*) or genitive NPs (GEN NP, e.g. *the girl’s mother*). No topicalization construction (TOP) was found in adults’ production.

**Figure 25. Proportions of different types of responses elicited from adults in subject and object relative clause elicitation conditions in different animacy configurations.**
(a) AA: animate subject – animate object; (b) AI: animate subject – inanimate object; (c) IA: inanimate subject – animate object; (d) II: inanimate subject – inanimate object.

The proportion of target relative clause responses by adults was analyzed using a two-way repeated measures ANOVA, with relative clause type (S vs. DO) and animacy configuration (AA vs. AI vs. IA vs. AA) as the within-subjects variables. The main effects of relative clause type and animacy configuration were significant (RC type: $F(1, 19) = 48.37$, $p<.001$; animacy configuration: $F(3, 57) = 15.59$, $p<.001$). The interaction between relative clause type and animacy configuration was also significant ($F(3, 57) = 10.74$, $p<.001$). This suggests that the pattern of target responses in subject and object relative clause elicitation is modulated by the variations in the animacy configuration of the relative clause. The pattern of relative clause responses in each animacy configuration will be discussed individually in the section below.
Animate subject – animate object configuration (AA)

Adults produced significantly more target relative clauses in the subject relative clause elicitation than in the object relative clause elicitation ($t(19) = 5.15, p<.001$). The percentage of target relative clauses elicited in the animate subject – animate object (AA) configuration is presented in Figure 26.

![Figure 26](attachment:image.png)

**Figure 26.** Proportion of target relative clauses elicited from adults in the animate subject – animate object (AA) configuration.

Figure 27 displays the proportions of the different types of relative clause responses adults produced in the subject and object relative clause elicitation conditions in the animate subject – animate object (AA) configuration. Subject relative clauses were the most frequent type of responses elicited in the subject relative clause elicitation, accounting for the high proportion of target elicitations seen in Figure 26. As for the object relative clause elicitation, the responses largely consisted of passivized subject relative clauses (*Passive S*) and direct object relative clauses (*DO*), in addition to a few internally headed relative clauses (*IHRC*) and subject relative clauses.
Figure 27. Proportions of different types of relative clause responses elicited from adults in the animate subject – animate object (AA) configuration.
(S: subject relative clauses; DO: object relative clauses; Passive S: Passivized subject relative clauses; IHRC: Internally headed relative clauses; RNP: relative clauses with resumptive NP; Patient S: patient-subject relative clauses)

Animate subject – inanimate object configuration (AI)

The proportion of target elicitations in subject relative clause elicitation was significantly higher than for object relative clause elicitation in the animate subject – inanimate object (AI) configuration ($t(19)=3.91$, $p<.001$). The percentage of target relative clauses elicited in each condition is presented in Figure 28.

Figure 28. Proportion of target relative clauses elicited from adults in the animate subject – inanimate object (AI) configuration.

Figure 29 displays the proportions of the different types of relative clause responses adults produced in the subject and object conditions in the animate subject – inanimate object (AI) configuration. The proportion of target production was highest in the AI animacy configuration, within which we also found the highest success rate for object relative clause elicitations (vs. AA: $p=.03$; vs. IA: $p<.001$; vs. II: $p=.001$). There were...
only a small number of alternative constructions, such as passivized subject relative clauses, observed in the object relative clause condition in comparison to other animacy configurations.

![Figure 29](image)

**Figure 29. Proportions of different types of relative clause responses elicited from adults in the animate subject – inanimate object (AI) configuration.**

(S: subject relative clauses; DO: object relative clauses; Passive S: Passivized subject relative clauses; IHRC: Internally headed relative clauses; RNP: relative clauses with resumptive NP; OVS: patient-subject relative clauses)

Inanimate subject – animate object configuration (IA)

The proportion of target responses dropped drastically in the object relative clause elicitation condition, leading to a great contrast between subject and object relative clause responses in the inanimate subject – animate object (AI) configuration ($t(19) = 7.34$, $p<.001$). The proportion of target relative clauses elicited in each condition is presented in Figure 30.

![Figure 30](image)

**Figure 30. Proportion of target relative clauses elicited from adults in the inanimate subject – animate object (IA) configuration.**
ACQUISITION OF CANTONESE RELATIVE CLAUSES: NP ANIMACY

Figure 31 displays the frequency of the different types of relative clause responses adults produced in the subject and object conditions in the inanimate subject – animate object (IA) configuration. While subject relative clause elicitation comprised exclusively of subject relative clauses, object relative clause elicitation consisted predominantly of passivized subject relative clauses, with a small proportion of the targeted object relative clauses and patient-subject relative clauses.

![Figure 31. Proportions of different types of relative clause responses elicited from adults in the inanimate subject – animate object (IA) configuration.](image)

(S: subject relative clauses; DO: object relative clauses; Passive S: Passivized subject relative clauses; IHRC: Internally headed relative clauses; RNP: relative clauses with resumptive NP; OVS: patient-subject relative clauses)

Patient-subject relative clauses (Patient S) were found exclusively in the object relative clause elicitation of the inanimate subject - animate object (IA) configuration. An example is given in (103).

(103) Patient-subject relative clause:

\[
[ \text{RC} \quad \text{拮住} \quad \text{個} \quad \text{伯伯} ]
\]

\[
\begin{align*}
gat1zyu6 & \quad \text{go2} & \quad \text{baa2} & \quad \text{gim3} & \quad \text{go2} & \quad \text{go3} & \quad \text{baak3baak3} \\
\text{stab-CONT} & & \text{CL} & & \text{CL} & & \text{old.man} \\
\end{align*}
\]

'the old man that is being stabbed by the sword'

Target:

\[
[ \text{RC} \quad \text{把} \quad \text{劍} \quad \text{拮住} \quad \text{個} \quad \text{伯伯} ]
\]

\[
\begin{align*}
\text{baa2} & \quad \text{gim3} & \quad \text{gat1zyu6} & \quad \text{go2} & \quad \text{go3} & \quad \text{baak3baak3} \\
\text{CL} & & \text{sword} & & \text{stab-CONT} & & \text{CL} & \text{old.man} \\
\end{align*}
\]

'the old man that the sword is stabbing'
This was similar to the role reversal error, in which the two NPs switched their location in the predicate, resulting an exchange in their syntactic roles, i.e. the original subject (sword) became the object while the original object (the old man) became the subject. The result is a passive-like construction, but without the auxiliary and the oblique marker for agent found with prototypical passive construction in Cantonese.

What is different from the usual role reversal errors observed in children is the retention of the thematic roles of the NPs. For example, in the usual role reversal errors, the target event of a relative clause the girl that the boy kisses would be ‘the boy kisses the girl’, and the event depicted by a response with role reversal error would become ‘the girl kisses the boy’, in which the original object (the girl) becomes the subject, taking the agent role of the predicate. The same applies to the original subject (the boy), which becomes the object as well as the patient of the predicate. Yet, in a patient-subject relative clause, as shown in (103), the original object (the old man) retains its original thematic role as the patient, even though it appears in the subject position. This gives the construction a sense of unaccusativity, in which the subject of the predicate takes a patient role; yet, different from unaccusative verbs, this construction is transitive. The switch of the syntactic positions does not trigger a change in meaning of the predicate event; the original transitive sense, such as the meaning of the sword stabbing the old man in the example, is preserved. There is, however, a slight difference in semantics between the target transitive object relative clause and the patient-subject relative clause: the latter carries a sense of describing a state experienced by the target referent, instead of describing the happening of the event, making the patient-subject more like an experiencer of the predicate.

The inverse voice of use is allowed in Cantonese, but only restricted to a very limited set of verbs. One of the most common of this type of verb is given in (104). The transitive verb kam2 means ‘cover’ in Cantonese (104a), but becomes ‘covering with a blanket’ when combined with pei2 ‘blanket’ (104b).

(104) a. **Kam2** (active voice):

```
個 BB 眼住 隻 眼
go3 bi4bi1 kam2zyu6 zek3 ngaan5
CL baby cover-PROG CL eye
```

‘The baby is covering an eye.’
b. *Kam2* (with patient-subject):

\[
\text{個 BB 冇被}
\text{go3 bi4 bi1 kam2 pei2}
\text{CL baby cover.blanket}
\]

‘The baby is covered by the blanket.’

One might suggest that the verb like *kam2pei2* ‘covering with blanket’ could be a VO compound, which makes it a completely different verb from the transitive *kam2* ‘cover’. Yet, the noun in the compound is not an object of the verb, and is allowed to be modified for specificity, as shown in (105). The sense of inverse voice still retains even when the verb is not in the form of a verb compound.

\[
\text{個 BB 冇住... 張 被}
\text{go3 bi4 bi1 kam2 zyu6 jat1 one zoeng1 pei2}
\text{CL baby cover-PROG CL blanket}
\]

‘The baby is covered by a blanket.’

**Inanimate subject – inanimate object configuration (II)**

The subject relative clause elicitation condition continued to elicit more target responses than the object relative clause elicitation condition in the inanimate subject – inanimate object (II) configuration \((t(19) = 5.29, p<.001)\). The proportion of target relative clauses elicited in each condition is presented in Figure 32.

![Figure 32](image-url)
Figure 33 displays the proportions of the different types of relative clause responses adults produced in the subject and object relative clause elicitation conditions in the inanimate subject – animate object (IA) configuration. Similar to other animacy configurations, the subject relative clause elicitation condition elicited exclusively subject relative clause responses. However, responses in the object relative clause elicitation condition consisted a variety of responses, including direct object relative clauses, subject relative clauses, passivized subject relative clauses and a few internally-headed relative clauses.

The subject relative clauses found in the object relative clause elicitation all had the form with the original direct object promoted to the relative clause subject position and the original subject demoted to the oblique position either as an instrumental (106) or as a locative (107).

(106) Subject relative clause with an instrumental subject:

```
[ac __ 用 衣夾 夾住] 啰 個
jung6 j1gep2 gaap6zyu6 go2 go3
use clip clip.CONT that CL
'the paper that is clipping using the clip'
```

Target:
```
[ac 個 夾 夾住 __] 啰 張 紙
go3 gep2 gaap6zyu6 go2 zoeng1 zi5
CL clip clip.CONT that CL paper
'the paper that the clip is clipping'
```
Subject relative clause with a locative:

\[ \text{RC} \quad \text{喺} \quad \text{hai}^2 \quad \text{exist} \quad \text{個} \quad \text{go}^3 \quad \text{CL} \quad \text{盒} \quad \text{hap}^2 \quad \text{box} \quad \text{inside} \quad \text{that} \quad \text{deoi}^1 \quad \text{CL} \quad \text{罐} \quad \text{gwun}^3 \quad \text{Cans} \]

'The pile of cans that is inside the box'

Target:

\[ \text{RC} \quad \text{個} \quad \text{go}^3 \quad \text{CL} \quad \text{盒} \quad \text{hap}^2 \quad \text{box} \quad \text{裝住} \quad \text{zong}^1 \text{zyu}^6 \quad \text{hold.CONT} \quad \text{that} \quad \text{CL} \quad \text{罐} \quad \text{gwun}^3 \quad \text{cans} \]

'The cans that the box is holding'

5.1.2.2 Discussion: Adult production

Adults showed a clear preference for subject relative clauses over object relative clauses, and this subject-object asymmetry was observed across all four animacy configurations. The well-documented disappearance of the processing complexity in object relative clauses with the animate subject – inanimate object (AI) configuration was not found in the adults’ production; adults continued to be relatively more reluctant to produce object relative clauses than subject relative clauses as in other animacy configurations. Yet, the moderation effect did boost the proportion of target object relative clauses in the AI configuration. The proportion of target responses in the object relative clause elicitation condition in the AI configuration was the highest amongst the four animacy configurations. Adults seemed to be more willing to respond using the canonical object relative clause construction when prompted to produce an object relative clause with an animate subject and an inanimate object. The tendency of resorting to alternative constructions was also greatly reduced.

Resorting to a relative clause of a more preferred type, such as subject relative clauses, with an alternative syntactic construction, such as passivization, was often the strategy adopted by adults (as well as children) to avoid the production of the target type of relative clauses, which was presumably of a more dispreferred type. Passivized subject relative clauses were the most common alternative construction used by adults. Resorting to passivized subject relative clauses is not only due to the dispreference for object relative clauses, but also
due to the general subject preference. Even though the processor would need to construct a syntactically more complex construction, the chosen construction satisfies the subject preference while being pragmatically felicitous for referring to the predicate object. The reduction of the rate of alternative constructions and the reduced proportion of passivized subject relative clauses in the animate subject - inanimate object (AI) configuration suggest that object relative clauses with such an animacy configuration are not as dispreferred as other types of object relative clauses, and therefore the tendency to resort to alternatively more favourable syntactic constructions was not as strong as in other configurations.

Direct object relative clauses were treated very differently when the animacy configuration was in the reverse pattern. In the inanimate subject - animate object (IA) configuration, the proportion of target object relative clauses was extremely low, and the passivized subject relative clauses became the predominant type of responses in the object relative clause elicitation condition. The preference for direct object relative clauses disappeared when the animacy configuration was no longer the preferred animate subject – inanimate object (AI) configuration. This could be a result of conflict between the properties of the head NP, for which an animate head noun is strongly expected to be the subject of the relative clause. Furthermore, the frequency account suggests that the ease with the animate subject - inanimate object (AI) configuration comes from frequent exposure to such animacy configuration in natural language, and therefore, the processor would have developed a kind of default expectation for such animacy configuration in all transitive sentences. Assuming that the reverse inanimate subject - animate object (IA) configuration is relatively less frequent in natural language, it increases the difficulty of the already difficult object relative clause construction. This increase in difficulty increases the processing load of the language processor, further forcing participants to resort to easier options such as passivized subject relative clauses in order to avoid the difficult construction. Furthermore, passivizing a transitive event with an animate object would make the animate NP become subject again, which further fulfills the animacy expectation for subjects.

The effect of animacy was only observed in contrastive configurations. The relative clause preferences and patterns of responses were very similar across the two parallel animacy configurations. The only difference
observed between the two parallel animacy configurations was the higher proportion of subject relative clauses with predicate change in the object relative clause elicitation condition in the inanimate subject – inanimate object (II) configuration. In these subject relative clauses, the original subject was often demoted to an oblique position (as in (106) and (107)), allowing the original object to become the subject of the predicate. The detransitivized predicate is supposedly less complex than the target transitive construction (Diessel and Tomasello, 2000), further reducing the difficulty in addition to the promotion of the original object to the subject position. Such a pattern was not observed in the animate subject – animate object (AA) configuration, being presumably barred by the animate status of the subject, which makes it difficult for the entity to become an instrumental or a locative. In overview, differences in the animacy of the NPs in relative clauses without contrastivity did not lead to a huge modulation in the pattern of production. This suggests that animacy has a more critical effect on relative clause processing when a contrast exists between the NPs in the relative clause, of which the information could be used as a cue for the grammatical role that the relevant NP plays in the relative clause.

5.1.2.3 Children

Figure 34 shows the types of responses elicited from children in the subject and object relative clause elicitation conditions in different animacy configurations. Though comparatively lower than adults, relative clause responses (including target and non-target) were the predominant type of responses elicited from children.
A two-way repeated measures ANOVA was used to analyze the proportion of target responses in children's production of relative clauses, with relative clause type (S vs. DO) and animacy configuration (AA vs. AI vs. IA vs. II) as the within-subjects variables. While the main effect of animacy configuration was significant (F(3, 39) = 14.98, p<.001), the effect of relative clause type was not significant (F(1, 13) = 1.05, p = .32). The interaction between the two factors was also not significant (F(3, 39) = 1.55, p = .22). This suggests that children's tendency to produce a target relative clause is modulated by the configuration of the animacy value of the relative clause NPs.

Figure 35 displays the proportions of target relative clauses in the subject and object relative clause elicitation conditions in the four animacy configurations. Children in general found subject relative clauses slightly easier to produce than object relative clauses, except for the animate subject – animate object (AA) configuration, in which object relative clauses enjoyed a slightly higher target production than subject relative clauses. None of
these differences reached statistical significance, however ([AA]: t(13) = .64, p=.53; [AI]: t(13) = 1.47, p=.16; [IA]: t(13) = .48, p=.63; [II]: t(13) = 1.61, p=.13).

![Proportions of target relative clauses elicited from children in different animacy configurations.](image)

Figure 35. Proportions of target relative clauses elicited from children in different animacy configurations.

Children had different preferences in the alternative constructions as adults. Complex constructions, such as passivized relative clauses were rare in children’s responses. Internally-headed relative clauses, as in (108), and predicate change to description of properties, as in (109), were the more common strategies adopted by children to avoid the production of the presumably more difficult target type of relative clauses.

(108) Internally-headed relative clause:

```
[\[RC\]架刀\text{car}撞到\text{hit}\text{CL}樹\text{that}\text{CL}\]
\text{that the car hits the tree}'
```

Target:

```
[\[RC\]架刀\text{car}撞到\text{hit}\text{CL}樹\text{that}\text{CL}\]
\text{the tree that the car hits}'
```

(109) Property description:

```
[\[ac\]\text{not have}\text{legs}那\text{the}\text{boy}]
\text{the boy that does not have legs'}
```

```
[gaa3\text{car}gong6\text{hit}syu6\text{tree}\text{that}\text{CL}]
\text{the tree that the car hits}'
```
Target: 
[RC 啲 雪 埋住 —] 嘅 個 男仔
d1 suet3 maa4zyu6 go2 go3 naam4zai2
CL: snow bury-CONT that CL boy

'the boy that the snow is burying'

Details of the pattern of relative clause responses in each animacy configuration will be discussed individually in the section below.

Animate subject – animate object configuration (AA)

The proportions of the different types of relative clause responses children produced in the subject and object relative clause elicitation conditions in the animate subject – animate object (AA) configuration are presented in Figure 36. The two elicitation conditions did not differ much in the variety of alternative constructions elicited, but the direct object relative clause condition resulted in slightly more target relative clauses than in subject relative clause condition.

Figure 36. Proportions of different types of relative clause responses elicited from children in the animate subject – animate object (AA) configuration.
(S: subject relative clauses; DO: object relative clauses; Passive S: Passivized subject relative clauses; IHRC: Internally headed relative clauses; RNP: relative clauses with resumptive NP; Patient S: patient-subject relative clauses)

In both conditions, there were a few instances of non-target relative clauses of the other NP type, i.e. subject relative clauses produced in object relative clause condition, and object relative clauses produced in subject
relative clause condition. All these instances involving a switch in NP type were instances of reversal errors. An interesting pattern was observed among the reversal errors found in the two elicitation conditions: the reversal errors found in the subject relative clause elicitation condition were all head reversal errors, as shown in (110). Instead of relativizing the subject of the predicate, the head NP became the original object.

(110) Head reversal error in subject relative clause elicitation condition:

```
[RC 媽媽 鬧 女仔] 嗜 個 女仔
maa4maa1 naau6 go2 go3 neoi5zai2
mother scold that CL girl
'the girl that the mother scolds'
```

Target:

```
[RC _ _ _] 嬰 個 媽媽
naau6 neoi5zai2 go2 go3 maa4maa1
scold girl that CL mother
'the mother that scolds the girl'
```

Reversal errors in the object relative clause elicitation conditions were split between head reversal and role reversal errors. The head reversal errors were similar to those found in the subject relative clause condition, as shown in (111); the role reversal errors involved a reversal of the thematic roles of the NPs in the predicate event, resulting to a reversal of grammatical roles in the relative clause produced. An example is given in (112).

(111) Head reversal error in object relative clause elicitation condition:

```
[rc _ 騎 熊仔] 後面 嗜 隻
pou2zyu6 hung4zai2 hou6min6 go2 zek3
ride-CONT Teddy back that CL
'the one that is riding the teddy’s back’ (NOTE: the child called the hippo ‘teddy’)
```

Target:

```
```

---

3 It is undoubtedly difficult to distinguish a response in (13) whether children intended them as an object relative clause or simply a declarative sentence. One possible (but not always applicable) way is to identify the syntactic construction by prosody, such as a high tone for the relativizer (go2 becomes go1). Such challenge was not very frequent, as children often embedded their responses within a matrix clause, such as ‘(the fairy) is pointing at...’.
Acquisition of Cantonese Relative Clauses: NP Animacy

(125)

[RC
cat
sitting _] the
zebra
kitty
sit
that
CL
hippo

'the hippo that the kitty is riding'

Role reversal error in object relative clause condition:

[RC
_holding
mommy
that
CL
baby

'the baby that is holding Mommy'

Target:

[RC
_mother
holding
that
CL
baby

'the mother that is holding the baby'

Limited instances of errors with head and role reversal combined were also found, as shown in (113). Only two such instances were found in the animate subject – animate object (AA) configuration for the same test trial. None was observed in other animacy configurations.

(113) Head/role reversal error in object relative clause elicitation condition:

[RC
_father
piggybacking
REL
child

'the child that the father is piggybacking on'

Target:

[RC
_mother
piggybacking
that
CL
father

'the mother that is holding the baby'

Animate subject – inanimate object configuration (AI)

Figure 37 displays the proportions of the different types of relative clause responses children produced in the subject and object relative clause elicitations in the animate subject – inanimate object (AI) configuration. Children produced almost exclusively target relative clauses in the AI configuration, in particular for the direct
object relative clauses. Although both subject and object relative clauses with the AI animacy configuration had higher rates of target production than those with the parallel animate subject – animate object (AA) animacy, only the difference for subject relative clauses reached significance (p = 0.01). Similar to the AA animacy configuration, all the direct object relative clauses produced in the subject relative clause elicitation condition were head reversal errors.

**Figure 37. Proportions of different types of relative clause responses elicited from children in the animate subject – animate object (AA) configuration.**
(S: subject relative clauses; DO: object relative clauses; Passive S: Passivized subject relative clauses; IHRC: Internally headed relative clauses; RNP: relative clauses with resumptive NP; OVS: patient-subject relative clauses)

**Inanimate subject – animate object configuration (IA)**

The proportions of the different types of relative clause responses children produced in the subject and object relative clause elicitations in the inanimate subject – animate object (IA) configuration is presented in Figure 38.
Figure 38. Proportions of different types of relative clause responses elicited from children in the inanimate subject – animate object (IA) configuration.

(S: subject relative clauses; DO: object relative clauses; Passive S: Passivized subject relative clauses; IHRC: Internally headed relative clauses; RNP: relative clauses with resumptive NP; OVS: patient-subject relative clauses)

The proportions of target relative clauses were the lowest among the four animacy configurations, and were significantly lower than in the animate subject – inanimate object (AI) configuration for both subject (p = 0.01) and object relative clauses (p = 0.05). There was also a high tendency to resort to different alternative constructions in both elicitation conditions.

Similar to adults, children produced patient-subject relative clauses in the inanimate subject – animate object (IA) configuration, and almost exclusively in direct object relative clause elicitations. An example is given in (114). All the patient-subject relative clauses involved a supposedly transitive verb taking the patient as subject and placed the agent at the object position. Such NP placement caused a mismatch between the thematic relations and grammatical roles of the NPs in a canonical transitive predicate.

(114) Patient-subject relative clause:

\[
\begin{align*}
\text{[ac} & \quad \text{砸住} & \text{梳化} \quad \text{啱} & \text{個} & \text{男仔} \\
\text{zaak6zyu6} & \quad \text{so1faa2} & \text{go2} & \text{go3} & \text{naam4zai2} \\
\text{crush-CONT} & \text{sofa that CL boy} \\
\text{'}the boy that is being crushed by the sofa' & 
\end{align*}
\]

Target:

\[
\begin{align*}
\text{[ac梳化} & \quad \text{砸住} & \text{__} \quad \text{啱} & \text{個} & \text{男仔} \\
\text{so1faa2} & \quad \text{zaak6zyu6} & \text{go2} & \text{go3} & \text{naam4zai2} \\
\text{sofa crush-CONT that CL boy} \\
\text{'}the boy that the sofa is crushing' & 
\end{align*}
\]
Inanimate subject – inanimate object configuration (II)

The proportions of the different types of relative clause responses children produced in subject and object relative clause elicitations in the inanimate subject – inanimate object (II) configuration are presented in Figure 19. The performance in both elicitation conditions were relatively good, which was comparable to the performance in animate subject – inanimate object (AI) condition, in particularly for the production of subject relative clauses (vs. AA: p = .03; vs. AI: p = .71; vs. IA: p = .03).

Figure 39. Proportions of different types of relative clause responses elicited from children in the inanimate subject – inanimate object (II) configuration.
(S: subject relative clauses; DO: object relative clauses; Passive S: Passivized subject relative clauses; IHRC: Internally headed relative clauses; RNP: relative clauses with resumptive NP; OVS: patient-subject relative clauses)

Although only a few instances of reversal errors were found in the inanimate subject – inanimate object (II) configuration, a similar dichotomy was observed: the reversal errors found in object relative clause elicitations split between head and role reversal errors, whereas in subject relative clause elicitations, role reversal error was never found; all were exclusively head reversal errors.

Unlike adults, children also produced several patient-subject relative clauses in the II animacy configuration. Again, they were exclusively found in object relative clause elicitations. An example is given in (115).

(115) Patient-subject relative clause:

\[
\text{[rc — 夾住 夾] 聞 張 紙} \\
\text{gaap6zyu6 gep2 go2 zoeng1 zi2} \\
\text{clip-CONT clip that CL paper}
\]
ACQUISITION OF CANTONESE RELATIVE CLAUSES: NP ANIMACY

'the paper that is clipping by the clip'

Target:


'the paper that the clip is clipping'

5.1.2.4 Discussion: Children production

Children’s production demonstrated similar tendencies as adults to the effect of animacy: the production of subject and object relative clauses became easier for children when it was in the animate subject - inanimate object (AI) configuration; on the other hand, children became less willing to produce subject and object relative clauses when the animacy configuration was in the inanimate subject – animate object (IA) configuration. This is further supported by children’s use of alternative constructions. As an avoidance strategy, children did not resort much to alternative constructions in the AI configuration, but the proportion and variety of alternative constructions increased greatly in the IA configuration. This suggests that children prefer relative clauses with an animate subject and an inanimate object (AI). Their dispreference for relative clauses with the IA configuration leads them to resort to use different alternative constructions to avoid producing relative clauses with such animacy configuration. Such dispreference could come from the complete contradiction to the semantic expectations for transitive predicates. Building from daily life exposure and language, children might have developed the same expectation as adults for the correspondence between the animacy and thematic assignment with respective grammatical roles in a transitive event, for which the subject should be animate and agentive and the object should be inanimate and patient, making the AI configuration the preferred, or default, animacy configuration for transitive events. When they encounter the reverse IA configuration, more effort would be required to analyze the unfamiliar animacy configuration of the transitive predicate, thus increasing the difficulty of processing such constructions.
Another piece of evidence for children’s dispreference for the IA configuration and the preference for the AI configuration comes from the patient-subject relative clauses. Patient-subject relative clauses were only found in the object relative clause elicitation condition. The original patient object was promoted to the subject position, but retained the patient role, resulting in a transitive predicate with a patient subject and an agent object. The construction resembles an unaccusative one with the subject being the patient of the predicate, yet it is not an unaccusative verb as it is not intransitive; it takes an agentive object. It is similar to the passive voice, which promotes the object to the subject position and demotes the subject to lower positions, yet it does not have the appropriate grammatical markings for passive voice; it is not marked by bei2, and neither does the agent become an oblique object. It also resembles locative inversion, as suggested by the verb often marked by the continuous aspect zyu6, yet it is not necessarily marked by zyu6. The patient-subject relative clauses were also found in adults’ responses, but only restricted to those verbs which allow such inverse construction, such as kam2 pei2 ‘covering with blanket’. Children, however, seemed to have overgeneralized the pattern to all transitive verbs tested.

In Cantonese, the canonical constituent ordering for an active transitive predicate is subject (agent) - verb - object (patient). Yet, in the patient-subject relative clauses, this constituent order is upset by the switch of the two NPs while the verb remains in the active transitive form. This seems to be a case of conversion of verb semantics - from a simple active transitive verb to a transitive verb with an inherent sense of patient-focus, which takes a patient subject and an agentive object. The patient-subject relative clauses make the animacy configuration of the relative clause aligned with the preferred animate subject – inanimate object (AI) configuration, which fulfills the preference for animate entities as subject, and the animacy configuration with an animate subject and inanimate object, hence the unconventional sense for the transitive predicate.

Although children at this age have mastered the passive voice (Lau, 2011), passivization in relativization, having two complex syntactic processes in one construction, could still be too complicated for children. Therefore, even though passivized subject relative clause is a popular alternative construction for adults, children use the patient-subject relative clauses instead. This also explains why children used patient-subject relative clauses in the II configuration – to produce a subject relative clause yet pragamatically appropriate in
response to the object relative clause elicitation, similar to the intentions of the adults in using passivized subject relative clauses.

The effect of animacy was not observed in every configuration. It seems to be only effective between the contrastive animacy configurations, i.e. the AI and IA configurations. The difference in NP animacy in parallel animacy configurations did not cause a significant difference in children’s relative clause production. Children showed similar proportions of target relative clauses in the animate subject – animate object (AA) configuration and the inanimate subject – inanimate object (II) configuration, although the proportion of target relative clauses was slightly higher in the subject relative clause elicitation in the II configuration. If the processor prefers an animate NP to be the subject of a transitive event due to its properties, such as topicworthiness (Mak et al., 2002, 2006) and agency, it might also induce penalty on processing when the animate NP does not play the role it is expected, such as an object in a transitive event. On the other hand, there might be less established expectations on inanimate NPs, hence more flexible to what grammatical role they can play in a sentence. Therefore, when an animate NP plays an object role in the AA configuration, the processor might be more reluctant to assign the patient object role to a supposedly agentive character.

Children’s numerical preference for subject over object relative clauses in general and the appearance of certain alternative strategies, such as the patient subject relative clauses, suggest an adult-like tendency for subject preference, at least in situations with difficult conditions, such as dispreferred animacy configuration. However, the lack of significant difference suggests that, at least for production, Cantonese children might have a period throughout the course of relative clause construction development in which subject and object relative clauses were at comparable level of difficulty. The absence of difference in the level of difficulty might be a result of the counterbalance of the pulling forces from different processing factors. Subject relative clauses are favoured by the general subject preference for Cantonese relative clauses, whereas object relative clauses, though supposedly more difficult to process, are facilitated by the surface resemblance to matrix clauses. Children, who are in the midst of acquiring the relative clause construction, might be influenced by these different factors during their production, hence the comparable performance in subject
and object relative clauses. Yet, an alternative possibility for the indifference could also be due to the unusual and non-standard design of the current experiment, which does not include actual reversible RCs, reducing the effect from syntactic differences.

Children in general had a rather low success rate in comparison to other production studies of similar nature (e.g. Hsu et al., 2009; Kim and O’Grady, 2015). The difference in children’s success rate could be due to the extreme rarity of relative clauses in Cantonese spontaneous speech. In corpora of thousands of utterances, only a few instances of relative clauses could be found (Matthews, 2013, personal communication). The extremely infrequent use of relative clauses which entails a low exposure to the relative clause construction might be the cause for the low tendency for children to resort to relative clauses and to produce well-formed relative clauses.

**Head reversal vs. role reversal**

Although reversal errors comprised a very minor proportion of children’s responses, some insights could be gained from the interesting patterns that emerged from children’s reversal errors. Figure 40 presents the proportions of different types of reversal errors observed in subject and object relative clause elicitations in different animacy configurations.
Two particular patterns emerge: (i) role reversal errors were found exclusively in object relative clause elicitation; and (ii) subject relative clause elicitations consisted of only head reversal errors. If the processor has a general preference for the head NP to be the relative clause subject, it is not difficult to understand that role reversals in object relative clause elicitation are the result of the urge of the child language processor to build every relative clause of which the head NP is the relative clause subject. Therefore, in children’s relative clauses, they mistakenly turned the original object of the predicate to be the subject of the relative clause produced. However, why role reversal errors did not appear in subject relative clause elicitations? It is because no benefit is gained for the language processor from reversing the grammatical relations of the original predicate. Having a role reversal pattern in subject relative clause elicitation would render the original subject, which is also the head NP, to become the object; this, as a result, is in contradiction with the general preference of the language processor for the head NP to also be the relative clause subject. Therefore, the presence of role reversal errors in object relative clause elicitation and absence of role reversal errors in subject relative clause elicitation together give evidence in support of the preference for the head NP to be the relative clause subject.
Development of the relative clause structure

A significant proportion of children’s responses were non-relative clause responses, such as simple noun phrases, matrix clauses, and genitive NPs. Although they do not resemble the target relative clause construction, through these non-relative clause responses, it is possible to have a glimpse of how children develop their relative clause construction, especially from their genitive NP construction.

Children’s NP responses (116), though extremely few, largely provided individuating information on the target picture. They usually mentioned the other character/entity in the event, which is designed to be the only contrast between the target and the distractor pictures. In responses with matrix clauses (117), they gave a full grammatical description of the picture that contained the target character.

(116) NP response from S(II):

箱
soeng1
chest
'chest'

Target:

[sc __ 綁住 個 箱 ] 嚮 個 鎖
bong2zyu6 go3 soeng1 go2 go3 so2
tie.CONT CL chest that CL lock

'the lock that is tying the chest'

(117) Matrix clause response from S(IA):

啲 沙 砸住 婆婆
di1 saa1 zaak6zyu6 po4po2
CL. sand crush.CONT granny
'The sand is crushing granny.'

Target:

[sc __ 埋住 婆婆 ] 嚮 堆 沙
maai4zyu6 po4po2 go2 deoi1 saa1
bury.CONT granny that CL sand

'the lump of sand that is burying granny'

The NP and the matrix clause responses show that children are fully aware of the particular pragmatic function of the relative clause construction -- using individuating information to identify the target referent.
The matrix clause responses might even be the proto-form of the relative clause construction, similar to the early internally-headed object relative clauses (118) by the young Cantonese-English bilingual children, which also take the form of a main clause, before they master the relative clause construction (Yip and Matthews, 2002; 2007).

(118) Internally-headed object relative clause in Cantonese-English bilingual children:

\[\begin{array}{llllll}
np/s & 我 & 食 & 藥 & 係 & 呢 隻 \\
ngo5 & sik6 & joek6 & hai6 & nil & zek3 \\
1sg & eat & medicine & is & this & cl \\
\end{array}\]

'The medicine I take is this one.'

What is different between the matrix clause responses found in this study and the early internally-headed relative clauses in the bilingual children's speech is the form of the original intended target structure. The bilingual children's internally-headed relative clauses all function as the object relative clauses, which share the same constituent order as the canonical word order, whereas the matrix clause responses found in this study are in place of both subject and object relative clauses. Although these responses carry the critical restrictive function, they still have not shown any signs of relational structure, the core syntactic property of the relative clause construction. The emergence of relational structure is seen from children's genitive NPs.

The Cantonese genitive construction uses the same relational marker go2 + cl to link up the possessor and the possessee, where the possessor comes in front of the relational marker while the possessee follows after. Children follow a very uniform rule in forming the genitive construction, no matter in which animacy configuration the construction is found. Their genitive NP construction always respects the constituent order and the relational structure of the relative clause construction. The genitive NP constructions shown in (119) to (122) are the prototypical form of genitive NP constructions from the subject and object relative clause elicitation conditions of the two contrastive animacy configurations. Without any influence from the animacy of the NPs, the ordering of the NPs follows faithfully their order in the target relative clause construction. Therefore, while the animate entity in (120) and (121) takes up the possessor position in the left periphery of the genitive construction, the inanimate entity in (119) and (122) comes first in the genitive NP construction.
and takes up the possessor position, which could be awkward in meaning, as it is rare for an inanimate entity to possess an animate entity, but the relative clause constituent order is faithfully respected.

(119) Genitive NP construction from S(AI):

電腦 個 姐姐
din6nou5 go3 ze4ze1
computer CL lady
‘computer’s lady’

Target:
[RC ___ 用 電腦] 嘅 個 姐姐
jung6 din6nou5 go2 go3 ze4ze1
use computer that CL lady
‘the lady that is using the computer’

(120) Genitive NP construction from DO(AI):

姐姐 部 收銀機
ze4ze1 bou6 saau1ngan5gei1
lady CL cashier
‘lady’s cashier’

Target:
[RC 姐姐 用 ___] 嘅 部 收銀機
ze4ze1 jung6 go2 bou6 saau1ngan5gei1
lady use CL cashier
‘the cashier that the lady is using’

(121) Genitive NP construction from S(IA):

婆婆 嘅 堆 沙
po4po2 go2 deoi1 saa1
granny that CL sand
‘granny’s sand’

Target:
[RC ___ 埋住 婆婆] 嘅 堆 沙
maai4zyu6 po4po2 go2 deoi1 saa1
bury.CONT granny that CL sand
‘the lump of sand that is burying granny’

(122) Genitive NP construction from DO(IA):

雪 嘅 個 男仔
syut3 go2 go3 naam4zai2
snow that CL boy
‘snow’s boy’
Target:

\[ \text{啲雪埋} \quad \text{啲個男仔} \]

\[ \text{di1 syut3 maa4zyu6 go2 go3 nam4zai2} \]

\text{CL snow bury.CONT that CL boy}

'the boy that the snow is burying'

It is unclear from these constructions whether children build them with an internal hierarchical structure or as a linear amalgamate. However, they suggest that children develop the relative clause construction by first acquiring the relational structure through the use of the relative marker \( \text{go2 + CL} \) to link up the predicate and the head noun.

### 5.1.3 Conclusion

Experiment 3 examined the effect of animacy in the production of relative clauses by Cantonese-speaking adults and children. The proportion of target relative clauses and types of relative clauses produced by children and adults were modulated by the animacy configuration of the relative clause. In accordance with previous studies, the proportion of target relative clauses increases in object relative clause elicitations when the animacy configuration is in the preferred animate subject – inanimate object (AI) configuration. In fact, in addition to increasing the proportion of target object relative clauses, the preferred AI animacy configuration favoured production in all respects, including increasing the proportion of target relative clause production in subject relative clauses, and reducing the proportion and variety of alternative constructions. When the animacy configuration is in reverse, i.e. with an inanimate subject and an animate object (IA), the proportion of target relative clauses dropped drastically in both subject and object relative clauses, and both children and adults resort more to different alternative constructions, including patient-subject relative clauses. This proves that the language processor has a strong preference for the AI configuration and a strong dispreference for the IA configuration.

While contrastive animacy configuration demonstrated a contrast in performance between the two settings, the performance between the two parallel animacy configurations, i.e. animate subject – animate object (AA) and inanimate subject – inanimate object (II), did not have a significant contrast, although children’s
performance in general was slightly better in the inanimate subject – inanimate object (II) configuration, which might be due to the weaker competition between two inanimate NPs than two animate NPs.

Examination between subject and object relative clauses in the four animacy configurations continued to demonstrate a strong subject-object asymmetry in adults’ production, supporting the notion of a subject preference in Cantonese relative clause processing. Children, however, did not actually demonstrate a statistically significant preference or dispreference for either subject or object relative clauses. This might be due to their yet developing relative clause construction, under the influence of the pulling forces between the universal subject preference and the facilitation from the surface resemblance with main clauses.

In conclusion, the effect of animacy is mainly observed in constructions with contrastive animacy configuration and the processor has a preference for the animate subject – inanimate object (AI) configuration. With the preferred AI configuration, the difficulty in processing is reduced, boosting the use of the relative clause construction. On the contrary, with the dispreferred IA configuration, the processor would avoid producing relative clauses with such animacy configuration and attempt to resort to alternative constructions that reset the animacy configuration to the preferred setting.
CHAPTER 6
THE ROLE OF RESUMPTIVE PRONOUNS

The actual role of resumption in child language acquisition remains an open question. In languages with postnominal relative clauses like English, the use of resumption has been judged unanimously as ungrammatical (Alexopoulou & Keller, 2007; Heestand et al., 2011; Hofmeister & Norcliffe, 2013), and it does not seem to show any facilitation in children's comprehension (Friedmann et al., 2009; Arnon, 2005). However, it appears to be largely a strategy used by both adults and children in production at times when the sentence becomes critically difficult. To determine the actual role of resumption, there is a need to eliminate one of the major confounds in previous studies in the literature. Most of the previously-investigated languages do not allow resumption, and only allow the gap strategy in their long distance dependencies. It does not provide a fair basis to compare preferences for a grammatical option to an illegitimate option. It is necessary for both options to be (equally) available and acceptable in the language in order to compare their actual effect in acquisition.

To assess whether resumptive pronoun plays a facilitative role in alleviating the difficulty children experienced during the acquisition of relative clauses, Cantonese provides a neat opportunity. As Cantonese object relative clauses allow both options for relativization in direct object relative clauses, the minimal pair between a gapped object relative clause and an object relative clause with resumptive pronoun provides a fair way to assess the role of resumptive pronouns in the acquisition of prenominal relative clauses. Experiment 4 (section 6.1) examines the effect of resumptive pronoun on children’s comprehension of Cantonese relative clauses. If resumptive pronouns have a facilitative role in comprehension, the difficulty children find in comprehending object relative clauses compared to subject relative clauses should be less in patterns with a resumptive pronoun than in their gapped counterparts. Recall that there is potential ambiguity when it comes to an object relative clause, in that the object relative clause may be interpreted as a main clause up to the point that the head noun is encountered. If children confuse the object relative clauses with a main clause, the
presence of the resumptive pronoun should break the ambiguity and reduce erroneous main clause misanalyses.

Section 6.2 presents an analysis that examines the role of resumptive pronouns in children’s production of relative clauses. Based on the relative clauses elicited from children in Experiment 2 and Experiment 3, it examines the use of resumptive pronouns in children’s relative clause production. If resumptive pronouns can alleviate the difficulty of producing a relative clause, children should manifest a greater tendency to rely on the resumptive pronoun strategy for relative clauses that they find difficult. Since relative clauses of different NP types in Cantonese differ in their relativization strategies, the legitimacy of the resumptive pronoun strategy in a particular type of relative clause construction might also affect children’s tendency to use the resumptive pronoun in relativization. Therefore, the analysis is divided according to the relativization strategy(ies) allowed, which includes subject relative clauses (allowing only the gap strategy), object relative clauses (allowing both gap and resumptive pronoun strategies), and indirect object and oblique relative clauses (allowing only the resumptive pronoun strategy), and presents the pattern of the use of resumptive pronouns in relative clause formation.

6.1 Experiment 4: The role of resumptive pronoun on the comprehension of Cantonese relative clauses

6.1.1 Method

Participants. Thirty-seven Cantonese-speaking children aged 3;0.07 – 5;11.26 (mean age: 4;05.23) from a local kindergarten in Hong Kong participated in this study. Children were awarded a gift for their participation.

Materials. We used a character selection task, a modified version of the common picture selection tasks, in which participants heard a test sentence involving a relative clause and were asked to select the character which the relative clause picked out. Three types of relative clauses were targeted: subject (S), direct object
with gap (DO(gap)), and direct object with resumptive pronoun (DO(RP)). A total of nine sets of stimuli were created. The pictures all consisted of two panels (left and right) with the same pair of animate characters in each panel. Each pair of panels depicted the same event, differing only in the (thematic) roles of the characters. A sample visual stimulus is provided in Figure 41, and the target patterns are exemplified in (123) to (125).

![Figure 41. Visual stimulus for subject type and the two direct object types of relative clauses.](image)

(123) **Subject:**
\[
\text{袋鼠} \text{ 畫} \text{ 畫} \text{ 豬豬} \text{ 唛} \text{ 唛} \text{ 袋鼠}
\]
\[
\text{waak6} \text{ zyu1zyu1} \text{ go2} \text{ zek3} \text{ doi6syu2}
\]
\[
\text{paint} \text{ piggy that CL kangaroo}
\]
\[
\text{‘the kangaroo that paints the piggy’}
\]

(124) **Direct Object (Gap):**
\[
\text{袋鼠} \text{ 畫} \text{ 畫} \text{ 豬豬} \text{ 唛} \text{ 唛} \text{ 袋鼠}
\]
\[
\text{doi6syu2} \text{ waak6} \text{ go2} \text{ zek3} \text{ zyu1zyu1}
\]
\[
\text{kangaroo paint that CL piggy}
\]
\[
\text{‘the piggy that the kangaroo paints’}
\]

(125) **Direct Object (Resumptive Pronoun):**
\[
\text{袋鼠} \text{ 畫} \text{ 豬豬} \text{ 唛} \text{ 唛} \text{ 袋鼠}
\]
\[
\text{doi6syu2} \text{ waak6} \text{ keoi5} \text{ go2} \text{ zek3} \text{ zyu1zyu1}
\]
\[
\text{kangaroo paint 3SG that CL piggy}
\]
\[
\text{‘the piggy that the kangaroo paints (it)’}
\]

All target sentences were embedded in a carrier question (see details below in the Procedure section), which reduced the possibility of parsing the relative clause as a main clause. Test items were pseudo-randomized, creating six orders of presentation which were arranged in a Latin square design. Each order consisted of nine test sentences (three tokens for each relative clause type) and eleven filler items, which involved syntactic structures of different kinds. All test sentences were controlled for NP type and sentence length, as well as for the semantic properties of the characters, all of which were animate. All visual properties of the pictures, such
as the size of the characters and the position were also carefully controlled. The target character and its location were counter-balanced across all trials and for all participants.

**Procedure.** Children were invited to participate in a ‘giving-a-sticker-to-the-lucky-star’ game. They were instructed that one of the four characters would be the “lucky star” who would receive a star sticker. The experimenter invited the child to be the presenter, and he or she was instructed to give out the award to the lucky star designated by the experimenter. At each trial, the experimenter read aloud the target item which was embedded in prompt questions such as *bin1 go2 hai6 [target]?* ‘Which one is [target]?’ and *nei5 ho2 m4 ho2ji3 bei2 lap1sing1sing1 [target]?* ‘Can you give the star to [target]?’ and statements such as *bei2 lap1sing1sing1 [target]* ‘Give the star to [target]’. An example is given in (126). If the child appeared to have difficulty understanding, the target sentence was repeated. Subsequent repetitions usually consisted of just the NP with the relative clause. After each trial, the child was given positive encouragement, and at the end of the experiment, each child was given a sticker as a reward.

(126) Target item: ‘the piggy that the kangaroo paints’

Test probes to the children:

**邊個係** [RC袋鼠畫_] 嘅 隻 豬豬?
*bin1 go3 hai6 doi6syu2 waak6 go2 zek3 zyu1zyu1* which CL be kangaroo paint that CL piggy
‘Which one is the piggy that the kangaroo paints?’

**俾粒星星** [RC袋鼠畫_] 嘅 隻 豬豬
*bei2 lap1 sing1sing1 doi6syu2 waak6 go2 zek3 zyu1zyu1* give CL star kangaroo paint that CL piggy
‘Give the star to the piggy that the kangaroo paints.’
6.1.2 Results

6.1.2.1 Accuracy

Figure 42 shows the accuracy with which children identified the target in each relative clause type. Performance was best with the subject type (60.7%), while relatively poor on both direct object types. Direct object relative clauses with a resumptive pronoun (27.4%) did not show any contrast with their gapped counterparts (26.3%).

![Accuracy of relative clause comprehension](image)

A repeated-measures ANOVA was used to analyze the accuracy data, with relative clause type (Subject vs. Direct object (gap) vs. Direct object (RP)) as the within-subjects variable. The effect of relative clause type was significant (F(2, 72) = 27.75, p<.001). From the series of pairwise comparisons, there was a significant difference in accuracy between subject relative clauses and the two types of object relative clauses (vs. DO (gap): p<.001; vs. DO (RP): p<.001), but the difference between the two types of direct object relative clauses did not reach significance (p=1).

6.1.2.2 Error Analysis

**Coding.** The children’s erroneous responses were categorized into three types, namely head errors, reversal errors and other errors. Figure 43 illustrates the three different types of erroneous responses.
A head error occurred when children mistook the referent of the first NP in the relative clause (the kangaroo) as the head, thereby interpreting the pattern to mean ‘the kangaroo that paints the piggy’. A reversal error occurred when children select the correct head, but assign it the wrong thematic role, treating it as the agent rather than the theme, thereby interpreting the sentence to mean ‘the piggy that paints the kangaroo’. An other error involved a combination of head and reversal error, thereby interpreting the sentence to mean ‘the kangaroo that the piggy paints’.

Results. Figure 44 summarizes the proportions of errors children committed with each relative clause type.

Head errors were predominantly found with the two types of direct object relative clauses. There were fewer head errors with relative clauses using the resumptive pronoun strategy versus those using the gap strategy,
and the difference in head error rate for the two object conditions was significant \((t(36) = 1.84, p=.04)\). This suggests that the presence of a resumptive pronoun modulated the occurrence of head errors. The rate of reversal errors was relatively low, and was similar across all three relative clause types.

6.1.3 Discussion

Overall, the presence of a resumptive pronoun did not show any facilitative effect on children's acquisition of Cantonese relative clauses. Children did not find object relative clauses with resumptive pronouns easier to understand than their gapped counterparts. Both types of object relative clauses showed the same level of poor performance. There was, however, evidence of a resumption effect on children's comprehension errors: the rate of head errors was significantly lower when the relative clause had a resumptive pronoun. Why would resumptive pronouns reduce children's head errors, but not improve their overall comprehension?

Recall that head errors arise in situations in which children misinterpret an object relative clause like [KANGAROO PAINT __ ] THAT PIGGY to mean ‘the kangaroo (that) paints the piggy’ rather than its intended meaning, ‘the piggy that the kangaroo paints’. This could be due to the surface isomorphism between a gapped object relative clause (127a) and a matrix clause (127b) in Cantonese, which might lead children to misinterpret the relative clause as a matrix clause. Since the restrictive determiner is homophonous with the distal demonstrative, there is no overt cue for the children to differentiate between the two forms.

(127)a. Object relative clause (Gap):

\[
\text{[rc 袋鼠 畫 __ ] 唛 隻 豬豬}
\text{doi6syu5 waak6 go2 zek3 zyu1zyu1 kangaroo paint that CL piggy}
\text{‘the piggy that the kangaroo paints’}
\]

b. Matrix clause:

\[
\text{袋鼠 畫 唛 隻 豬豬}
\text{doi6syu5 waak6 go2 zek3 zyu1zyu1 kangaroo paint that CL piggy}
\text{‘The kangaroo paints that piggy.’}
\]
The predominance of head errors in object relative clauses with a gap could be the result of children mistakenly analyzing the sentence as a matrix clause and assuming the subject of the sentence to be what the sentence was about (Mak et al., 2006, p. 484; O’Grady, 2011, p. 20). Therefore, it may be that children understand the function of relative clauses, but misanalyse particular relative clause patterns as matrix clauses. Lau (2006) tested children on subject-modifying object relative clauses and found that children consistently misedanalysed the relative clause as a matrix clause, acting out the sentence as if it were a conjoined clause sentence (128).

(128) Target sentence:

[RC 男仔 餵 ___] 車 隻 大笨象 匿埋 嚇 次 樹 下面
boy feed that CL elephant hide at CL tree under
‘The elephant that the boy feeds hides under the tree.’

Children’s act-out error in Lau (2006):
The boy fed the elephant and hid under the tree.

Children in the current experiment may well have experienced the same difficulty. This explains why the number of head errors is reduced when the resumptive pronoun is present in the relativized position: it eliminates the isomorphism between the object relative clauses and the matrix clauses (129). With the resumptive pronoun in the relativized position, the surface configuration of the two structures is no longer identical.

(129) a. Object (Resumptive):

[RC 袋鼠 畫 佢] 車 隻 豬猪
doi6syu5 waak6 keoi5 go2 zek3 zyu1zyu1
‘the piggy that the kangaroo paints (it)’

b. Matrix clause:

袋鼠 畫 車 隻 豬猪
doi6syu5 waak6 go2 zek3 zyu1zyu1
‘The kangaroo paints that piggy.’
Even if the child parser initially interprets the resumptive pronoun as the matrix object, the error can be quickly corrected upon encountering $g^2+\text{CL} \ 'that'$. In contrast, if the relative clause contains a gap, the parser will not realize its error until after the head noun, when further information of the matrix sentence is revealed. This in turn presumably makes it more difficult to correct the misanalysis.

That said, the resumptive pronoun variant still had a rather high rate of head errors. Although, with a resumptive pronoun, the object relative clauses are no longer isomorphic with a main clause, the two constructions still share the same ordering of major constituents, such as the noun-verb-noun order. Children are known to apply the canonical word order as a strategy for interpreting relative clauses they found difficult (Bever, 1970; Townsend & Bever, 2001; Su, 2006; Yip & Matthews, 2007b). The canonical word order effect does not seem to require a full surface resemblance with the main clause, but concerns only the ordering of the major constituents (MacDonald & Christiansen, 2002; Mitchell, Cuertos, Corley, & Brysbaert, 1995; Tabor, Juliano, & Tanenhaus, 1997). If children focus only on the ordering of the major constituents, then, even with a resumptive pronoun, the resemblance with a main clause is not completely eliminated. Children could still have interpreted the Cantonese object relative clauses as main clauses using the canonical word order schema.

The fact that resumptive pronouns reduced the occurrence of head errors without improving overall accuracy suggests that object relative clauses are inherently more difficult than subject relative clauses. This aligns with the theory of a universal subject advantage in relative clause processing (e.g. Vasishth et al., 2013; Diessel & Tomasello, 2005; Hawkins, 2004; Hsu et al. 2009; Keenan & Comrie, 1977, among many others). Even though the presence of the resumptive pronoun makes the relative clause structure explicit to the parser, the difficulty induced by relativization at the direct object position as discussed in Chapter 4 and Chapter 5 remains. Children continued to perform poorly on object relative clauses in comparison to subject relative clauses, even with the presence of resumptive pronouns. The overall null effect of resumption observed in the current experiment echoes the lack of a difference in adults’ comprehension of Mandarin relative clauses.
using the resumptive pronoun and gap strategies (Ning, 2008). Similar to the children in this study, the Mandarin-speaking adults did not show a facilitative effect. In fact, resumptive pronouns had a deleterious effect in their online comprehension of subject and object relative clauses. Furthermore, resumptive pronouns, though allowed, are rare in natural spontaneous speech (Yuan & Zhao, 2005). The low frequency in use might have resulted in children being less familiar with resumptive pronouns and failing to effectively use them in their comprehension.

### 6.2 Use of resumptive pronouns in relative clause production

This section will explore the use of resumption in Cantonese children's relative clause production. It has been demonstrated that resumption is a strategy largely relied on by adults and children in production when they are under great processing pressure, even when resumption is not permitted in their languages. If resumption indeed has a facilitative role in production to reduce the processing load incurred by the resolution of the long-distance dependency, Cantonese children, with limited processing capacity, should prefer the resumption strategy over the gap strategy, in particular when the resumption strategy is a legitimate option in the language.

Since Cantonese relative clauses are relatively rare in spontaneous speech, the current analysis is based on the production data from Experiment 2 (the effect of grammatical relations) and Experiment 3 (the effect of animacy). All subject and object relative clauses elicited from children in Experiment 2, whether target or non-target, were included in the current analysis, and therefore, the clause type of the relative clauses ranged from simple transitive and passive voice, to ditransitive and locative. To maintain a consistent NP animacy configuration of the targeted relative clauses with Experiment 2, only the responses from the animate subject – animate object (AA) condition from Experiment 3 were included in the current analysis.
6.2.1 Analysis

6.2.1.1 Object relativization

Table 4 shows the strategy adopted by children in their object relative clauses. The percentages are based on the total number of direct object relative clauses elicited from children (including target and non-target responses) in Experiments 2 and 3.

<table>
<thead>
<tr>
<th>Object relative clauses</th>
<th>Gap</th>
<th>Resumptive Pronoun</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transitive (Expt 3, AA condition)</td>
<td>90.9% (20)</td>
<td>0</td>
</tr>
<tr>
<td>Transitive construction (Expt 2)</td>
<td>57% (65)</td>
<td>16.7% (19)</td>
</tr>
<tr>
<td>Ditransitive construction (Expt 2)</td>
<td>75% (15)</td>
<td>0</td>
</tr>
<tr>
<td>Locative construction (Expt 2)</td>
<td>40% (4)</td>
<td>0</td>
</tr>
</tbody>
</table>

Even though Cantonese allows the resumptive pronoun strategy for direct object relativization, the use of the resumptive pronoun strategy was rather infrequent in children’s relativization. The gap strategy was the predominant strategy in children's relative clause formation. An example of children’s object relative clauses with resumptive pronoun is given in (130).

(130) [rc.女仔 錫 佢] 嘅 個
girl sek keoi5 go2 go3
'he that girl kisses (him)'

Such pronouns appeared only in simple transitive clauses. Increased complexity of the clause type with more elements in the relative clause does not seem to elevate children’s preference for the resumptive pronoun strategy. The gap strategy continued to prevail in relative clauses with a ditransitive or locative clause, as shown in (131) and (132).

(131) [rc.象象 抱 __ 俾 老虎] 嘅 幾 熊仔
elephant hold DAT tiger that CL teddy
'he that the elephant holds up to the tiger'
6.2.1.2 Subject relativization

Table 5 shows the strategy adopted by children in their subject relative clauses. The percentages are based on the total number of subject relative clauses elicited from children (including target and non-target responses) in Experiments 2 and 3.

Table 5. Proportions of different relativization strategies in subject relativization.

<table>
<thead>
<tr>
<th>Subject relative clauses</th>
<th>Gap</th>
<th>Resumptive Pronoun</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intransitive (Expt 2)</td>
<td>92.3% (72)</td>
<td>2.6% (2)</td>
</tr>
<tr>
<td>Middle voice (Expt 2)</td>
<td>94.1% (32)</td>
<td>0</td>
</tr>
<tr>
<td>Transitive (Expt 3, AA condition)</td>
<td>88.2% (15)</td>
<td>0</td>
</tr>
<tr>
<td>Transitive (Expt 2)</td>
<td>84.5% (201)</td>
<td>1.3% (3)</td>
</tr>
<tr>
<td>Passive voice (Expt 2)</td>
<td>100% (20)</td>
<td>0</td>
</tr>
<tr>
<td>Ditransitive (Expt 2)</td>
<td>76.9% (70)</td>
<td>0</td>
</tr>
<tr>
<td>Locative (Expt 2)</td>
<td>40% (4)</td>
<td>0</td>
</tr>
<tr>
<td>Comititative (Expt 2)</td>
<td>100% (1)</td>
<td>0</td>
</tr>
</tbody>
</table>

Although subject relativization in Cantonese supposedly does not allow the use of the resumptive pronoun strategy (Matthews and Yip, 2011; Cheung, 2007), a few instances of subject relative clauses with resumptive pronoun were still found in children’s subject relative clauses. The five instances found in children’s production are shown in (133). Subject relative clauses with resumptive pronoun were not idiosyncratic to children’s production, but were also observed in adults’ production (such as in Experiment 2 of this study; and in previous studies, e.g. Francis et al., 2015).

(133) a. [佢排緊隊] 嘅隻
ACQUISITION OF CANTONESE RELATIVE CLAUSES: RESUMPTIVE PRONOUN

keoi5  paa4-gan2-deoi2  go2  zek3  
3SG  line.up-PROG  that  CL
‘the one that (it) is lining up’

b. [ac 佢 企 唔度] 嘅 姐姐  
keoi5  kei2  hai2dou6  ge3  ze4ze1  
3SG  stand  at.here  REL  sister
‘the lady that (she) is standing here’

c. [ac 佢 撲緊 信 同埋 撲緊 幅 圖畫] 嘅 男仔  
keoi5  lo2gan2  seon3  tung4maai4  lo2gan2  fuk1  tou4waa2  ge3  naam4zai2  
3SG  get-PROG  letter  and  get-PROG  CL  picture  REL  boy
‘the boy that (he) is getting the letter and the picture’

d. [ac 佢 做緊 撲住 金魚] 嘅 男仔  
keoi5  zou6gan2  lo2zyu6  gam1jyu5  ge3  
3SG  do-PROG  get-CONT  goldfish  REL
‘the boy that (he) is getting the goldfish’

e. [ac 佢 鬧 爸爸] 嘅 媽咪  
keoi5  nau6  baa4baa1  ge3  maa1mi4  
3SG  scold  father  REL  mommy
‘the mommy that (she) is scolding the father’

Comparing the proportion of relative clauses with resumptive pronoun between subject and object relativization, children still used the resumptive pronoun strategy in object relativization more than in subject relativization (16.7% versus 1.3%).

6.2.1.3 Indirect object, oblique and genitive relativization

Table 6 shows the strategy adopted by children in their indirect object, oblique and genitive relative clauses. The percentages are based on the total number of each type of relative clauses elicited from children (target and non-target) in Experiment 2 (none of the relative clauses produced in Experiment 3 involved these three types).

<table>
<thead>
<tr>
<th>Relative clause type</th>
<th>Gap</th>
<th>Resumptive Pronoun</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indirect object (Expt 2)</td>
<td>62.1% (72)</td>
<td>10.3% (12)</td>
</tr>
<tr>
<td>Oblique (Expt 2)</td>
<td>62.5% (15)</td>
<td>12.5% (3)</td>
</tr>
<tr>
<td>Genitive (Expt 2)</td>
<td>82.1% (23)</td>
<td>17.9% (5)</td>
</tr>
</tbody>
</table>
Even though the grammar of standard Cantonese supposedly requires use of the resumptive pronoun strategy for the relativization of these positions, a significant proportion of indirect object, oblique and genitive relative clauses were formed using the gap strategy. An example of each type of relative clause is given in (134) – (136). Such gapped indirect object and oblique relative clauses were not idiosyncratic to children; they also made up a significant proportion in adults’ production (in Experiment 2, and also in Francis et al., 2015). Gapped genitive relative clauses were not attested in adults’ production in Experiment 2, but both options seem acceptable in Cantonese.

(134) Gapped indirect object relative clause with dative verb ‘send’:

\[
\text{[RC 兔兔 送 禮物 俾 前個 熊仔] 嘅 個 熊仔}
\text{tou3tou3 sung3 lai5mat6 bei2 go2 go3 hung4zai2}
\text{bunny send gift DAT that CL teddy}
\]

‘the teddy that the bunny sends a gift to’

Target:

\[
\text{[RC 兔仔 送 禮物 俾 佢] 嘅 隻 熊仔}
\text{tou3zai2 sung3 lai5mat6 bei5 keoi5 go2 zek3 hung4zai2}
\text{bunny send gift DAT 3SG that CL teddy}
\]

‘the teddy that the bunny sends a gift to (it)’

(135) Gapped oblique relative clause:

\[
\text{[RC (男仔) 擺 架 車 啥 後面] 嘅 恐龍}
\text{naam4zai2 baai2 gaa3 ce1 hai2 hau6min6 ge3 hung2lung4}
\text{boy place CL car at back REL dinosaur}
\]

‘the dinosaur that (the boy) places the car behind’

Target:

\[
\text{[RC 男仔 擺 車車 喊 佢 後面] 嘅 隻 恐龍}
\text{naam4zai2 baai2 ce1ce1 hoeng2 keoi5 hau6min6 go2 zek3 hung2lung4}
\text{boy place car at 3SG back that CL dinosaur}
\]

‘the dinosaur that the boy places the car behind (it)’

(136) a. Gapped genitive relative clause:

\[
\text{[RC 佢 隻 眼睛 好似 想喊] 嘅 隻 老鼠}
\text{keoi5 zek3 ngaan5zing1 hou5ci3 soeng2haa3 go2 zek3 lou5syu2}
\text{3SG CL eye look.like want.cry that CL mouse}
\]

‘the mouse whose eye looks like it wants to cry’

b. Genitive relative clause with resumptive pronoun:
ACQUISITION OF CANTONESE RELATIVE CLAUSES: RESUMPTIVE PRONOUN

The pattern of use of resumptive pronoun of children parallel the preference in the grammaticality judgment and adult production data in Francis et al. (2015). Adults showed a preference for subject position with the gap strategy, and oblique and genitive positions with the resumptive pronoun strategy; however, they did not completely reject the alternative strategy: the mean rating for the resumptive pronoun strategy for subject position was 3.86 out of 7, and the mean rating for the gap strategy for oblique and genitive strategy was in the range of 3.08 to 4.36 out of 7. Francis et al. also showed that adults had a high rate of resumptive pronoun use (above 70%) in oblique (objects of co-verb) and genitive positions, while an extremely low rate for subject position (5.6%) and a modest rate in the object position (18.4%). It seems that for both Cantonese adults and children the use of resumptive pronouns is gradient instead of categorical. Rather than required in the lower positions, such as indirect object, oblique and genitive, and excluded in subject position (as stated in the Cantonese grammars), resumptive pronouns are more likely to be used in the lower positions on the accessibility hierarchy.

6.2.1.4 Relative clauses with resumptive NP (RNP)

A common strategy in children’s relativization was the use of a resumptive NP. These relative clauses repeated the relativized NP in both the clause-internal relativized position and the relative clause head position. An example is given in (137).

(137) Relative clause with resumptive NP:

[RC 媽媽 搬住 女女] 嗎 個 媽媽
maa4maa1 laam2zyu6 neoi4neoi5 go2 go3 maa4maa1
mother hug.CONT daughter that CL mother
'the mother that the mother is holding the baby'
In very rare cases, the resumptive NP is a semantically-related noun, instead of a mere repetition of the head NP, as shown in (138). Similar observations have been made in English (Zukowski, 2005), Mandarin Chinese (Hsu et al., 2009), and Korean (Kim & O’Grady, 2015).

\[(138) \quad [\text{男仔 錫 女仔} \quad 嘅 個 \quad 妹妹 \quad \text{that CL young.sister}]\]

\[\text{naam4zai2 sek3 neoi5zai2 go2 go3 mui4mui2} \quad \text{boy kiss girl that CL young.sister}\]

\['the young sister that the boy kisses (the girl)’\]

Table 7 shows the proportion of relative clauses with resumptive NP elicited in different relative clause types. The percentages are based on the total number of each type of relative clauses elicited from children (including target and non-target responses) in Experiments 2 and 3.

**Table 7. Proportions of relative clauses with resumptive NP.**

<table>
<thead>
<tr>
<th>Relative clause type</th>
<th>Proportion of Resumptive NP</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Subject</strong></td>
<td></td>
</tr>
<tr>
<td>Intransitive (Expt 2)</td>
<td>5.1% (4)</td>
</tr>
<tr>
<td>Middle voice (Expt 2)</td>
<td>5.9% (2)</td>
</tr>
<tr>
<td>Transitive (Expt 3, AA condition)</td>
<td>11.8% (2)</td>
</tr>
<tr>
<td>Transitive (Expt 2)</td>
<td>14.3% (34)</td>
</tr>
<tr>
<td>Ditransitive (Expt 2)</td>
<td>23.1% (21)</td>
</tr>
<tr>
<td>Locative (Expt 2)</td>
<td>60% (6)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Object</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Transitive (Expt 3, AA condition)</td>
<td>9.1% (2)</td>
</tr>
<tr>
<td>Transitive (Expt 2)</td>
<td>26.3% (30)</td>
</tr>
<tr>
<td>Ditransitive (Expt 2)</td>
<td>25% (5)</td>
</tr>
<tr>
<td>Locative (Expt 2)</td>
<td>60% (6)</td>
</tr>
<tr>
<td>Indirect object (Expt 2)</td>
<td>27.6% (32)</td>
</tr>
<tr>
<td>Oblique (Expt 2)</td>
<td>25% (6)</td>
</tr>
<tr>
<td>Genitive (Expt 2)</td>
<td>0</td>
</tr>
</tbody>
</table>

Relative clauses with resumptive NP comprised a rather significant proportion of children’s relative clauses. They were particularly prevalent when the elicited relative clause was in a ditransitive or locative construction. Children also tended to use NP resumption more in the conditions which targeted for the indirect object or oblique relative clauses, even if the relative clause produced was a transitive object relative clause. It seems
that the pressure of targeting a relative clause structure of a more complex clause type promotes the use of NP resumption. However, this type of NP resumption may be a task effect, as children were first given (and primed by) a full sentence test probe.

6.2.1.5 Internally headed relative clauses (IHRC)

Besides relative clauses with resumptive NP, there was another type of relative clauses using a full NP to mark the position of relativization — namely, the internally headed relative clauses (IHRC). In the internally headed relative clauses, the head NP is found internal to the clause, making the relative clause a full clause without any gap, while the relative marker was left hanging with a matching classifier to the head noun. An example of what might be analyzed as an internally headed relative clause is given in (139). Internally headed relative clauses were also observed in adults, but were much less systematically found than in children’s production and seemed to be due to performance error.

(139) IHRC:

<table>
<thead>
<tr>
<th>夫婦</th>
<th>拿住</th>
<th>BB</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>maa4maa1</td>
<td>pou2zyu6</td>
<td>bi4bi1</td>
<td>go2</td>
<td>go3</td>
<td></td>
</tr>
<tr>
<td>mother</td>
<td>hold-CONT</td>
<td>baby</td>
<td>that</td>
<td>CL</td>
<td></td>
</tr>
</tbody>
</table>

'he the one that the mother is holding the baby'

Target:

<table>
<thead>
<tr>
<th>夫婦</th>
<th>拿住</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>maa4maa1</td>
<td>pou2zyu6</td>
<td>go2</td>
<td>go3</td>
<td>bi4bi1</td>
<td></td>
</tr>
<tr>
<td>mother</td>
<td>hold-CONT</td>
<td>that</td>
<td>CL</td>
<td>baby</td>
<td></td>
</tr>
</tbody>
</table>

'The baby that the mother is holding'

Table 8 shows the proportion of internally headed relative clauses elicited in different clause types. The proportions from Experiment 2 are based on the total number of responses elicited in the entire experiment (i.e. 1440 responses), while the proportion from Experiment 3 is based on the total number of responses elicited in the animate subject – inanimate object (AA) condition (i.e. 84 responses).

Table 8. Proportions of internally headed relative clauses.

<table>
<thead>
<tr>
<th>Clause Type</th>
<th>Proportion of IHRC</th>
</tr>
</thead>
</table>
The internally-headed relative clause differs from the resumptive NP pattern in its headlessness and the predominant use of the *go2 + CL* relative marker. The headless relative clause with the *go2 + CL* relative marker, as in (139), resembles the internally-headed relative clauses in Korean (140), which is headed by a referential noun counterpart *kes* 'thing' (Chung & Kim, 2003).

![Korean IHRC:](image)

(140) Korean IHRC:

<table>
<thead>
<tr>
<th>[Mary-ka kamca-lul kwup-o-un]</th>
<th>kes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mary-Nom potato-Acc bake-prf-REL thing</td>
<td></td>
</tr>
<tr>
<td>'the one that Mary baked the potato' (meaning 'the potato that Mary baked')</td>
<td></td>
</tr>
</tbody>
</table>

### 6.2.2 Discussion

Even though the resumptive pronoun strategy is a legitimate strategy for object relativization in Cantonese, children rarely employed it in their object relative clause formation. This suggests that, out of the two, the gap strategy is the preferred, or default, strategy for Cantonese relativization, which are compatible with previous findings for Cantonese (Francis et al., 2015) and Mandarin Chinese (Su, 2004; Ning, 2008). The reason for the dispreference in the use of the resumptive pronoun could be that the cost of producing an overt pronoun in the relativized position is greater than the benefits the processor could enjoy due to its presence. As suggested by Hofmeister and Norcliffe (2013), the pronoun might actually add to processing cost by introducing a referential dependency. Although object relative clauses have been shown to be inherently more difficult to process than their subject counterparts, the dependency in a simple object relative clause may not be sufficiently complex to call for the resumptive pronoun strategy. In fact, children appeared not to find object relative clauses particularly difficult to produce, as shown by the absence of difference in their rates of target
production on subject and object relative clauses (see § 4.2.2 and § 5.1.2.3). The same applies to those relative clause types that require the use of resumptive pronoun strategy.

Another possible reason for the avoidance of resumptive pronouns could be their low frequency in the input. The resumptive pronoun strategy is not frequently adopted in spontaneous speech, according to previous studies in Mandarin Chinese (Su, 2004) and Cantonese (Francis et al., 2015). This limits the exposure of young children to resumptive pronouns in relative clause, making them less accessible.

The resumptive NP patterns observed in Cantonese-speaking children resemble those observed in children's production of other languages under experimental conditions (Hsu et al., 2009; Labelle, 1990; McKee et al., 1998; Pérez-Leroux, 1995). This may be a general phenomenon resulting from children's limited capacity to process long-distance dependencies. The full NP in-situ in the relativized position indicates a failure of extraction during dependency formation when the processor is under pressure and processing resources are limited. The non-target patterns, such as resumptive NP pattern and internally headed relative clauses, demonstrate a continuum in children's ability to extract the relativized NP while at the same time retaining the information about its original position relevant to thematic role assignment and grammatical agreement. When the processor is unable to fully handle these tasks, children could easily produce a full clause (e.g., [s KANGAROO PAINT PIGGY], directly linking it to the head noun PIGGY. This might be comparable to the way young Cantonese-English bilingual children used full main clauses as relative clauses (Yip & Matthews, 2007b). Young bilinguals, under greater pressure in processing the weaker second language, failed to reformulate the planned clause into the desired relative clause construction containing a long distance dependency.

Further evidence for this idea comes from other prenominal relative clause languages, such as Quechua (Courtney, 2006) and Japanese (Ozeki & Shirai, 2007, 2010). Courtney (2006) found that Quechua children started off with a full clause that was construed through analogy as a modifier to the head. As they mastered the details of the relative clause construction, children became capable of constructing the relative clause as a gapped structure. Japanese children too develop their relative clause constructions along the continuum of
noun modification, from words to phrases then clauses (Ozeki & Shirai, 2010). They rely on their knowledge of simpler phrasal modification, such as adjectivals, to master the relative clause construction. The proto-form of the relative clauses of English- and German-speaking children took the form of syntactic amalgams, which contained only a simple clause modifying the head (Diessel & Tomasello, 2000, 2005). Children preferred relative clauses that resemble simple sentences, and prefer the actor in the relative clause to correspond to the sentence-initial NP as it does usually in natural language.

### 6.3 Conclusion

The current study was designed to investigate the role of resumptive pronouns in the acquisition of relative clauses in Cantonese, a language in which the resumptive pronoun strategy is not a last-resort strategy for illicit gap constructions, but a legitimate relativization strategy. The results reveal that resumptive pronouns do not directly improve the comprehension of Cantonese relative clauses, nor is resumption a preferred strategy in production. This rejects the prediction of a facilitative role for resumptive pronouns in the comprehension and production of relative clauses by Cantonese-speaking children. Although resumptive pronouns do not improve the comprehension of Cantonese relative clauses overall, they do reduce the occurrence of head errors — apparently by eliminating the isomorphism between an object relative clause and a matrix clause by making explicit the relative clause structure. This helps to prevent the processor from misinterpreting the relative clause as a matrix clause. Yet, resumptive pronouns cannot fully prevent children from misinterpreting object relative clauses as main clauses. This may be because, even with a resumptive pronoun, the relative clause still has the superficial constituent ordering found in canonical declarative clauses in Cantonese. Children might have only relied on the constituent ordering to interpret relative clauses. Another reason for resumptive pronouns failing to facilitate the acquisition of Cantonese relative clauses might be their low frequency of use in the input: children might not have enough exposure to them to become familiar with the role of resumptive pronoun and its potentially facilitative effect in relative clause processing.
In sum, resumptive pronouns do not directly relieve the processing burden incurred from relative clause processing, hence the null effect in both children’s comprehension and production. By marking the relativized position, however, resumptive pronoun renders the structure more explicit, reducing ambiguity and mitigating certain errors in comprehension.
CHAPTER 7
CONCLUSION

This thesis examines the effect of three factors, namely the grammatical relation of the relative clause head noun, NP animacy, and the presence of resumptive pronouns, on Cantonese-speaking children’s production and comprehension of relative clauses. What follows in this chapter will first be a summary of the findings from the three experimental studies (§ 7.1), then a general discussion on their implications for the acquisition of Cantonese relative clauses (§ 7.2). Finally, this chapter will conclude with some remarks on the contribution of this thesis to the general mechanisms of the acquisition of relative clauses (§ 7.3).

7.1 Summary of the experimental findings

7.1.1 The role of grammatical relations

This study (Experiment 1 and Experiment 2) aims at establishing a hierarchy of acquisition difficulty for Cantonese relative clauses and investigates whether it parallels the hierarchy of NP accessibility (Keenan & Comrie, 1977; Hawkins, 2004). In order to establish the hierarchy of acquisition difficulty, this study examined also the lower positions in the accessibility hierarchy, namely indirect object and oblique, in addition to the often contrasted positions, subject and object. Comparisons were performed between each position, resulting in the following pairs of comparisons:

- Subject (S) vs. Object (DO) in transitive construction
- Subject (S) vs. Indirect object (IO) in ditransitive construction
- Direct object (DO) vs. Indirect object (IO) in ditransitive construction
- Direct object (DO) vs. Oblique (OBL) in locative construction
The pairwise comparisons observed the following difficulty asymmetries in Cantonese-speaking children’s comprehension and production, as shown in (141).

(141) Difficulty asymmetries in the relative clause acquisition of Cantonese children:
(Asymmetries observed in adult production are given in the brackets)

<table>
<thead>
<tr>
<th>COMPREHENSION</th>
<th>PRODUCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>S &gt; DO</td>
<td>S = DO (S &gt; DO)</td>
</tr>
<tr>
<td>S &gt; IO</td>
<td>S &gt; IO (S &gt; IO)</td>
</tr>
<tr>
<td>DO = IO</td>
<td>DO &gt; IO (DO = IO)</td>
</tr>
<tr>
<td>DO = OBL</td>
<td>DO ~&lt; OBL (DO = OBL)</td>
</tr>
</tbody>
</table>

The discrepancies in the preferences in children’s comprehension and production suggest that different factors are playing a role in children’s production and comprehension at this stage of acquisition. Both children’s comprehension and production demonstrates a prominent subject preference. Among all the theories that predict a subject preference for Cantonese, only the topicality account (e.g. Mak, et al., 2006, 2008; Kim & O’Grady, 2015) can provide a satisfactory explanation for the observed two-tiered results, with subject outperforming all the other NP positions while the other three lower positions were at comparable level of performance. The relative ease of subject relative clauses, as the account upholds, derives from the topicality of subjects. Because the function of a relative clause is to provide information of the noun it modifies in the sentence, and often any information provided in the sentence is to be about the topic of the sentence, which, by default, is the subject, and therefore, the consistency with the processing expectations facilitates the processing of subject relative clauses.

As for production, children seem to rely on their acquired knowledge of the language’s canonical word order to facilitate their formation of relative clauses, which in turn creates an interaction with the prevailing subject preference. Children appear to find it easier to produce relative clauses whose constituent order matches that of a main clause.
In contrast to the alleviation effect observed in production, the effect of word order resemblance, on the other hand, seems to be the culprit for the error patterns in children’s comprehension. Because of the resemblance with a main clause, children might have analyzed the relative clauses using the canonical word order schema (as suggested by Bever, 1970). Together with the prevalent subject preference, children might have, by default, treated the subject of those relative clauses which have a main clause resemblance as the head NP, and that is why head errors, in particular those which involved misinterpreting the subject as the target referent, were more prevalent in these types of relative clauses. For relative clauses that do not have a main clause resemblance, reversal errors were often the most prevalent type of errors children committed. Children seem to have misinterpreted the respective grammatical roles of the NPs in the relative clauses by using the canonical constituent order of the nominals in main clauses, thereby committing the reversal errors.

Although other relative clause accounts, such as working memory-based account (Gibson, 1998, 2000; Warren and Gibson, 2002; Vasishth and Lewis, 2006) and structural complexity account (e.g. O’Grady, 1997; Hawkins, 2004) failed to explain the findings of the current study, the effects of structural complexity (in terms of valency) and discourse referentiality are demonstrated to play a role in children’s production. Children tend to avoid using structurally more complex, such as the full ditransitive and locative constructions, in their relative clauses; instead, they prefer the structurally simpler transitive construction, leading to a significant proportion of reduced ditransitive and simple transitive relative clauses in the indirect object and oblique conditions. Furthermore, children (and adults) were found occasionally to represent other non-head NPs in the relative clause with an indefinite nominal as a measure of defocus to avoid any interference effect from the discourse referents within the long distance dependency.

The findings in this study are only partially consistent with the NPAH – children only find subject easiest to understand and to produce than the other types of relative clause lower in the hierarchy; but apart from that, the predicted accessibility hierarchy, in particular for the lower positions, is not
borne out by the asymmetries observed in children’s comprehension and production. The findings supports a multifactorial analysis proposed by Diessel and Tomasello (2005) and Hawkins (2007). The acquisition of Cantonese relative clauses is mainly determined by the subject prominence, for which topicality of subjects makes subject relative clauses easier to understand and to produce, and the preferred type when using a relative clause to depict a referent. The word order resemblance helps children make use of their previously acquired knowledge of the language’s canonical word order to construct the relative clause. Due to their reliance on the main clause resemblance, however, children also tend to comprehend relative clauses using the canonical order of nominals in main clauses, hence the head errors and reversal errors. Other factors, such as structural complexity and discourse referentiality of NPs modulated the choice of constituents and syntactic structures of children’s of relative clause constructions.

7.1.2 The role of animacy

This study (Experiment 3) investigates the effect of NP animacy in children’s production of Cantonese relative clauses. As previous studies, which based on observations from postnominal relative clauses, have shown that the asymmetry between subject and object relative clauses disappears in both adult processing and child acquisition when the relative clauses have an animate subject – inanimate object (AI) configuration (Mak, et al., 2002, 2006; Gennari & MacDonald, 2008; Traxler et al., 2002, 2005; Kidd et al., 2007), this study systematically examined children’s relative clause preferences (subject –object asymmetry) in Cantonese for the full range of possible animacy configurations, namely animate subject - animate object (AA), animate subject - inanimate object (AI), inanimate subject - animate object (IA), and inanimate subject - inanimate object (II), was performed. With regard to target production, the difference between the subject and object relative clauses did not reach significance in all animacy configurations. Yet, in line with previous studies, the
production of subject and object relative clauses became easier for children when it was in the preferred animate subject - inanimate object (AI) configuration, in comparison to the common animate subject – animate object (AA) configuration. Target relative clause production drastically dropped when the animacy configuration was reversed with the subject as an inanimate entity and the object as an animate entity (i.e. the IA animacy configuration), and the proportion and variety of alternative constructions significantly increased. One of the major alternative construction children used is the patient subject construction (142). The patient subject relative clause promoted the original patient object to the subject position, but retained the patient role, resulting in a transitive predicate with a patient subject and an agent object. Although the original transitive sense is preserved, the patient-subject construction carries an additional sense of describing the state experienced by the referent.

(142) Patient-subject relative clause:

```
[ac 砸住 梳化] 嗑 個 男仔
zaak6zyu6 so1faa2 go2 go3 naam4zai2
crush-CONT sofa that CL boy
'the boy that is being crushed by the sofa'
```

Target:

```
[ac 梳化 砸住 ___] 嗑 個 男仔
so1faa2 zaak6zyu6 go2 go3 naam4zai2
sofa crush-CONT that CL boy
'the boy that the sofa is crushing'
```

Children used the alternative constructions, such as the patient subject construction, to avoid producing relative clauses with the dispreferred animacy configuration and aligned the animacy configuration of the relative clause to the preferred animacy configuration. Such dispreference could come from the complete contradiction to the semantic expectations for transitive predicates. Building from daily life exposure and language, children might have developed the same expectation as adults for the correspondence between the animacy and thematic assignment with respective grammatical roles in a transitive event, making the AI configuration the preferred, or default, animacy configuration for transitive events. When they encounter the reverse IA configuration, more effort
would be required to analyze the unfamiliar animacy configuration of the transitive predicate, thus increasing the difficulty of processing such constructions.

The effect of animacy was not observed in every configuration. It seems to be only effective between the contrastive animacy configurations, i.e. the AI and IA configurations. The difference in NP animacy in parallel animacy configurations did not cause a significant difference in children’s relative clause production. Children showed similar proportions of target relative clauses in the animate subject – animate object (AA) configuration and the inanimate subject – inanimate object (II) configuration, although the proportion of target relative clauses was slightly higher in the subject relative clause condition in the II configuration. This might be due to a less established expectations on inanimate NPs, hence more flexible to what grammatical role they can play in a sentence. On the contrary, animate NPs are expected to be subjects due to its properties, such as topicworthiness (Mak et al., 2002, 2006) and agency, penalty might be induced when the animate NP does not play the role it is expected, such as an object in a transitive event.

7.1.3 The role of resumptive pronouns

This study examines the role of resumptive pronouns in the acquisition of Cantonese relative clauses. In most of the previously-investigated languages, which only allow the gap strategy in their long distance dependencies, resumptive pronoun is regarded as an illegitimate option in the language but is often found to be used as a last resort to rescue illicit long distance dependencies. Different from those languages, the resumptive pronoun strategy is adopted as a legitimate relativization strategy for certain NP types in Cantonese, and, in particular, direct object relativization allows both the gap strategy and the resumptive pronoun strategy. This provides an opportunity to assess its actual function when it is a legitimate option in the language. Experiment 4 assessed whether resumptive pronoun plays a facilitative role in children’s comprehension of Cantonese relative clauses. It compares three types of relative clauses, namely subject relative clauses, object relative clauses with
gap, and object relative clauses with resumptive pronoun. If resumptive pronouns have a facilitative role in children’s comprehension, the difficulty children find in comprehending object relative clauses compared to subject relative clauses should be less in patterns with a resumptive pronoun than in their gapped counterparts.

The presence of a resumptive pronoun in general did not show any facilitative effect on children's acquisition of Cantonese relative clauses. Children did not find object relative clauses with resumptive pronouns easier to understand than their gapped counterparts. Both types of object relative clauses showed the same level of poor performance. The only effect observed for the resumptive pronoun was in the reduction of the rate of head errors: children were less likely to misinterpret the subject as the target referent in object relative clauses with resumptive pronoun than their gapped counterparts. Because object relative clauses with gaps have a surface isomorphism with main clauses, children could have easily misanalysed the relative clause as a main clause and assume the target referent is the default topic, the subject. However, with the resumptive pronoun in the relativized position, the surface isomorphism no longer exists in object relative clauses. This might have prevented children to be deeply committed to the main clause misanalysis and are able to recover to the correct relative clause analysis, hence the lower rate of head errors.

This study further examined children’s use of resumptive pronouns in relative clause production. As observed in their comprehension, resumptive pronoun is not a preferred option in children’s production. Although Cantonese allows both the gap strategy and the resumptive pronoun strategy for direct object relativization, the use of the resumptive pronoun strategy was rather infrequent in children’s relativization. The gap strategy was the predominant strategy in children's relative clause formation. Even though the resumptive pronoun strategy was the supposedly required strategy for relativization of the lower positions (indirect object, oblique and genitive), the gap strategy was still the predominant strategy children adopted, which results to a significant proportion of gapped indirect object and oblique relative clauses. Though it seems children do not have a preference for
the resumptive pronoun, interestingly, they do not completely disallow it for subject relativization, which supposedly does not allow the use of the resumptive pronoun strategy; a few subject relative clauses with resumptive pronouns were found in children’s production. This parallels the preference observed in adults’ grammaticality judgement and production in Francis et al. (2015), who also show a preference for subject position to be relativized with the gap strategy, and oblique and genitive positions with the resumptive pronoun strategy, but they did not completely reject the alternative strategy in all positions. It seems that out of the two, the gap strategy is the preferred, or default, strategy for Cantonese relativization, and, for both Cantonese adults and children, the use of resumptive pronouns is gradient instead of categorical. Rather than required in the lower positions, such as indirect object, oblique and genitive, and excluded in subject position (as stated in the Cantonese grammars), resumptive pronouns are more likely to be used in the lower positions on the accessibility hierarchy. The dispreference in the use of the resumptive pronoun could be due to the greater cost of producing an overt pronoun in the relativized position than the benefits the processor could enjoy from its presence, as the pronoun might actually add to processing cost by introducing a referential dependency (Hofmeister & Norcliffe, 2013). The difficulty associated with object relative clauses and relative clauses of other lower positions examined in the current studies may not be sufficiently complex to call for the resumptive pronoun strategy. It is also possible that the low frequency of use of resumptive pronouns in spontaneous speech leads to a limited exposure to resumptive pronouns in relative clauses for young children, making resumptive pronouns less accessible for children in production.

7.2 General research implications

7.2.1 Universal subject relative clause preference
The three studies consistently demonstrated a strong subject advantage over other lower positions of the accessibility hierarchy for the acquisition of Cantonese relative clauses. Despite typological
peculiarities of its relative clause construction, Cantonese aligns with other languages in demonstrating a subject preference in the processing and acquisition of relative clauses, lending support to the hypothesis of a universal subject preference.

Children do not only find subject relative clauses easier to comprehend and to use in their speech; they also prefer to use subject relative clauses over other types of relative clauses of lower positions. The alternative strategies observed in the three studies suggest that children would rather use a syntactically more complex construction in order to respond with a pragmatically appropriate subject relative clause, so that they can avoid relativization from the less preferred positions.

7.2.2 Comprehension vs. Production

Although children’s comprehension and production demonstrate different asymmetries, they point to one conclusion: the acquisition of Cantonese relative clauses is determined by a multitude of factors, and these factors exert different effects on comprehension and production. Some of them appear to be universal constraints, such as subject prominence. They produce similar effects on children’s comprehension and production. In comprehension, children demonstrate an overwhelmingly high rate of accuracy with subject relative clauses, even errors observed in comprehension show children have a strong tendency to take subjects as the target referent of relative clauses. As for production, children have a high rate of target production for subject relative clauses, and they have a very strong motivation to respond with a subject relative clause. On the other hand, other factors, such as word order resemblance, lead to different effects on comprehension and production. Due to the peculiar configuration of Cantonese relative clause construction (prenominal relative clauses with a head initial word order), some relative clause types in Cantonese, such as object relative clauses, have a resemblance with main clauses. Because of the resemblance, children exploited their knowledge of the canonical word order to help in constructing those relative clauses. This renders object relative clauses and other relative clauses which have a main clause resemblance easier to produce for
children. However, when children employ their word order knowledge to interpret relative clauses in comprehension, they might have experienced a garden path effect, in which they become too involved in the main clause analysis, which in turn interacts with the effect of subject prominence, and misinterpret the subject as the target referent (the default topic of the relative clause).

As a result, though it seems children’s comprehension and production demonstrate different preferences in relative clause acquisition, the two processes are in fact determined by the same multitude of factors.

7.2.3 Children vs. Adults

Adults were also tested for their production in the two production studies to provide reference for children’s production. The asymmetries observed in the production of relative clauses are different between adults and children; interestingly however, the asymmetries in adults’ production parallel the asymmetries observed in children’s comprehension. This further strengthens the speculation that children’s reliance on the word order resemblance in production is a developmental strategy.

Children exploit previously acquired knowledge to facilitate the processing of syntactic constructions that they have not yet mastered. Once they have mastered the construction, the developmental strategy may no longer play a critical role. For this reason, the effect of word order does not seem to have any significance in adult relative clause production.

Except the differences in the difficulty asymmetries, children and adults actually demonstrate very similar preferences in their production of relative clauses. They both have a strong subject preference, such that both groups often use different means to produce a subject relative clause. They have a similar pool of alternative strategies to convert relative clauses of the dispreferred type to the preferred subject relative clause type, but adults and children have different favourites. Adults usually rely on alternative constructions, and passivization is the most common option adults use to respond with a pragmatically appropriate subject relative clause. Passivization is much less favoured
in children’s production, which might probably due to their syntactic complexity. Instead, children prefer to change to a completely different relative clause predicate, such as changing the verb with which the target referent becomes the subject of the predicate, or simply describe the physical or psychological state of the target referent. Both adults and children have a tendency to use a simpler syntactic structure, such as transitive construction, instead of the more complex targeted structure, such as ditransitive or locative construction, but children is more significant in this respect.

All in all, children show a similar relative clause preference and pattern in relative clause acquisition as adult relative clause processing. What is different from adult processing is that children seem to make use of the typological characteristics of the relative clause construction and rely on additional facilitation from existing knowledge to master the developing constructions, hence the reliance on the word order resemblance by children in their production of relative clauses.

7.3 Concluding Remarks

This thesis contributes to the understanding of the acquisition of relative clauses in Cantonese, a language whose relative clause construction is different from the languages examined in the vast literature on relative clause acquisition and processing. With the typologically peculiar prenominal relative clause construction, Cantonese provides clear evidence in favour of the universal subject preference. This thesis also helps to break the stalemate in the accounts for relative clause processing and acquisition. Working memory-based accounts (Gibson, 1998, 2000; Warren and Gibson, 2002; Vasishth and Lewis, 2006) fail to explain the prevailing subject preference in Cantonese. Neither can all of the accounts which predict a universal subject preference, such as the structural complexity account (O’Grady, 1997; Hawkins, 2004), provide a full and satisfactory explanation for the pattern observed in the acquisition of Cantonese relative clause. Only the topicality account (Mak et al., 2002, 2006; Kim & O’Grady, 2015) can account for the two-tiered preference in the current findings. This thesis does not examine whether the frequency of use of relative clauses can predict the acquisition
pattern observed in the experimental studies, and therefore cannot evaluate the predictions of the frequency accounts (Fox and Thompson, 1990; Roland, Dick and Elman, 2007).

It is also important to seek further what contributes to the prominence of the subject that makes it more accessible for relativization, and, at the same time, more available for acquisition and processing. In this thesis, topicality of the subject is proposed to be the key. It hypothesizes that a consistency with the expectation for the relative clause to be about the topic of the sentence will facilitate processing of the relative clause. As subject is usually the default topic of a sentence, children should find subject relative clauses easier to acquire than relative clauses of other non-topic positions. This is in line with the proposal outlined in Kim and O’Grady (2015).

Even though this thesis finds support for the universal subject preference, it is not fully compatible with the NPAH (Keenan & Comrie, 1977). The incompatibility suggests that the acquisition of relative clause is not only shaped by the factors that underlie the accessibility (or the inferred processing difficulty) to relativization, but also by factors such as, general learning strategies. In addition to subject prominence, the acquisition of Cantonese relative clauses is found to be influenced by other factors, such as word order resemblance, structural complexity and discourse referentiality, and each exert different degree of influence on the acquisition process. How these different factors interact with each other and to what extent is their influence in child language acquisition awaits further research.

As observed in previous studies, the relative clause preference can be modulated by the animacy configuration of the NPs in the relative clause. Children demonstrated similar sensitivity to the NP animacy configuration in their production of relative clauses. The animate subject – inanimate object (AI) configuration, as previously found in other languages, is also preferred by Cantonese children. In contrast, the reversed inanimate subject – animate object (IA) configuration is extremely difficult and dispreferred for children (as well as adults). Children made different attempts to convert the
dispreferred animacy configuration to the preferred animacy configuration, and one of them was the patient subject construction.

Resumptive pronouns do not demonstrate a facilitative effect on the acquisition of Cantonese relative clauses, in contrast to the ameliorate effect observed in adult processing. Children do not use resumptive pronoun in their production either. The only effect of resumptive pronouns observed in this thesis seems to be rendering the relative clause structure more explicit, reducing ambiguity and mitigating certain errors in comprehension. Two possible reasons for the dispreference for resumptive pronoun in the acquisition of relative clauses are proposed. First, the relative clause tested in the current studies are usually in simple transitive construction, which might not be complex enough to call for the use of resumptive pronouns. Second, resumptive pronouns are rare in spontaneous speech, such that children might not have enough exposure to them to become familiar with the role of resumptive pronouns and their potentially facilitative effect in relative clause processing. Further research is called for to study the true function of resumptive pronoun in language processing and explore why children do not make use of them in acquisition.

This thesis demonstrates that the acquisition of relative clauses show similar tendencies as adult relative clause processing. It is worth pursuing a processing-oriented account to investigate whether child acquisition of relative clauses is subjected to psycholinguistic limitations similar to those in adult language processing. Research in Cantonese relative clause construction is only just budding. Many aspects of the processing and acquisition of Cantonese relative clauses are yet to be explored. Most of the preliminary works on Cantonese relative clauses are on child acquisition (e.g. Lau, 2006; Chan et al., 2011). An understanding of the mechanisms underlying the processing of relative clauses by Cantonese-speaking adults may offer an even better solution than the findings of the current thesis to the stalemate among the confounding theories in the relative clause literature. Cantonese also presents an interesting test case for long distance dependencies involving backward anaphora, given its prenominal relative clause construction. As a representative of languages with a rare and peculiar
relative clause construction, understanding how children and adults process Cantonese relative clauses will contribute an important piece to the full picture of the general mechanisms of relative clause processing and acquisition.
REFERENCES


APPENDIX A: Relative clause responses in children’s and adults elicited production across all comparisons in Experiment 2

The table indicates the types of relative clause responses elicited from adults and children in different conditions. In order to provide a more accurate picture of the general tendencies, idiosyncratic responses from a single individual will not be counted; only patterns with at least two instances from different participants will be marked.

<table>
<thead>
<tr>
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<th>ADULT</th>
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<td>S vs. IO</td>
<td>DO vs. IO</td>
<td>DO vs. OBL</td>
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<tr>
<td>Indefinite nominal</td>
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<tr>
<td>Non-target:</td>
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<tr>
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<tr>
<td>Description of appearance</td>
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<td>Description of state/action</td>
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<td>Contrast with other NPs</td>
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<tr>
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<td>Simple transitive</td>
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<td>S vs. IO</td>
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<td>Gap-type IO relative clauses</td>
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<td>Oblique relative clause</td>
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<td>Genitive relative clause</td>
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<td>Internally headed relative clause</td>
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<td>Relative clause with RNP</td>
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186
APPENDIX B: Test stimuli for Experiment 1 and Experiment 2

S – DO comparison

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S – IO comparison

With *bei2* as main verb

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## S – IO comparison
with dative verb

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</tr>
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## DO – IO comparison

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<tr>
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APPENDIX C: Targeted relative clauses for Experiment 3

Animate subject – animate object (AA) configuration

<table>
<thead>
<tr>
<th>Subject</th>
<th>Direct object</th>
</tr>
</thead>
<tbody>
<tr>
<td>托住松鼠嘅大笨象</td>
<td>大笨象托住嘅松鼠</td>
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<tr>
<td>拉長鹿嘅兔兔</td>
<td>兔兔拉長嘅長鹿</td>
</tr>
<tr>
<td>推婆婆嘅姐姐</td>
<td>姐姐推婆婆</td>
</tr>
<tr>
<td>坐河馬嘅貓</td>
<td>貓坐河馬</td>
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<tr>
<td>攪住妹妹嘅媽媽</td>
<td>媽媽攪住妹妹</td>
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<tr>
<td>錫男仔嘅女仔</td>
<td>女仔錫女仔</td>
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Animate subject – inanimate object (AI) configuration

<table>
<thead>
<tr>
<th>Subject</th>
<th>Direct object</th>
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<tbody>
<tr>
<td>搬紙箱嘅叔叔</td>
<td>叔叔搬紙箱</td>
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<td>拋波波嘅女仔</td>
<td>女仔拋波波</td>
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<tr>
<td>掉標槍嘅男仔</td>
<td>男仔掉標槍</td>
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<td>食沙律嘅女仔</td>
<td>女仔食沙律</td>
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<td>扼住花嘅女仔</td>
<td>女仔扼花</td>
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<td>用收銀機嘅姐姐</td>
<td>姐姐用收銀機</td>
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Inanimate subject – animate object (IA) configuration

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<th>Subject</th>
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<td>繞住女仔嘅燈</td>
<td>嘅燈繞住女仔</td>
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<tr>
<td>打中叔叔嘅波波</td>
<td>呔波打中叔叔</td>
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<tr>
<td>埋住婆婆嘅雪</td>
<td>嘅雪埋住小朋友</td>
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<td>扼住伯伯嘅劍</td>
<td>把劍扼住伯伯</td>
</tr>
<tr>
<td>猛住男仔嘅梳化</td>
<td>梳猛住男仔</td>
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Inanimate subject – inanimate object (IA) configuration

<table>
<thead>
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<th>Subject</th>
<th>Direct object</th>
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<tbody>
<tr>
<td>載住垃圾嘅車</td>
<td>車載住垃圾</td>
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<td>衣夾住紙</td>
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<td>個箱繞住條鍊</td>
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<tr>
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<td>個罐裝住罐</td>
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<td>掳住頂帽嘅架</td>
<td>個架挼住頂帽</td>
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<td>車撞到棵樹</td>
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APPENDIX D: Test stimuli for Experiment 4

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</tbody>
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