

**On the Acquisition of *bei2*-Dative Constructions  
in Cantonese**

**粵語「畀」與格結構的習得研究**

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# Abstract

The present study examined the acquisition of argument structure in Cantonese *bei2*-dative construction. The dative verb *bei2* “give” is a three-argument taking verb involving the subject of agent, the direct object of theme, as well as the indirect object of recipient for expressing a transfer event. Using the canonical form [NP SUBJ] [VP [V *bei2*] [NP DO] [NP IO]] as the reference, different syntactic alternations were constructed by varying the number of argument structures and the relative position of the direct and indirect objects. A comprehension experiment involving 60 normal-developing children aged three to eight years old with 10 children (5 boys and 5 girls) in each age group was conducted using an enactment paradigm. Children were asked to act out the meaning of various canonical and non-canonical constructions with the help of toys.

The findings revealed that it was not until age 8 that children were able to fully master the full three-argument structure in the *bei2*-dative construction. Children as young as 3 years old were able to comprehend constructions with empty subject argument but the direct and indirect object without difficulty. However, children came across difficulty in processing constructions with overt subject argument, irrespective of the number of argument structures. Hence, among the three argument structures that the dative verb *bei2* “give” was undertaken, the direct object and the indirect object were acquired earlier than the subject argument. It was also shown that children with increasing age were developing better competence in subject argument processing, suggesting that the acquisition was a lengthy process and was not completed by the age of 8.

Before they were able to fully acquire the full form of three-argument structure in the dative construction, particularly the subject argument structure, children employed child-as-agent strategy and word order strategy in comprehension. Investigations on the relative position of object arguments suggested that displacement of direct object of theme made no effect on children's comprehension. On the contrary, even children at age 8 failed to achieve constructions with topicalization of the indirect object before the subject. Children got role reversals or failed to assign participant roles in their mis-interpretation. In another aspect, the explicit expression of argument structures, especially the indirect object, was important for children's interpretation of sentence meaning.

A follow-up experiment examining children's symbolic play skills revealed that children at age 3 were able to use other animate thing other than self to act as participant in play. Rather than a failure to act in a symbolic way, the difficulty children came across in processing the subject argument in the enactment paradigm should be due to linguistic, cognitive, or social factors. The findings were discussed using the perspectives of processing limitation account by examining the syntactic architecture of the dative construction Usage-based account was also employed to discuss the relevancy of input to the acquisition of dative argument structures.

## 摘要

本文研究粵語兒童在動詞「畀」的與格結構中動核結構的習得。粵語動詞「畀」是一個三價動詞來表示交接行為，在主語以外帶一個直接賓語及一個間接賓語。主語的題元角色是動作的施事者，直接賓語是客體，而間接賓語則是受事者。研究以慣用句式「主語 - 動詞 - 直接賓語 - 間接賓語」作為藍本，設定出四十五句含有不同動元數目，以及直接/間接賓語在不同位置出現的句子。研究以六十名兒童為對象來進行理解測試。受試者的年齡為三歲至八歲，十人為一個年齡組別（五男五女）。兒童須運用測試者所提供的物料來演繹不同的句子。研究結果顯示兒童需達八歲才能完全理解動核結構所聯繫的三個動元，其中以理解主語最為困難。兒童的表現並不受動元的數目影響，並隨著年齡同步增長。這顯示三價動核結構的習得是個漸進的過程，兒童需到達八歲才告完成。

當兒童未能完全掌握與動詞組配的三個動元時，兒童主要運用「以自己為施事者的策略」以及「詞序策略」來對句子進行理解。研究結果亦顯示兒童對句子的理解並不受直接賓語在句子出現的

位置所影響。然而，年及八歲的兒童亦未能正確理解間接賓語被提前至主語之前的句子，兒童會出現題元角色錯配的現象。此外，兒童對明確陳述的動元（尤其是間接賓語）有較好的理解。

從跟進研究的結果來看，三歲的兒童已發展出在遊戲中運用其它有生命的玩物作施事者的象徵性遊戲技巧。因此，兒童對三價動詞中的主語出現理解上的困難，並非因為象徵性遊戲技巧的不成熟所導致。本文考慮動核結構的複雜性，從處理限制的角度，以及強調以語言運用為本的語言習得理論對理解主語困難的現象作討論。

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“The **LORD** is my shepherd, I shall not be in want.”

Psalm 23:1

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# Chapter One: Introduction

An area that has received much attention in the child language literature is verb-argument structure (e.g. Bowerman, 1990; Pinker, 1984, 1989; Tomasello, 1992). Argument structure refers to the relationship between a verb and its complements, or arguments, in a sentence (Shapiro, 1997). Current accounts of children's acquisition of verb argument structure emphasize its lexical nature: that, ultimately, children must learn the specific semantic and syntactic properties of individual verbs in order to use them appropriately in sentences.

Different categories of verbs can be examined in English. These verb categories are based upon the number of arguments required for an utterance to be considered grammatical and to make it complete. The first category of verb --- intransitive --- needs only one argument, which occurs in the subject position of a sentence. This argument is often referred to as the agent of an action. Sentence (1) illustrates the agent in the subject position.

(1) *The boy* laughed.

The second category of verb --- transitive --- requires both a subject and a direct object. In such sentences, the subject corresponds with the agent, and the direct object corresponds with the patient, or the recipient of an action. Sentence (2) illustrates the subject and direct object in transitive sentence construction.

(2) *The boy* hit *the dog*

There are also verbs which need to be appeared with a subject, a direct object, and an oblique object as illustrated in sentence (3) below. The verb “put” takes three arguments in which the subject corresponds with the agent, the direct object with the theme, and the oblique object with the location.

(3) *The boy put the ball on the table.*

Argument structure is of interest because it captures the relationship between syntax and semantics. Napoli (1993) argued that languages require a mapping mechanism where syntactic and semantic information can be linked. This appears in the form of both subcategorization and argument frames. The subcategorization describes the syntactic relationship between a verb and the constituents of a sentence. On the other hand, the argument frame describes the thematic role of the participants in an activity. It is believed that in order for children to acquire a verb, they must store information about the meaning along with the subcategorization and argument frames (Pinker,1989; Smith & Sachs, 1990; van der Lely, 1994). Consider, for example, the verb “kiss”, when it is stored in the lexicon, it may be represented as follows by entailing both semantic as well as syntactic information.

(4) verb	:	“kiss”
meaning	:	contact with puckered lips
subcategorization frame	:	subject and direct object
argument frame	:	agent, patient

When this information appears in its surface form, a sentence such as (5) is produced.

(5) *The boy* <sub>(agent-subject)</sub> *kissed the girl* <sub>(patient-direct object)</sub>.

Within linguistic theory, lexicalist accounts propose that semantic and syntactic information is projected from the verb (Levin, 1985; Levin & Rappaport Hovav, 1995, Rappaport Hovav & Levin, 1998). Moreover, the semantic and syntactic information are connected via linking rules. Such mapping has been described as the canonical linking rules. The mapping patterns for the semantic and syntactic components of the verb link the argument frame with its corresponding subcategorization frame. In the majority of cases, the agent gets mapped to the subject position and the patient to the direct object position. Canonical linking rules have been hypothesized to play an important role in the learning of verb-argument structure (e.g. Bowerman, 1990; Pinker, 1989). They refer to the regular relationship found in the majority of languages between thematic roles, such as agent and patient, and syntactic functions such as subject and direct object. For example, if a child knows that a verb involves an agent and a patient, the child can infer that those arguments are expressed as the grammatical subject and object, respectively. The canonical or default mapping between particular thematic roles and particular syntactic functions may apply in the absence of information to the contrary (van der Lely, 1994).

Researches of language acquisition have long been interested in how children learn the argument structure of verbs (e.g. Bowerman, 1990; Pinker, 1984, 1989; Tomasello, 1992), focusing primarily on the number-and-position-of-arguments relationship. In acquisition research, verb argument structure has been investigated from the theoretical perspective of Chomskyan syntax and associated nativist assumptions. It holds the viewpoint that children come equipped with an innately universal grammar. As learning of verb-argument structure takes a long time, it is common for normally developing children to make errors while acquiring verbs

(e.g., Braine *et al.*, 1990; Gleitman, 1993; Pinker, 1989; Smith & Sachs, 1990; Tomasello, 1992). Many of these studies focus on investigating errors children made, especially on missing arguments, and ask for possible reasons to explain the error production given that children have innate knowledge of syntax.

On the contrary, usage-based account (Tomasello, 2003) emphasizes the importance of language input and children's own usage which influence children's representation of grammatical structures. Grammar emerges as the speakers of a language create linguistic constructions out of the recurring linguistic information they receive by means of social learning and cognitive processes. Usage-based approach of language acquisition has suggested that the following processes play an important roles in learning of verb-argument structure: (1) the entrenchment of constructions in conventional uses through repetitions; (2) the preemption of generalizations by alternative constructions (contrast, competition); and (3) the formation of verb classes that enable children to predict the behavior of new verbs on the basis of their (mostly semantic) similarities to well-known verbs (Tomasello, 2003).

Another line of research has been interested to investigate children's production and comprehension of dative constructions, particularly those for expressing the transfer of objects between people. These constructions provide much information on learning of verb-argument structure because different syntactic realizations are possible for expressing the same sentence meanings, thus providing rich information on the interaction between semantic and syntactic domains during sentence processing.

For examples, there are experimental studies comparing the comprehension of ditransitive structure and their ordinary transitive counterpart ((e.g. Cook, 1976; Osgood and Zehler, 1981; Roeper, Lapointe, Bing, & Tavakolian, 1981; O’Grady, 2000). It is generally found that children find the to-dative pattern easier to comprehend than the double object pattern. However, production studies yield a different finding in that children are found to produce ditransitive patterns at a much earlier age than the ordinary transitive counterpart (e.g. Gropen, Pinker, Hollander, Goldberg, and Wilson, 1989; Snyder and Stromswold, 1997).

Concerning dative constructions in Cantonese, Tang (1998) provided a comprehensive account on the classification of dative constructions in Cantonese. He further classified Cantonese verbs into different groups according to their syntactic and semantic properties and worked out the relationship between thematic properties of dative verbs and associated dative constructions. A recent study by Chan (2003) provided developmental findings on Cantonese-speaking children’s development of *bei2* “give” dative constructions and investigated the effect of input properties of child-directed speech of adults on children’s acquisition of dative constructions.

In sum, verb-argument structure is an area that has received much attention in child language literature. It provides important information on the acquisition of syntactic and semantic knowledge. However, research investigating children’s acquisition of verb-argument structure in Cantonese is rare. It is worth to find out what Cantonese-speaking children know about verb-argument structure and when they know about it.

The present study was conducted to supply us with a frame of reference concerning typical development of verb-argument structure in Cantonese-speaking children. It took a developmental perspective to investigate children's comprehension of the most complex form of three-argument structure involving three participant roles in the dative verb *bei2* "give" across ages.

The rest of the paper is organized as follows: Chapter Two provides a more detailed theoretical account on verb-argument structure, and related research on the area of children's acquisition. Dative constructions in both English and Cantonese, and the characteristics of the verb *bei2* "give" in Cantonese, which is the target verb in the present study, will also be reviewed. Chapter Two will be ended by purposes of the present study. Details of the methodology will be given in Chapter Three. Results of the experimental study and an analysis of children's errors will be presented in Chapter Four. The results will be discussed in Chapter Five while the final chapter provides a concluding remark to the paper.

# Chapter Two: Theoretical Background

## 2.1 Introduction

Most linguistic theories agree that during sentence comprehension, the main determinant that we use to construct the meaning of a sentence is the verb. The predominant view since Chomsky (1965) has been that the lexical representation of a verb specifies (or projects) the number and types of arguments corresponding to the participants in the event described by the verb. The term verb-argument structure is used to describe the relationship between a given verb and the arguments (nominals, sentence complements, prepositional phrases) with which it can appear (Naigles & Lehrer, 2002). In the sections that followed, a more detailed account on subcategorization and argument structure which describe the syntactic and semantic information of the verb, as presented by Shapiro (1997), as well as the mapping mechanism that links the syntactic and semantic information, will be given in Section 2.2.<sup>1</sup> Section 2.3 describes theoretical accounts on children's acquisition of verb-argument structure and related hypotheses for the explanation of error productions. Reviews of dative constructions in both English and Cantonese as well as relevant researches investigating these constructions will be given in Section 2.4 and 2.5. Outline of the present study will be described in Section 2.6.

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<sup>1</sup> Shapiro (1997)'s work borrowed from Chomsky's Government & Binding and Principles & Parameters frameworks (Chomsky, 1986, 1995).

## 2.2 Lexical representation of a verb

### 2.21 Subcategorization

By subcategorization we mean the type of syntactic environment into which a verb can enter. In particular, it is a characterization of the type of phrasal category that follows the verb. The subcategorization frame  $-[\_NP]$  indicates that a verb cannot occur with a NP (a direct object). Such verbs are often called *intransitive*. The frame  $+[_NP]$ , in contrast, indicates that the verb requires a direct object. Such verbs are called *transitive*.<sup>2</sup> Verbs may also subcategorize for a PP. Consider the following verbs for their subcategorization frames:<sup>3</sup>

- (1) “dance” :  $-[_NP]$
- (2) “kiss” :  $+[_NP]$
- (3) “put” :  $+[_NP PP]$

The verb “dance” requires no direct object NP, the verb “kiss” requires a direct object NP, and the verb “put” requires both a NP and a PP. Thus, “kiss” is said to subcategorize for a NP, and “put” for a NP and a PP.<sup>4</sup> The subcategorization frames of the above verbs will make up sentences with the following syntactic realizations:

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<sup>2</sup> Verbs (e.g., *study*) that optionally take a direct object have the subcategorization frame  $+[_(NP)]$ .

<sup>3</sup> Note for abbreviations: V=verb, VP=verb phrase, NP=noun phrase, PP=prepositional phrase.

<sup>4</sup> Because all English sentences require a subject argument, following Chomsky (1982), many linguistic theories have simplified the subcategorization information so that it only includes non-subject arguments

- (4) [NP John] [VP [V danced]]
- (5) [NP John] [VP [V kissed] [NP Mary]]
- (6) [NP John] [VP [V put ] [NP the toy ] [PP on the table]]

Verbs in principle can subcategorize for any phrase type, or combinations of phrases, but each verb chooses its allowable phrasal environment. Subcategorization information restricts the output of the phrase structure rules of a grammar to only well-formed instances of a language. That is if it is assumed that the subcategorization frame for each verb must be satisfied in the sentence in which the verb is contained, then we ensure that the correct verb will be inserted in its proper structural configuration. Again, if the phrase structure allows the generation of a sentence like “John \_\_\_ the door”, only a verb that allows a direct object NP can be inserted in the (blank) verb slot.

Indeed, there is a principle which is known as the Projection Principle that formally describes this constraint on well-formedness. This principle is quite powerful and rationalizes syntax in the following sense: When we acquire a lexical item, we acquire facts about the item’s syntactic privileges of occurrence.

## 2.22 Argument structure

Most sentences can be considered representations of relations between a predicate and its argument, hence the term argument structure. Unlike subcategorization information, argument structure is not concerned with the syntactic form of the phrasal categories a verb allows, but instead is concerned with the number of participants described by the verb and the type of thematic role associated with it. Using the three verbs mentioned above as an illustration, the verb “dance” requires just one participant which is the agent and hence is known as a one-place argument structure. The verb “kiss” requires two participants, the agent and the patient; thus, it selects for two arguments and hence a two-place argument structure. The verb “put”, on the other hand, requires three participants which are the agent, the theme, and the location and thus entails a three-place argument structure.

- (7) “dance” : NP \_\_\_\_  
                  agent
- (8) “kiss” : NP \_\_\_\_ NP  
                  agent     patient
- (9) “put” : NP \_\_\_\_ NP on PP  
                  agent     theme     location

Thus, the argument structure of these verbs determines the number and the roles that the referents of NPs play in the situation described by sentences as shown below:

- (10) [ John <Agent> ] danced
- (11) [ John <Agent> ] kissed [ Mary <Patient> ]
- (12) [ John <Agent> ] put [ the toy <Theme> ] on [ the table <Location> ]

As discussed above, each verb carries important lexical information for constructing well-formed sentences: subcategorization and argument structure; argument structure, in turn, interacts with the more semantic notion of thematic roles. In the following, canonical linking rules which map thematic roles with syntactic functions and how they may facilitate language acquisition will be discussed.

### **2.23 Canonical linking rules**

Canonical linking rules are the regular ways in which thematic roles (such as agent and patient) are mapped onto syntactic functions (such as subject and object). (Bowerman, 1990; Pinker, 1984). There has been much discussion about what constitutes the “canonical” or default mapping. Canonical linking has been characterized in terms of two interrelated hierarchies: one for thematic roles (or argument positions) and one for syntactic functions. The thematic role of a verb, which was the highest on the hierarchy (e.g., the agent), was linked to the highest available syntactic function (e.g., the subject). The next highest syntactic function (e.g., the theme/patient) was linked to the next available highest syntactic function (e.g., the object) and so on (Jackendoff, 1987; Levin, 1985; Pinker, 1989; Rappaport & Levin, 1988). If a person can identify the appropriate semantic properties and thus the arguments of a verb, in the absence of any conflicting information, he or she can then apply the particular linking rule to map each argument onto the appropriate syntactic function (Pinker, 1989). However, if a mapping does not represent the default semantic-syntactic relationship, the interpretation of the sentence may be wrong.

## 2.24 Syntactic-semantic interaction in language learning

According to van der Lely (1994), canonical linking rules can operate bidirectionally; from semantics to syntax (forward linking) and from syntax to semantic (reverse linking). Linking rules may facilitate language acquisition in several ways. Pinker (1984), Berwick (1986) and others have hypothesized that children use knowledge of thematic roles and the linking rules to “bootstrap” themselves into syntax which has been referred to as “semantic bootstrapping” (Pinker, 1984), which facilitates the development of phrase structure rules. The semantic cues may also be used by children to express the meaning of a new verb in an utterance without previously hearing it in a sentence. For example, when learning a new verb the child can determine the thematic roles of the noun arguments on a non-linguistic basis and then, with the use of the canonical linking rules, map the arguments onto the default syntactic functions. This may be seen as “productive” learning of verb-argument structure (Pinker, Lebeaux, & Frost, 1987).

Another way in which linking rules may facilitate language acquisition is when syntactic cues are used in conjunction with the linking rules to help learn the meanings of verbs (Gleitman, 1990; Naigles, 1990; Naigles, Gleitman, & Gleitman, 1993). The syntactic cues may be used in more than one way. First, by attending to the verb’s subcategorization frame the child can predict aspects of its meaning (Landau & Gleitman, 1985). Landau and Gleitman (1985) have used the term “syntactic bootstrapping”, which refers to attending to sets of subcategorization frames associated with a verb stem. This procedure may facilitate learning verbs by narrowing down the possible meanings shared by all of the stem’s syntactic entries.

Thus, hearing “John gorps” increases the likelihood that “gorp” means “smile” and decreases the likelihood that it means “hit”. And hearing “John gorps Bill” should imply the reverse (Gleitman & Gillette, 1995).

It is a controversial issue as to the extent syntactic bootstrapping can facilitate and is needed to learn a verb’s meaning. However, hearing a verb in one syntactic frame may give some information about the verb’s semantic structure (e.g., the number of arguments and type of arguments), although it cannot reveal anything about the core meaning content of the verb. Pinker (1989) has suggested that such kind of syntactic to semantic mapping may be particularly important in learning verbs which undergo certain syntactic alternations such as the passive and locative.

### **2.3 Theoretical approaches to verb-argument acquisition**

Theories of language acquisition have long debated the means by which children learn the argument structure of verbs. How do children learn that “fall” is one-argument verb, that “push”, “stroke”, and “take” are two-argument verbs, and that “put” and “give” are three-argument verbs? It has been found children make errors in their learning process in that verbs are use with incorrect number of arguments. For example, children may overgeneralize the transitive construction to intransitive verbs and produced utterances like “He falled me down”. Starting in their third year of life, children appear willing to produce familiar verbs with unattested numbers of arguments (Naigles & Lehrer, 2002). Given that children are productive rather than

conservative with their early use of verb-argument structure, how do they overcome their unwarranted productivity? How do they learn that intransitive verbs cannot take an object argument, that transitive verbs cannot take just a subject argument? Such questions have stimulated a great deal of research over the past decades. Proposals have ranged from nativist view to more recent usage-based approach.

### **2.31 Nativist theory of learning**

Nativist theories of language development assume that despite the fact that children's early utterances are clearly not adult-like and lack many components of grammatical speech, children are operating with an abstract knowledge of grammatical categories (e.g. Hyams, 1986; Radford, 1990; Valian, 1986, 1991). Such an approach holds the view that children come equipped with an innately given set of semantic verb classes and a set of thematic linking rules that might facilitate learning the syntax of verbs (e.g., Pinker, 1989). Thus, nativist theories of language development typically rely, to some extent, on the notion of performance limitations to explain the primitive appearance of early child speech whilst claiming that children operate with a complex and abstract grammar (Theakston, Lieven, Pine, & Rowland, 2001).

For example, Pinker (1989) describes early language production in terms of a "processing bottleneck" in order to explain the incomplete nature of children's early utterances. Thus, he proposes a specific performance limitation, namely children's limited memory capacity which governs their ability to realize sentence constituents overtly and apply grammatical rules appropriately.

Studies examining argument structure in young, normally developing children have shown that they frequently omit obligatory arguments (e.g. Bloom, 1993; Hyams & Wexler, 1993; Ingham, 1992; O'Grady, Peters, & Masterson, 1989; Valian, Aubrey, & Hoeffner, 1996). These studies have shown that arguments in the subject position appear to be more vulnerable for omission than arguments in the direct object position. According to Bloom (1993), children's subjectless sentences tend to have more words following the main verb than sentences with subjects. In other words, there is a negative relationship between the production of subject arguments and the number of words following the main verb of a sentence. He hypothesized a production-based limitation, in which children are less likely to produce subject because the length of the sentence taxes their linguistic processing system. This results in an omission of the information preceding the verb in a sentence. As children become more proficient with language, they are able to overcome this limitation and subjects are produced.

An alternative to Bloom's (1993) theory was proposed by Grela and Leonard (1997). According to Grela and Leonard (1997), it is not the length of the sentence, but the complexity of the verb argument structure that is relevant for subject omission. They proposed a continuum of argument structure complexity where verbs requiring one argument were the least complex, while verbs requiring three arguments were the most complex. They argued that sentences containing verbs with greater argument structure complexity should result in more omission errors because the amount of information required by the verb will tax the processing system of children who are not competent with language.

Valian (1991) attempted to derive predictions regarding the ways children's language might be affected by early production limitations. She assumes that the child, from the start of language development has a full model of adult grammar and must simply establish the precise lexical items which map onto each adult grammatical category. She explains the pattern of early language use in terms of full competence read through performance limitations which affect the child's ability to produce long and complex utterances early in development. These limitations, she claims, affect both children's ability to acquire verb-argument structure and to produce a wide range of grammatical constituent such as auxiliaries.

However, it has been argued that theories depend upon such limitations must provide specific predictions concerning the nature of limitations and the ways in which they would be expected to affect children's early speech. Otherwise it would be an *ad hoc* nature of performance-based explanations of children's errors which renders them empirically untestable. Tomasello (2003) also argues that positing the innate universal grammar view creates two major problems. The first derives from the fact of linguistic diversity. The problem is how any given child, learning any given language, can link the abstract categories of the innate universal grammar to the particulars of the particular language she is learning. The second derives from the fact of developmental change. The problem in this case is how to account for changes in children's language over time, given that the innate universal grammar itself does not change across development (the continuity assumption).

## 2.32 Usage-based processes

In recent years, new data have emerged that suggest the importance of usage-based processes to account for the learning of verb-argument structure. One central hypothesis of the usage-based theory of language acquisition is that all linguistic structures are acquired by means of social learning and cognitive processes. It is also assumed that aspects of use affect grammar. In other words, according to this view, performance can affect competence.

One such mechanism proposed is the Principle of Uniqueness (Brooks, Tomasello, Dodson, & Lewis, 1999; Naigle, Fowler, & Helm, 1992; Pinker, 1989), which operates by disallowing more than one lexical entry from filling a semantic niche. When two words are determined to be equivalent in meaning (e.g., transitive verb “go” and “take”), then one of the two --- the one not attested --- will be pre-empted and removed from the lexicon. Thus, once the semantically equivalent attested forms are fully learned, they will pre-empt the children’s productive (and unattested) forms in the lexicon.

A second mechanism invokes children’s well-known attention to word frequency; it has also been called Entrenchment (Brooks *et al.*, 1999; Naigle *et al.*, 1992; Tomasello, 2000). The idea is that the more frequently a verb is heard, the better it will be learned, semantically, and the more settled (or “entrenched”) it will be in its attested argument structures. Thus, frequent hearing of a verb will enhance it

semantics and entrench its syntax, and so serve, over time, to inhibit its use in unattested argument structures. For example, the verb “take” is heard only in transitive structures, the more children will assume that it can only appear in transitive structures.

A third mechanism focuses on the semantics of the verbs directly, claiming that information concerning which verbs can appear in which argument structures is predictable from extremely detailed semantic distinctions between subclasses of verbs (Brooks and Tomasello, 1999; Pinker, 1989). Once a verb is learned to completion, its membership (or not) in a relevant semantic subclass will be ascertained, and it will either be permitted to appear in the argument structure related to that subclass, or not. For example, once children have learned enough about “go” to realize that it does not belong to any of the semantic subclasses of motion verbs that participate in the transitive/intransitive causative alternation, they will no longer use “go” in a transitive sentence frame.

According to Naigles and Lehrer (2002), all these mechanisms have garnered considerable empirical support, that each places the burden of the acquisition of argument structure on learning the meanings of the individual verbs, and, given that such learning is generally agreed to take a long time, that each predicts a fairly long and drawn-out period of development before children’s acquisition of argument structure is completed (Brooks *et al.*, 1999; Mazurkewich & White, 1984; Naigle *et al.*, 1992).

## **2.4 Dative argument structures in English**

### **2.41 English dative constructions**

Instead of focusing on the lexical properties of verbs on the acquisition of verb-argument structure, another line of research has focused on structural perspectives by examining dative argument structures. It was hoped to provide insight not only into children's acquisition of these particular constructions, but also into the general processes of language acquisition --- especially with regard to the relation between verbs and construction.

According to Newman (1996), all languages of the world have grammatical constructions for expressing the transfer of objects (and other things) between people. In English, many verbs of transfer can occur in either of the following two patterns, which are related to one another both syntactically and semantically:

(13) The to-dative pattern

e.g., Mark gave a book to Jane.

(14) The double object pattern

e.g., Mark gave Jane a book.

Syntactically, the to-dative pattern consists of a transitive verb followed by one NP complement and one PP complement, whereas the double object pattern consists of a ditransitive verb followed by two NP complements with the indirect object preceded the direct object. Semantically, the postverbal NP is the theme while the NP

preceded by “to” is the recipient in the to-dative pattern. In the double object pattern, the first postverbal NP is the recipient while the second postverbal NP is the theme.

These constructions are interesting from a developmental perspective for several reasons: (a) each refers to a salient semantic situation for children and so is acquired relatively early; (b) each is relatively coherent semantically in that it is always used for some kind of transfer between people; and (c) each is cognitively complex in that it involves three participants (Dixon, 1991).

When a language permits two structures with similar meanings, questions arise as to which pattern is acquired first, whether learners make more mistakes with one structure than the other, and so on. Both the comprehension and production aspects have been investigated in the past several decades on the acquisition of these two patterns.

## **2.42 Comprehension studies**

Results from a number of experimental studies indicate that the comprehension of ditransitive structures lags behind that of their ordinary transitive counterparts (e.g. Cook, 1976; Osgood and Zehler, 1981; Roeper, Lapointe, Bing, & Tavakolian, 1981). For example, Cook (1976) conducted an act-out experiment in 90 children between the ages of 5 and 10 involving the to-dative and the double object pattern as shown below:

(15) The to-dative pattern

*The lion showed the bear to the giraffe.*

(agent)            (theme)            (goal)

(16) The double object pattern

*The lion showed the giraffe the bear.*

(agent)            (goal)    (theme)

Notice that these sentences are fully reversible in that any noun phrase could occur in any position without the sentence becoming nonsensical. This is important since it means that children can understand what the sentences mean only if they understand the function of word order in English. In particular, they must know that in the to-dative pattern the first postverbal noun phrase is the theme and that the noun phrase preceded by *to* refers to the goal or recipient of the action. And in the double object pattern, they must know that the first postverbal noun phrase is the goal and that the final noun phrase is the theme (O'Grady, 2000).

It was found that even at age 10, children's comprehension scores on the ditransitive object pattern (with the recipient-theme order) are only slightly above 50%, far below the near-perfect scores obtained on the ordinary transitive pattern (with the theme-recipient order). A number of other studies (Osgood and Zehler, 1981; Roeper *et al.*, 1981) have arrived at the same result. In each case, the most common error involves treating the ditransitive pattern as if it contained a regular transitive verb and the preposition "to" as illustrated in (17) & (18).

(17) Actual sentence:

*The lion showed the giraffe the bear.*

(agent)                      (goal)      (theme)

(18) Child's interpretation:

*The lion showed the giraffe to the bear.*

(agent)              (theme)              (goal)

O'Grady (2000) uses what he called the Iconicity hypothesis to explain the experimental findings. Evidently, children prefer the theme-recipient order because of its iconicity property --- it matches the manner in which the corresponding event unfolds.

A sentence is iconic if the order of its words matches the manner in which the corresponding event unfolds. In the case of verbs of transfer like "give", "show" and "tell", we have an event that originates with an agent who then acts upon a theme and transfers it to a recipient. The structure of a transfer event is like this: Agent → Theme → Recipient. So, in the to-dative sentence "Mark gave a book to Jane", an event in which Mark (the agent) picks up a book (the theme) and transfers it to Jane (the recipient). The to-dative pattern is said to be iconic in which the word order --- agent, then theme, then recipient --- matches the manner in which the event unfolds, with the agent acting on the theme and transferring it to the recipient. . On the other hand, the double object pattern is said to be non-iconic because the recipient precedes the theme. Cross-linguistic study by Cho, Lee, O'Grady, Song, Suzuki, and Yoshinaga (2002) also provides evidence in favour of the Iconicity hypothesis.

## 2.43 Production studies

In terms of production, matters seem to be quite different. It was found that children are able to produce ditransitive patterns at a much earlier age than the results of comprehension studies would lead one to expect. For example, children at around 2-years-old could produce utterances with double object construction such as “Show Fraser horsie” and “Give doggie paper” in Gropen, Pinker, Hollander, Goldberg, and Wilson (1989)’s study. Moreover, Pinker (1989) reports that the ditransitive versions of some verbs are used before their ordinary transitive counterparts. An even more dramatic finding is reported by Snyder and Stromswold (1997). They studied the emergence of double object and to-dative patterns in extensive speech samples from 12 children aged 1;4 to 2;6 at the time of the first recording. They found that 11 of the 12 children acquired the double object pattern before the to-dative and that the remaining child acquired both patterns at the same time. However, a more recent study by Campbell and Tomasello (2001) on the acquisition of the English dative constructions did not replicate this result. Instead, they found variability across children. By 3 years of age children are at least occasionally using dative constructions in clearly innovative ways such as “I’ll brush him his hair, “You put me just bread and butter”.

Research findings show a preference for double object patterns in children’s production while experimental results seem to demonstrate a preference for the to-dative pattern in comprehension. O’Grady (1997) argued that the two types of study may focus on different structures --- double object structure in which the postverbal NP is a pronoun (e.g. I sent *her* a letter) and in which it is a lexical NP.

(e.g. I sent *Mary* a letter). Since pronouns in English tend to be clitics (phonologically dependent elements that must adjoin to a major category such as a verb), it is conceivable that the acquisition device initially does not treat the pronominal pattern as a true double object construction on a par with constructions containing two lexical NPs. Whereas comprehension experiments have explicitly focused on sentences involving lexical NPs, production studies may not distinguish between the two types of double object patterns clear enough.

O’Grady (1997) further argued that there may be another possibility to account for the discrepancy between comprehension and production studies. The author stated that extraneous factors may interfere with children’s comprehension of double object patterns, especially those containing two lexical NPs. As mentioned in the above section, canonical linking rule maps the subject NP to the agent role and the object NP to the patient role in a default way to associate between grammatical relations and thematic roles in simple transitive patterns. This has been referred to as using the canonical sentence strategy to assist them in sentence comprehension. According to O’Grady (1997), such an association may extend to structures in which the verb takes three arguments to give the extended canonical sentence strategy as: NP V NP ...NP = Agent Action Theme Goal. Consistent with this strategy, the erroneous interpretation exemplified in (17) and (18) treats an intended goal-theme sequence in the stimulus sentence (“show the giraffe the bear”) as if it were a theme-goal sequence (“show the giraffe to the cow”).

There is no doubt that further investigation on the comprehension versus production difference is still needed before more definitive conclusions can be arrived at.

## 2.5 Dative argument structures in Cantonese

### 2.51 Cantonese dative constructions

Tang (1998) classified three types of dative constructions in Cantonese:<sup>5</sup>

#### (19) Prepositional dative construction (PDC)

ngo5 sung3 yat1 fan6 lai5 mat6 bei2 koei5

I give NUM CL gift DAT 3SG

“I gave a gift to him/her.”

#### (20) Double object construction (DOC)

ngo5 sung3 koei5 yat1 fan6 lai5 mat6

I give 3SG NUM CL gift

“I gave him/her a gift.”

#### (21) Inverted double object construction (IDOC)

ngo5 sung3 yat1 fan6 lai5 mat6 koei5

I give NUM CL gift 3SG

“I gave a gift to him/her.”

---

<sup>5</sup> All Cantonese examples in this article are transcribed in the JyutPing romanization system developed by the Linguistic Society of Hong Kong. Tones are marked numerically as follows: 1: high level, 2: high rising, 3: mid level, 4: low falling, 5: low rising and 6: low level. The following abbreviations are used in the glosses for Cantonese examples: CL: classifier, NUM: numeral, DAT: dative marker; 3SG: third person singular pronoun; 2SG: second person singular pronoun.

(19) is the prepositional dative construction in which the transitive verb is followed by one NP complement and one PP complement with the indirect object introduced by a dative preposition. (20) is the double object construction in which the ditransitive verb is followed by two NP complements, with the indirect object precedes the direct object. (21) is an idiosyncratic dative construction in Cantonese. This construction also consists of a ditransitive verb followed by two NP complements. However, the direct object precedes the indirect object without any dative marker. It differs from the double object construction in the word order of direct and indirect objects. Tang (1998) has used the term “inverted” double object construction to describe such inversion in word order of dative construction, which is one of the major syntactic characteristics of Cantonese.

(19) - (21) can be realized with the following syntactic and semantic representations:<sup>6</sup>

(22) Prepositional dative construction (PDC) :

V + DO + DAT + IO  
                   (theme)                    (recipient)

(23) Double object construction (DOC) :

V + IO + DO  
                   (recipient) (theme)

(24) Inverted double object construction (IDOC) :

V + DO + IO  
                   (theme) (recipient)

---

<sup>6</sup> Note for abbreviations: V=verb; DO=direct object; IO=indirect object; SUBJ=subject

The word order of dative construction in Cantonese has attracted much attention in the past. Xu & Peyraube (1997) argued that the dative construction with the indirect object followed by the direct object (i.e. the IDOC) is predominant in Cantonese. For example, (25) is more acceptable than (26) in the following two sentences:

(25) ngo5 sung3 bun2 syu1 koei5  
 I give CL book 3SG  
 “I gave a gift to him/her.”

(26) ngo5 sung3 koei5 bun2 syu1  
 I give 3SG CL book  
 “I gave him/her a gift.”

The authors argued that the DOC pattern is permitted under specific conditions, e.g. for emphasis, or due to lexical idiosyncrasy of certain verbs. They proposed that IDOC (V+DO+IO) is derived from PDC (V+DO+DAT+IO) by preposition deletion supporting by both synchronical and diachronical evidence. The two forms share the same constraints in relation to the semantic nature of the verbs and the focus information transmitted by the two objects (DO and IO).

Matthews and Yip (1994) also noted that the direct object follows the indirect object in Cantonese and made Cantonese differs from both English and Mandarin. This construction is used primarily with the verbs *bei2* “give” and *ze3* “lend”. Some speakers use this construction with additional verbs such as *sung3* “send, give as

a present” and *waang4* “return”. However, the indirect object may come first when the direct object is especially long as in (27):

- (27) ngo5 bei2 nei5 gei2 cin1 man1 tung3 maai4  
I give 2SG a few thousand dollar plus  
yat1 zoeng1 gei1 piu3  
NUM CL air-ticket  
“I gave you a few thousand dollars plus an air ticket.”

Tang (1998) conducted a comprehensive work in describing Cantonese dative constructions and their grammatically with different verbs. He classified Cantonese dative verbs into five different groups according to their syntactic and semantic properties and found out that only dative verbs belong to the “give” type, i.e. verbs that assign a Goal thematic role to the indirect object, allow the inverted double object construction. This type of verbs includes verbs such as: *bei2* “give”, *sung3* “give (as a present)”, and *zoeng2* “award”. In this type of verb, the indirect object is the intended possessor of the direct object and the verbs denote a change of possession.

He further proposed that the IDOC should be structurally related to the PDC with a null dative marker by providing supporting evidence from a phonological point of view.

## 2.52 The Cantonese verb *bei2* “give”

As the present study will focus on the dative verb *bei2* “give” with the DOC and IDOC construction for investigation, a more detailed account on its constructions and related researches will be given in this section and subsequent section.

At the conceptual level, the verb *bei2* “give” expresses an event which involves three participants, a giver, a givee, and thing that is given. In linguistic theorizing, these participants are subsumed under different thematic roles, an *Agent* (the one doing the giving), a *Recipient* (the one receiving something), and a *Theme* (what is being given). Moreover, the lexical entry specifies how the different participants of a particular verb are syntactically realized. Syntactically, the verb *bei2* “give” requires, besides a subject NP, two object NPs. In Cantonese syntax, the verb *bei2* “give” allows both the DOC and IDOC, hence the first postverbal NP can be the direct object and the second be the indirect object or the reversed order.<sup>7</sup>

These syntactic requirements are specified in the two subcategorization frames in (28) and (29):

(28) DOC : *bei2* [NP IO] [NP DO]

(29) IDOC : *bei2* [NP DO] [NP IO]

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<sup>7</sup> PDC is also allowed for the dative verb *bei2* “give” which is realized as *bei2* [NP DO] [PP [P *bei2*][NP IO]]. Since this construction will not be adopted for the present investigation, it will not be discussed here.  
Note for abbreviation: P=Preposition

In terms of the linking of thematic roles to syntactic constituents, the agent role is assigned to the subject NP, the theme role to the direct object NP, and the recipient role to the indirect object NP. Thus, the lexical entry of the verb *bei2* “give” is assumed to entail information about subcategorization frames such as in (28) as well as thematic roles such as in (30) and (31):

(30) *bei2* [ NP <Recipient> NP <Theme> ]

(31) *bei2* [ NP <Theme> NP <Recipient> ]

### 2.53 Production data for *bei2*-dative constructions

Researches on the acquisition of dative constructions in English have been abundant while hardly any is found in Cantonese. One exception is the one by Chan (2003) who investigated the development of dative constructions with the verb *bei2* “give” in child Cantonese. This study used monolingual Cantonese child language corpus, the CANCORP (Lee, Wong & Leung, 1996) to trace the early development of the Cantonese *bei2*-datives among eight children from the age of 1;05.22 to 3;04.14. Empirical developmental findings were also supplemented by naturalistic Cantonese-English bilingual corpus data, bilingual diary as well as clinical data from speech therapists in Hong Kong.

The author adopted the realization [*bei2*-T(heme)-R(ecipient)] as the canonical form of the *bei2*-dative construction. It was found that the canonical double object form was acquired late. As reported, the full *bei2*-datives with overt theme and recipient were generally very few among the monolingual subjects. Late use, inconsistent use, or even absence of the canonical [*bei2*-T-R] is noted in the subjects before age three, suggesting that such form is not yet acquired in children's early developing grammar before age three. Instead, the non-canonical [*bei2*-R-T] double object form and [*bei2*-T-*bei2*-R] serial verb form emerged early and are used in a non-target manner from an adult language perspective. Children also used non-full *bei2*-datives in the form of [*bei2*-R] and [*bei2*-T] before using the full *bei2*-datives.

Empirical findings on adult input were also provided which were derived from analyses of adult child-directed speech in the Hong Kong Cantonese Child Language Corpus (CANCORP) (Lee et al., 1996). Analysis of the adult input showed that the canonical form is used more frequent than the non-canonical forms. However, it was also found that the canonical form was used alongside with other *bei2*-datives with unexpressed or displaced theme, and other related serial verb dative constructions which instantiated the [*bei2*-R] sequence. The author took a usage-based perspective and argued that the early schematization of the canonical [*bei2*-T-R] form might be difficult in such a linguistic environment. The findings also support the markedness hypothesis which states that children find it easier to acquire unmarked structure — that is, structures that are for one reason or another more common in the world's languages. Since the non-canonical forms are cross-linguistically less marked than the canonical form, this leads to the earlier emergence of the former one than the latter one in child Cantonese.

## **2.6 The present study**

To sum up, past researches on verb-argument structure has focused on investigating the syntactic and semantic properties of verbs and the extent to which the meanings of verbs determine the syntactic and semantic expression and interpretations of its arguments. Researches in child language literature also interested in how children learn the verb-argument structure by focusing on the lexical properties of verbs as well as the production and comprehension of different syntactic alternations.

Despite the considerable amount of researches investigating verb-argument structure in English and even in other languages, we know relatively little about the learning in Cantonese. The present study was conducted to add to the body of knowledge that is accumulating but is still much lacking in child language literature, especially in Cantonese, on the acquisition of verb-argument structure. It focused on the comprehension aspect because, according to Golinkoff and Hirsh-Pasek (1995), comprehension data are particularly useful for our understanding of language acquisition in that it can yield a more accurate picture of the content of the child's emerging language system. This is because it is not necessarily true that any structure that can be produced will be produced. Moreover, it may provide a window onto the process of language acquisition. Arguably, by the time a child is producing a particular structure, the child has already acquired it. Yet, the steps leading to the analysis and mastery of that structure would be closed to inspection without studies of sentence comprehension.

The present study examined the acquisition of the three-place argument structure in comprehension using the dative verb *bei2* “give” as the reference. The study aimed to provide insights on the following five areas:

- (1) In the light of the vulnerability of subject argument structure for omission in production for English-speaking children, it was particularly worthwhile to look for comprehension pattern as well. It aimed to investigate whether the subject argument structure was the most difficult structure to comprehend among the three participant roles and the effect of the number of argument structures on comprehension;
- (2) This study adopted a developmental perspective and investigated the acquisition of argument structures across age;
- (3) Cantonese is a pro-drop language allowing null arguments. The number of argument structure varies in dative constructions as argument structures can be unexpressed in surface syntax. When the referent of an argument is available in the here-and-now context or is present in previous conversational discourse, the argument may be unexpressed in syntactic realization. It may also be regarded as an implicit or null argument structure. The effect of explicit Vs. implicit expression of direct object and indirect object argument structures on children’s comprehension will be examined in the present study;

- (4) In Cantonese, different syntactic alternations are allowed for dative constructions. The effect of the relative positions of the direct object and indirect object (agent, theme and recipient) on children's comprehension was also under investigation;
- (5) No matter children possess full competence of lexical representation of argument structures as suggested by nativist theory, or as suggested by usage-based theory, performance can affect competence, it is an observable fact that children make errors during their developmental process. The present study attempted to look for the error patterns children may exhibit before they have fully acquired the structure. This could also provide insights on comprehension strategies children may employ which are short cuts or heuristics used by them in the absence of full comprehension (Chapman, 1978).

The reasons for choosing the dative verb *bei2* “give” to construct sentence frame are three-folded:

- (1) The dative verb *bei2* “give” is a ditransitive verb which can take up three arguments to complete its structure, leading to the most complex verb-argument configuration;

- (2) The dative verb *bei2* “give” has special structural significance by allowing syntactic configurations of both the double object construction as well as the inverted double object construction, which is idiosyncratic in Cantonese syntax. This provides a platform for investigating how the variations of surface word orders of the direct object, indirect object, and subject affect children’s comprehension;
  
- (3) Production data is available in the existing literature in Chan (2003)’s study for making comparison between children’s performance in comprehension and production.

In the chapter that follows, detailed descriptions on the methodology adopted in this present study will be given.

# Chapter Three: Method

## 3.1 Participants

Sixty Cantonese-speaking children participated in this study in six age groups, from three to eight years old.<sup>8</sup> There were 10 children in each age group, with five boys and five girls. The age range and mean ages of children in each group are listed in Appendix I. Children were recruited from four day care centres, one kindergarten, and one primary school in Hong Kong.

## 3.2 Stimuli

Stimulus sentences with the dative verb *bei2* “give” were constructed with reference to the sentence frame listed below as the canonical three-argument full form (i.e., the IDOC construction):

[NP SUBJ] [VP [V *bei2*] [NP DO] [NP IO]]

In this canonical construction, the SUBJ argument has the thematic role of agent, the DO argument of theme, and the IO argument of recipient.

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<sup>8</sup> A pilot study suggested that children at age 2 were not appropriate subjects for this study as their vocabulary size, compliance, and auditory attention were not developed well enough for following the instructions in this study.

Target sentences were constructed under two conditions: (1) by varying the number of argument structures (by having empty and/or unexpressed argument structure), and (2) by displacement of the DO and IO in the surface syntax.

In order to look for the difficulty children may come across in processing the SUBJ argument structure, the following five *bei2*-dative constructions were constructed which contained no SUBJ argument for processing. Thus, leaving the SUBJ argument empty by having children to act as the agent of action themselves rather than having to process another NP as the SUBJ argument. The dative verb was aligned with one or two argument structures and with different relative position of DO. These constructions were referred to as *bei2*-dative constructions with empty SUBJ argument structure and are shown in Table 1:

<b>Type</b>	<b>Structure</b>	<b>Movement Patten</b>
Type I	<i>bei2</i> -IO	Nil
Type II	<i>bei2</i> -DO	Nil
Type III	<i>bei2</i> -DO-IO	Nil
Type IV	<i>bei2</i> -IO-DO	Postposed DO
Type V	DO- <i>bei2</i> -IO	Topicalized DO

**Table 1:** *bei2*-dative construction with empty SUBJ argument structure

The dative verb in type I and type II constructions was aligned with one argument structure, with the DO being unexpressed for type I and the IO being

unexpressed in type II. Children had to interpret the unexpressed DO and IO from the immediate context as well as from the conversational discourse. For type III, IV, and V constructions, the SUBJ argument of agent was also left empty. The dative verb was aligned with two argument structures. Type III followed the canonical *bei2*-DO-IO order. In type IV and type V, the DO was postposed after IO (i.e., the DOC construction) and topicalized before the dative verb respectively.

Another five *bei2*-dative constructions were constructed with an overt SUBJ. The dative verb may align with one more overtly expressed argument structures or no more additional structure. Also, there were different movement patterns of DO and IO. Table 2 shows these five constructions:

Type	Structure	Movement Patten
Type VI	SUBJ- <i>bei2</i>	Nil
Type VII	SUBJ- <i>bei2</i> -IO	Nil
Type VIII	IO-SUBJ- <i>bei2</i>	Topicalized IO
Type IX	SUBJ- <i>bei2</i> -DO	Nil
Type X	DO-SUBJ- <i>bei2</i>	Topicalized DO

**Table 2:** *bei2*-dative constructions with overt SUBJ argument structures plus no additional or one more argument structure

For type VI construction, both the DO and IO were unexpressed. For type VII, and VIII, the DO argument of theme was unexpressed. The IO argument was

displaced at the sentence initial position in VIII while there was no movement of argument structure in VII. For type IX, and X, the IO argument of recipient was unexpressed. The DO argument was displaced at the sentence initial position in X while there was no movement of argument structure in IX.

The last five *bei2*-dative constructions contained the full form of three argument structures, with all the arguments overtly expressed and with different displacement of DO and IO. Table 3 lists out these constructions:

Type	Structure	Movement Patten
Type XI	SUBJ- <i>bei2</i> -DO-IO	Nil
Type XII	SUBJ- <i>bei2</i> -IO-DO	Postposed DO
Type XIII	DO-SUBJ- <i>bei2</i> -IO	Topicalized DO
Type XIV	SUBJ-DO- <i>bei2</i> -IO	Preposed DO
Type XV	IO-SUBJ- <i>bei2</i> -DO	Topicalized IO

**Table 3:** *bei2*-dative constructions with the full form of three-argument structure

In these five constructions, all the argument structures were overtly expressed. Type XI was the full three-argument canonical form of the *bei2*-dative. Displacements of the DO argument were noted in type XII (postposed DO), type XIII (topicalized DO), and type XIV (preposed DO) constructions. In type XV construction, the IO argument was topicalized at sentence initial position.

These constructions aimed to shed light on (i) the difference between empty and

overt SUBJ argument, (ii) the effect of the number of argument structure on comprehension, (iii) the difference between explicit and implicit OBJ (both direct and indirect) argument structures, and (iv) whether the relation positions of DO and IO led to difference in processing.

There were altogether 15 sentence types under test, with three tokens for each type. Thus, there were a total of 45 test sentences. Examples of each sentence type can be found in Appendix II.

Both the SUBJ and IO arguments were animate characters while DO argument was inanimate. Eight animate nouns were chosen including “dog”, “cat”, “elephant”, “pig”, “tortoise”, “giraffe”, “rooster”, and “monkey”. Four inanimate nouns were chosen which were “apple”, “ice-cream”, “sausage”, and “vegetable”.

The SUB and the IO argument were animate such that both nouns have equal probability of being the agent and the recipient of the dative verb *bei2* “give”. This could prevent the possible use of animacy cue for role assignment. Rather, children had to rely solely on linguistic knowledge to derive the meaning of sentences.

For constructions with an empty SUBJ argument structure, children had to be the SUBJ of agent themselves for giving the DO of theme to the IO of recipient. On the contrary, for constructions with an overt SUBJ argument structure, children had to pick out the SUBJ of agent according to the instruction and acted symbolically for

giving the DO of theme to the IO of recipient. When facing null argument structure, children had to interpret the unexpressed structure which had not been mentioned in the instruction from the immediate context and from the conversational discourse given in the task explanation. The following three examples were used to illustrate the expected responses from children:

- (1) In Type I one-argument construction “*bei2*-IO” (e.g. “gives to the dog”) with an empty SUBJ, children were provided with four choices of IO of recipient and one unexpressed DO of theme in the context. Children were expected to be the SUBJ of agent and gave the unexpressed DO of theme to the IO of recipient according to the instruction.
- (2) In Type VII two-argument construction “SUBJ-*bei2*-IO” (e.g. “The giraffe gives to the pig”), children were provided with four choices of SUBJ of agent, four IO of recipient, and one unexpressed DO of theme. Children were expected to pick out the SUBJ of agent according to the instruction and gave the unexpressed DO of theme to the IO of recipient as mentioned.
- (3) In XI three-argument construction “SUBJ-*bei2*-DO-IO” (e.g. “The monkey gives the apple to the dog”), children were provided with four choices of SUBJ of agent, four DO of theme, and four IO of recipient. Children were expected to pick out the SUBJ of agent and gave the DO of theme to the IO of recipient as mentioned.

### **3.3 Procedures**

All participants were tested individually in a quiet place provided by each setting. Before experimental testing, a pretest was administered to assess children's knowledge of the nouns contained in the test sentences. All subjects performed with 100% accuracy.

Children were then asked to act out the meaning of the test sentences with the help of toys provided by the experimenter. They were instructed to listen carefully since they would hear each sentence only once. The materials used and the instructions given for each sentence type can be found in Appendix III.

The experimenter read each sentence at a normal conversational rate with normal prosodic variation to prevent possible interference of role assignment due to intonational cues. If the children questioned or were hesitant to enact the sentence, they were encouraged and told to "just do what you think". Children were allowed one additional presentation of each stimulus sentence under their verbal request or if they showed no response provided that no attempt had been made in the enactment. Throughout testing, participants received constant encouragement and praise and, as needed, reminders to "listen carefully" and "stay focused". Feedback after enactments was always neutral without specifying whether the responses were correct or not.

### **3.4 Scoring**

All the children's responses for each sentence were recorded as correct or incorrect on the assessment form (see Appendix IV). Children had to demonstrate

clear transferring of things among participants (rather than just relating things together) and to choose correct entities according to the instruction for classifying as a correct response. For the incorrect response, children's performance would also be noted. Errors would be considered to be a pattern for a sentence type if children performed at least two times in the same way. Scores for each sentence type in each age group were calculated and computed into percentage of accuracy.

## Chapter Four: Results

For each sentence type there were three items, and for each age group there were 10 subjects, yielding a total of 30 items per sentence type for each age group. The mean percentages of correct responses in each sentence type produced by the six age groups were worked out. Initial interpretation of the results revealed that children's performance on the 15 sentence types yielded three major patterns: (1) most of the children scored at ceiling for a group of constructions (4.1 below), (2) children of each age group got similar pattern of score for a group of constructions and there were a general increasing trend of achievement across age groups (4.2 below), and (3) children had low achievement for a group of constructions for children in all age groups (4.3 below). Based on the above observations, data were grouped into these three major areas for further statistical analysis. Results can be summarized as follows:

### **4.1 *bei2*-dative construction with empty subject argument of agent**

#### **4.11 Results**

There were five constructions without the SUBJ argument structure. Two constructions were formed with one argument structure (*bei2*-IO and *bei2*-DO). Three constructions were formed with two argument structures with the canonical structure of DO preceded IO (*bei2*-DO-IO) and non-canonical with movement of DO (*bei2*-IO-DO and DO-*bei2*-IO).

As shown in Table 4, children of all ages achieved nearly perfect scores in *bei2*-dative construction with empty SUBJ argument. Statistical analysis revealed that children showed no difference across ages ( $p = .302$ ), across sentence types ( $p = .381$ ), and no interaction was found between the two factors ( $p = .449$ ). In other words, all these sentence types formed a homogeneous pool despite differing in the number of argument structure and the position of DO.<sup>9</sup>

Age Group	Type I	Type II	Type III	Type IV	Type V
	<i>bei2</i> -IO	<i>bei2</i> -DO	<i>bei2</i> -DO-IO	<i>bei2</i> -IO-DO	DO- <i>bei2</i> -IO
3-year olds	100%	100%	90%	100%	93.3%
4-year olds	100%	100%	100%	93.3%	100%
5-year olds	100%	100%	100%	100%	100%
6-year olds	100%	100%	100%	100%	100%
7-year olds	100%	100%	100%	100%	100%
8-year olds	100%	100%	100%	100%	100%

**Table 4: Comprehension of *bei2*-dative constructions with empty SUBJ argument structure**

## 4.12 Interpretation

Children as young as three years old were able to comprehend sentences with the DO, the IO, and with both the DO and IO in *bei2*-dative constructions with empty SUBJ argument structure without difficulty. Moreover, movement of the DO,

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<sup>9</sup> Results of these five sentence types were combined in subsequent analysis.

whether it was postposed to the right following the IO, or topicalized in front of the dative verb, made no difference on children's comprehension. In acting out such constructions, children acted with self as the agent of action and gave the DO of theme to the IO of recipient. Children were also able to interpret the unexpressed DO in Type I construction and the unexpressed IO in Type II construction from the immediate context and previous conversational discourse successfully.

#### **4.13 Error analysis**

Errors made were all due to incorrect comprehension of the noun entity while interpreting the sentence meaning correctly. For example, in *bei2*-DO-IO construction, a 3-year-old child performed "*bei2*-icecream-giraffe" by giving the ice-cream to the dog instead of to the giraffe.

## **4.2 *bei2*-dative construction with overt subject argument of agent and displacement of direct object**

### **4.21 Results**

There were eight sentence constructions with the SUBJ argument and displacement of DO. The number of argument structure varied from one (SUBJ-*bei2*) to the most complex form of three (e.g. SUBJ-*bei2*-DO-IO). Children's performance on comprehending this group of *bei2*-dative constructions are summarized in Table 5:

Age Group	Type VI	Type VII	Type IX	Type X	Type XI	Type XII	Type XIII	Type XIV
	SUBJ- <i>bei2</i>	SUBJ- <i>bei2</i> -IO	SUBJ- <i>bei2</i> -DO	DO-SUBJ- <i>bei2</i>	SUBJ- <i>bei2</i> -DO-IO	SUBJ- <i>bei2</i> -IO-DO	DO-SUBJ- <i>bei2</i> -IO	SUBJ-DO- <i>bei2</i> -IO
3-year olds	0%	0%	0%	0%	0%	0%	0%	0%
4-year olds	50%	40%	40%	40%	40%	33.3%	33.3%	33.3%
5-year olds	40%	40%	40%	40%	36.7%	40%	40%	40%
6-year olds	50%	50%	50%	50%	50%	50%	50%	50%
7-year olds	70%	70%	70%	70%	70%	70%	70%	70%
8-year olds	100%	100%	100%	100%	100%	100%	100%	100%

**Table 5: Comprehension of *bei2*-dative constructions with overt subject argument and displacement of direct object**

The data were subjected to a repeated measure 2-way ANOVA in which age was a between-subject factor and sentence type was a within-subject factor. Analysis using Pillai's trace statistic revealed a significant main effect of age ( $F(5,54) = 6.76, p = .000$ ) while the effect for sentence type and the interaction between the two factors were not significant ( $p = .35$  and  $.44$  respectively). In other words, children at older age had better performance on the comprehension task and children of all ages performed in the same pattern regardless of sentence types.

As there was no effect for the sentence type on children's performance, the results of eight constructions were combined for subsequent analysis to locate the specific of systematic variation. Post-Hoc Tukey comparisons showed that 3-year-olds performed significantly worse than 7-year-olds ( $p = .004$ ) and 8-year-olds ( $p = .000$ ). Also, 4-year-olds performed significantly worse than 8-year-olds ( $p = .017$ ), as did 5-year-olds ( $p = .02$ ). However, there were no significant differences among the older child age groups.

## 4.22 Interpretation

Results revealed large discrepancy in achievement between dative constructions with empty and overt SUBJ argument structure, suggesting that the SUBJ argument was the most difficult component among the three argument structures in *bei2*-dative constructions that children came across difficulty with. It was not until 8 years old that children could fully master the SUBJ in dative construction in terms of comprehension. Children with increasing age were developing better competence in processing the SUBJ. Moreover, it was found that the number of argument structure (i.e. no matter the construction contained just the single SUBJ argument structure or had the full form of three-argument structure) made no effect on children's comprehension. The relative position of the DO (i.e. whether it was postposed to the right, preposed to the left, or topicalized) also made no effect. For the non-full form of *bei2*-dative constructions, children were able to interpret the unexpressed argument structure from the context and discourse without difficulty.

## 4.23 Error analysis

The analysis of errors on *bei2*-dative construction with an overt SUBJ argument of agent and displacement of DO will be made according to the number of argument structures.

### 1. Construction with one argument structure

**SUBJ-*bei2*:** In this construction, children were provided with four choices of SUBJ, one choice of unexpressed DO and one unexpressed IO. They were expected to pick out the SUBJ to be agent and gave the unexpressed DO to the unexpressed IO. Children across age groups mis-interpreted this construction in the same way with a high percentage (3-year-olds: 60%; 4-year-olds: 83.3%; 5-year-olds: 83.3%; 6-year-olds: 60%; 7-year-olds: 66.7% of the time). They acted as the agent of action themselves (i.e. children themselves acted to be the giver instead of the mentioned animate SUBJ) and gave the unexpressed DO of theme to the SUBJ of the construction. In other words, they mis-interpreted the SUBJ to be the IO as the recipient.

### 2. Construction with two argument structures

**SUBJ-*bei2*-IO:** In this construction, children were provided with four choices of SUBJ, one unexpressed DO and four choices of IO. Children at different age groups acted to be the agent of action themselves for the transfer of the unexpressed DO in

their mis-interpretation. However, there were variations in their performance for correct interpretation of IO of recipient among children of different ages. Only 30% of the three-year-olds processed the IO correctly while 40% of them gave the DO to the SUBJ of agent instead. For children at 4, 5, and 6, they were more able to interpret IO of recipient correctly with higher percentage of accuracy (4-year-olds: 66.7%; 5-year-olds: 66.7%; 6-year-olds: 60%). For children at 7, although they also acted to be the agent of action themselves, their error patterns suggested that they were more able to process both the SUBJ and IO in the construction by referring to both arguments in their act-outs. One of the seven-year-old children acted to be the giver and gave the unexpressed DO to both the SUBJ as well as the IO. Another child picked up the SUBJ first, then, with self acted to be the giver, gave the unexpressed DO to the IO. The third child related both the SUBJ and the IO to the unexpressed DO without obvious “who gives what to whom” relationship.

**SUBJ-*bei2*-DO/DO-SUBJ-*bei2*:** In both of these constructions, children were provided with four choices of SUBJ, four choices of DO, and one unexpressed IO. In the latter construction, the DO was being topicalized. These two constructions will be put together for analysis because children exhibited similar patterns of errors. Consistent with the constructions discussed above, children at different age groups also acted to be the agent of action themselves in their mis-interpretation. However, the IO of recipient was unexpressed in this construction, leading to lower chance to interpret the IO correctly as compared to the **SUBJ-*bei2*-IO** construction, especially for 3-year-olds. Instead, children had higher tendency to substitute the SUBJ to be the unexpressed IO as the recipient.

For **SUBJ-*bei2*-DO** construction, the success rates for correct IO interpretation are listed as follows: 3-year-olds: 10%; 4-year-olds: 50%; 5-year-olds: 66.7%; 6-year-olds: 40%. For **DO-SUBJ-*bei2*** construction, the success rates are: 3-year-olds: 0%; 4-year-olds: 66.7%; 5-year-olds: 66.7%; 6-year-olds: 40%).

For 7-year-old children, the same pattern as in the **SUBJ-*bei2*-IO** construction was obtained. One of the children acted to be the giver and gave the DO to both the SUBJ as well as the unexpressed IO. Another child picked up the SUBJ first, then, with self acted to be the giver, gave the DO to the unexpressed IO. The third child related both the SUBJ and the unexpressed IO to the DO without obvious “who gives what to whom” relationship.

### 3. Construction with three argument structures

#### **SUBJ-*bei2*-DO-IO/SUBJ-*bei2*-IO-DO/DO-SUBJ-*bei2*-IO/SUBJ-DO-*bei2*-IO:**

In all these constructions, children were provided with four choices of SUBJ, four choices of DO, and four choices of IO. All the argument structures were expressed despite that the position of DO varied. Children showed similar patterns of errors and so they will be discussed as a group. Also similar to the above, children at different age groups acted to be the agent of action themselves in their mis-interpretation. As the IO was expressed, 4- to 6 year-old children achieved high accuracy in interpreting the IO of recipient correctly.

The success rates for correct IO interpretation in **SUBJ-*bei2*-DO-IO** construction are listed as follows: 3-year-olds: 10%; 4-year-olds: 83.3%; 5-year-olds: 83.3%; 6-year-olds: 80%. The success rates in **SUBJ-*bei2*-IO-DO** construction are: 3-year-olds: 40%; 4-year-olds: 83.3%; 5-year-olds: 100%; 6-year-olds: 80%. The success rates in **DO-SUBJ-*bei2*-IO** construction are: 3-year-olds: 20%; 4-year-olds: 66.7%; 5-year-olds: 83.3%; 6-year-olds: 80%. The success rates in **SUBJ-DO-*bei2*-IO** construction are: 3-year-olds: 20%; 4-year-olds: 83.3%; 5-year-olds: 83.3%; 6-year-olds: 80%.

3-year-old children demonstrated greater difficulty in processing verb-argument relationship in construction with three argument structures as they showed irregular pattern of performance and were easy to pick up entities wrongly. Some children performed the three tokens for the same sentence types in different ways. For example, in comprehension of **SUBJ-DO-*bei2*-IO construction** among 3-year-olds, 20% of them acted to the giver themselves and gave the DO to IO. 10% of them did it in the same way but getting the theme entities wrongly. 20% of them substituted the SUBJ to be the IO as the recipient while 50% of them showed inconsistent error patterns. 7-year-old children showed similar errors to those mentioned in constructions with two argument structures and will not be discussed here.

To sum up for this part, in processing *bei2*-dative construction with overt SUBJ argument of agent and displacement of DO, children failed to interpret the SUBJ of agent correctly but acted to be the giver themselves. If the IO was expressed in the construction, children were more able to interpret IO correctly by giving the DO of theme to the IO of recipient. On the other hand, if the IO was unexpressed in the

construction, children had stronger tendency to substitute the SUBJ to be the IO. Hence, explicit expression of argument structure seems to facilitate comprehension of the construction. 7-year-olds were more able to process both the SUBJ and IO of the construction although they showed no clear “who gives what to whom” relationship in their act-outs.

### 4.3 *bei2*-dative construction with an overt subject argument of agent and displacement of indirect object

#### 4.31 Results

There were two sentence constructions with the SUBJ argument and movement of IO, namely IO-SUBJ-*bei2* with two argument structures, and IO-SUBJ-*bei2*-DO with three argument structures. In both cases, the IO was topicalized to place in front of the SUBJ. Results are summarized in Table 6:

Age Group	Type VIII	Type XV
	IO-SUBJ- <i>bei2</i> -	IO-SUBJ - <i>bei2</i> -DO
3-year olds	0%	0%
4-year olds	6.7%	0%
5-year olds	3.3%	0%
6-year olds	6.7%	0%
7-year olds	23.3%	0%
8-year olds	33.3%	16.7%

**Table 6: Comprehension of *bei2*-dative construction with subject argument and displacement of indirect object**

These data were also computed to a repeated measure 2-way ANOVA in which age was a between-subject factor and sentence type was a within-subject factor. Analysis using Pillai's trace statistic revealed significant main effects of both age ( $F(5,54) = 2.47, p = .044$ ) although it just reached the significance level, and sentence type ( $F(1,54) = 8.47, p = .005$ ). No significant interaction between the two factors was observed ( $p = .310$ ). This suggests that the Type VIII was easier than Type XV and children of different ages performed differently on these two sentence types. However, the patterns across age groups did not differ for the two sentence types. Follow-up Tukey analyses showed that there were no significant differences between any of the child age groups.

#### **4.32 Interpretation**

Comparison between data showed that *bei2*-dative construction with SUBJ argument structure as well as topicalized of IO before SUBJ was the most difficult construction among all the sentence types. Even children at eight could only achieve a rather low score in these types of sentences. The significant main effect of sentence type suggests that children had more difficulty in processing these constructions with three argument structures than two. Thus, the number of argument structure affects the level of processing.

## 4.32 Error analysis

Analysis of errors on the two *bei2*-dative constructions with SUBJ argument of agent and movement of IO will be made separately and divided into groups: for those who were able to process the SUBJ argument structure in 4.2 discussed above and those who failed.

### 1. Construction with two argument structures

**IO-SUBJ-*bei2*:** In this construction, children were provided with four choices of IO, four choices of SUBJ, and one unexpressed DO and. It was found that for those 4- to 8-year-olds who were able to process the SUBJ in 4.2 were also capable to look for a possible SUBJ and IO in the instruction and did the offering of DO of theme between the two parties. However, in a majority of cases they got participant confusion by interpreting the IO to be the SUBJ and vice versa (75% in 5- and 6-year-olds; 100% in 7- & 8-year-olds). The error pattern in 4-year-olds was somewhat different. All of them who were able to correctly process SUBJ and IO in 4.2 did not show role assignment in **IO-SUBJ-*bei2*** construction. Instead, they related both the mentioned noun phrases of SUBJ and IO to the DO of theme without assigning “giver” and “givee” roles.

For children who failed to process SUBJ in 4.2 also failed to do so in this construction but acted to be self as agent. However, there was no obvious dominancy in whether they chose the first mentioned NP (i.e. the IO) or the second mentioned

one (i.e. the SUBJ) to be the participant role of IO of recipient (40% Vs 20% in 3-year-olds; 33.3% Vs 50% in 4-year-olds; 50% Vs 50% in 5-year-olds; 0% Vs 60% in 6-year-olds). For 7-year-olds, they also demonstrated a better capability in processing both the SUBJ and IO as in 4.2 by referring to both arguments in their act-outs. However, in referring the DO of theme to the NP entities by being the agent themselves, they followed the-order-of-mentioned sequence, i.e. referred the DO first to the IO then to the SUBJ.

## 2. Construction with three argument structures

**IO-SUBJ-*bei2*-DO:** In this construction, all the argument structures were expressed with four choices given for all entities. Similar to **IO-SUBJ-*bei2*** construction, for those 4- to 8-year-olds who were able to process the SUBJ in 4.2 would seek for the SUBJ and IO in the instruction and did the offering of DO of theme between the two parties but with participant role confusion (100% in 4-, 5-, 6- and 8-year-olds; 85.7% in 7-year-olds; ). For those who failed to process the correct SUBJ structure, they acted to be agent for the transfer of object themselves. There was also no obvious dominancy in whether they would choose the first mentioned NP (i.e. the IO) or the second mentioned one (i.e. the SUBJ) to be the participant role of IO of recipient (30% Vs 30% in 3-year-olds; 50% Vs 30% in 4-year-olds; 33.3% Vs 66.7% in 5-year-olds; 40% Vs 40% in 6-year-olds). For 7-year-olds, they demonstrated the same pattern in mis-interpretation as in **IO-SUBJ-*bei2*** construction by referring the DO of theme to the NP entities using the-order-of-mentioned sequence, i.e. referred the DO first to the IO then to the SUBJ.

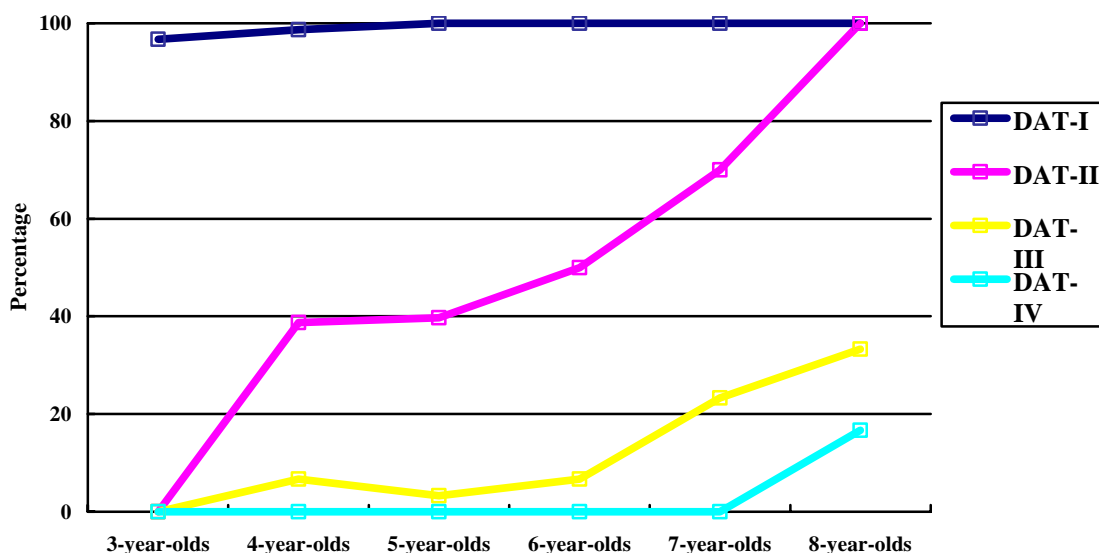
To sum up for this part, in processing *bei2*-dative construction with overt SUBJ argument of agent and displacement of IO, children who were able to interpret the SUBJ of agent correctly in previous constructions showed difficulty in situation in which the canonical first NP as agent and second NP as recipient relationships are violated. They assigned agent and recipient roles to the NPs according to the order-of-mentioned sequence, i.e. IO be the agent and SUBJ be the recipient. For those who failed to process the SUBJ acted to be the agent themselves. They demonstrated greater difficulty in choosing the recipient role among the two mentioned NPs with no preference shown.

#### **4.4 Four types of dative constructions**

Summing up results from the above, four types of dative construction were suggested with increasing levels of difficulty namely:

- (1) *bei2*-dative construction with empty SUBJ argument of agent (DAT-I),
- (2) *bei2*-dative construction with overt SUBJ argument of agent and displacement of DO (DAT-II),
- (3) *bei2*-dative construction (two-argument) with overt SUBJ argument of agent and topicalized IO (DAT-III), and
- (4) *bei2*-dative construction (three-argument) with overt SUBJ argument of agent and topicalized IO (DAT-IV).

The following graph illustrates children's performance on these four types of *bei2*-dative construction in different age groups:



**Graph 1: Children's comprehension on four types of *bei2*-dative construction**

Consistent with the previous analysis, results of ANOVA revealed a reliable effect of age ( $F(5,54) = 7.36, p = .000$ ). Follow-up test showed that difference across age groups was attributed by DAT-II. The effect of Dative-type was significant ( $F(3,52) = 806.66, p = .000$ ). The interaction between the two factors was also significant ( $F(15,162) = 2.29, p = .006$ ), indicating that the age group performed differently across the Dative-types.

## 4.5 Follow-up experiment

Results from the present experimental study revealed one major finding that in processing the three argument structures of the dative verb *bei2* “give”, the SUBJ of agent was the most difficulty one. One possibility is that children may not possess symbolic play skills in substituting the agent role other than self by other animate objects to act out actions on other objects. Such a play skill was critical for the act-out paradigm employed in this present study. If not, the difficulty in processing the SUBJ argument structure may due to linguistic and cognitive reasons. In order to verify this assumption, a small scale follow-up experiment was conducted to provide insight on this aspect.

In the follow-up experiment, a subject-verb-object construction using the transitive verb *mo2* “touch” was targeted:

[NP SUBJ] [VP [V *mo2*] [NP OBJ ] <sup>10</sup>

The verb *mo2* “touch” was targeted because it shared the same act-out with the verb *bei2* “give” by using one’s hand to perform the action. If children had difficulty in substituting other agent role other than self for acting out the action *mo2* “touch” on the OBJ of patient, they should show the same performance as that in the experimental study by being the agent of action themselves and touched the OBJ of patient.

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<sup>10</sup> Note for abbreviation: OBJ=object

Children were asked to act out such construction in three tokens by providing them with the same animate nouns in the experimental study (see Appendix V for the target sentences). Fifteen children took part in this follow-up experiment with five 3-year-olds, five 4-year-olds, and five 5-year-olds.

It was found that children as young as 3-year-old were able to perform the act-out in a symbolic way by picking out one animate thing to be agent and touched another animate thing. However, four of them got role reversal (i.e. reversing the role of agent and patient) and were easy to get the entities wrongly. All the 4- and 5-year-olds performed accurately by choosing the SUBJ of agent and touched the OBJ of patient as mentioned symbolically. This shows that children were able to use other animate things as participants in play to be the agent of actions even at age 3.

## Chapter Five: Discussion

Verbs encode information that is potentially crucial to sentence processing in the form of subcategorization and argument structures. The information that the verb provides is postulated to be the semantic relations that are involved in verb-argument structures. Syntactic-based linguistic approaches, such as Government and Binding Theory (Chomsky, 1982), have also attempted to deal with semantic relations and verb-argument structure, which have become embodied in the linguistic concept of thematic roles. The present study examined the acquisition of argument structures in Cantonese dative constructions with the verb *bei2* “give”. The dative verb *bei2* “give” is a three-place argument taking verb involving the subject of agent, the direct object of theme, as well as the indirect object of recipient for expressing a transfer event. Using the canonical form [NP SUBJ] [VP [V *bei2*] [NP DO] [NP IO]] as the reference, different syntactic alternations were constructed by varying the number of argument structures and the relative position of the direct and indirect objects. The major findings will be discussed in the following by focusing on different areas:

### 5.1 Processing of the subject argument structure

As we can see, children as young as three years old were able to comprehend dative constructions with empty SUBJ argument in which they acted to be the agent of action and transferred the DO of theme to the IO of recipient. On the contrary, children came across great difficulty in processing constructions with overt SUBJ argument. Statistical analysis on constructions with overt SUBJ showed that

children performed in the same way for constructions with different number of argument structures. In other words, an increase in the number of argument structures (DO and IO) did not cause the same increase in processing difficulty, suggesting that the difficulty lied solely in the processing of the SUBJ argument structure.

In coming across constructions which requested children to process a SUBJ argument of agent for doing the transfer of DO of theme to the IO of recipient, they failed to pick out the agent from the context but acting to be the agent themselves. It was not until children reached 8 years old could interpret the SUBJ argument correctly.

A follow-up experiment by having children to act out a reversible active sentence with the verb *mo2* “touch” showed that 3-year-olds demonstrated the play skill by using other animate thing to be the agent in play to act on other things. This was consistent with the findings reported in the Symbolic Play Scale Check List (Westby, 1980). It states that children at 3 to 3½ years old (Stage VIII in the checklist) are able to use doll or puppet as participant in play by exhibiting imaginative play skills. Such findings helped to rule out the possibility that children’s failure to process the SUBJ argument in dative construction was due to immature symbolic play skills. Rather, there should be other factors that come to play.

It was also shown that children with increasing age were developing better competence in subject argument processing. Statistical analysis revealed that 3-year-olds had significantly lower capability than 7-year-olds and 8-year-olds in processing the SUBJ argument. 4-year-olds and 5-year-olds also demonstrated poor

competence than 8-year-olds. This shows that the mastering of SUBJ argument structure in the dative verb *bei2* “give” is a long-term achievement rather than something that happen suddenly in the course of acquisition.

Combining the findings of the follow-up experiment using the transitive verb *mo2* “touch” which takes two arguments and the experimental study using the ditransitive verb *bei2* “give” which takes three arguments, there is empirical evidence suggesting that the number of participants involved in the transferring event may create additional processing load to children. As suggested by Grela and Leonard (1997), it is the complexity of the verb argument structure that is relevant to account for subject omission errors in production in English-speaking children. They regard verbs requiring three arguments as having the most complex structural complexity. If the amount of information required by the verb taxes the processing system of children who are not competent with the language, omission errors will be resulted. In a similar vein for comprehension, performance errors may due to limitation in processing capacity for three participant roles. In this case, children have to do on-line sentence processing in a selective way. Let’s look at the phrasal architecture of the complete form of the dative verb *bei2* “give” more specifically.

[NP SUBJ] [VP [v *bei2*] [NP DO] [NP IO]]

Both the direct object NP and the indirect object NP fall within the bracketed domain of the VP. According to the Principles and Parameters approach, these two object arguments are often called internal because they fall within the internal configuration of the VP; the subject argument, on the other hand, is often called external because it

falls outside the maximal projection of the VP. When the number of constituents to be manipulated during on-line processing exceeds children's processing capacity, the SUBJ argument structure, which is external to the VP, may be more vulnerable to have enough processing.

Changes in performance over time may be attributed by the view that children are gradually developing better cognitive processes to overcome the processing limitation, thus enabling them to process the complex argument structure over developmental time.

The difficulty in processing the subject argument structure will also be looked into from the usage-based perspective. According to this approach, children construct their abstract linguistic representations out of their item-based constructions using general cognitive, social-cognitive, and learning skills --- which act on the language they hear and produce (Tomasello, 2003). An important factor which facilitates children in building up constructions of language is the frequency and the type with which children hear a linguistic construction. This provides the raw materials for the schematization process. Tomasello (2003) gives an example in the passive construction to illustrate this point. Children acquiring English typically do not produce full passive sentences until 4 or 5 years of age. One possible reason suggested is that it is not a frequent construction in children's early linguistic experience. It is estimated that English-speaking children hear a full passive in only 1 of every 20,000 adult utterances directed to them. As the full passive construction is not frequent and salient in adult speech to young children, children will acquire this

structure late. A number of experimental studies have provided evidence to support the key role of frequency plays in learning (e.g., Brooks and Tomasello, 1999; Dopke, 1998).

As reported in Chapter Two, in Chan (2003)'s study which examined early development of the Cantonese *bei2*-datives in children, empirical findings on adult input were derived from analyses of adult child-directed speech in the Hong Kong Cantonese Child Language Corpus (CANCORP) (Lee et al., 1996). Out of the 1880 tokens of the target *bei2*-dative construction attested in the corpus, non-full datives, constitute 62.66% of all the *bei2*-datives used by adults when speaking to young children. These include *bei2*-datives with either T or R unexpressed or *bei2* "give" along (with or without the agent expressed). Although the analysis did not provide data on the use of SUBJ argument of agent in adult's speech in a focus way, it can be presumed that adults infrequently use the full three-argument *bei2*-dative in their speech. From the usage-based point of view, children need repeated exposure of the instantiating expressions concerned to form schematization of the target construction. It is predicted that the linguistic representation of the full form of the dative verb *bei2* "give" is not facilitated in such linguistic environment.

Although it may be possible that input frequency affects children's learning of the full argument structure of the dative verb, the complexity of structure may also contribute to what children learn and when they learn. As suggested by Tomasello (2003), there is much traditional linguistic work on child language acquisition that looks at the order in which children learn certain structures and infers from the linguistic complexity. But such inferences can never be validly made solely on the

basis of order of acquisition, that is, without some information about the relative frequencies with which children hear the constructions in question.

In sum, the present study documents developmental fact that children find the SUBJ argument structure most difficult to process among the three arguments carried by the dative verb *bei2* “give”. The structural complexity of the verb and the input frequency of the full form of the verb-argument structure may interact in complex ways in the developmental process.

## **5.2 Explicitness of the direct object and indirect object argument structures**

In the present study, target constructions were manipulated such that the DO and IO arguments may be unexpressed. They are also known as null or implicit arguments. Children had to interpret the referent of unexpressed argument which did not appear in the constructions from the immediate context as well as from the previous conversational discourse provided during task explanation.

It was found that children who were achievers for the target constructions in the experiment, that is, those who were able to process the SUBJ argument, had no difficulty to do the interpretation. They were able to make inferences for the unexpressed information during immediate comprehension.

However, for the non-achievers, that is, those who failed to process the SUBJ argument structure accurately, they showed different responses to explicitly and implicitly expressed information under different linguistic environment in the constructions.

As reported in Chapter Four, in a majority of cases non-achievers acted to be the agent of action themselves for transferring the DO of theme to the IO of recipient. It was found that children were able to pick out the DO of theme for transferring, no matter it was overtly expressed or not. In type VI (SUBJ-*bei2*), type VII (SUBJ-*bei2*-IO), and type VIII (IO-SUBJ-*bei2*) constructions in which the DO was unexpressed, all children were able to pick out the entity for transferring from the context although it had not been mentioned. As there was only one inanimate thing present in the immediate context, children would choose that thing as the referent of theme for transferring. It seemed that the referent of theme was highly predictable from the context.

However, it was found that children's interpretation of correct IO of recipient was a bit more complicated. It concerned not only the explicit expression of IO per se, but also the expression of the SUBJ and the DO as well. Comparing the following target constructions for the expression of argument structure and children's performance on correct interpretation of IO in Table 7:<sup>11</sup>

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<sup>11</sup> Constructions with displacement of IO were not included. Also 7-year-olds were not included because their error pattern was different from the other age groups as discussed in Chapter Four.

Structure	Expression			Age Groups			
	SUBJ	DO	IO	3	4	5	6
<b>SUBJ-<i>bei2</i></b>	✓	✗	✗	0%	0%	0%	40%
<b>SUBJ-<i>bei2</i>-IO</b>	✓	✗	✓	30%	66.7%	66.7%	60%
<b>SUBJ-<i>bei2</i>-DO</b>	✓	✓	✗	10%	50%	66.7%	40%
<b>DO-SUBJ-<i>bei2</i></b>	✓	✓	✗	0%	66.7%	66.7%	40%
<b>SUBJ-<i>bei2</i>-DO-IO</b>	✓	✓	✓	10%	83.3%	66.7%	80%
<b>SUBJ-<i>bei2</i>-IO-DO</b>	✓	✓	✓	40%	83.3%	100%	80%
<b>DO-SUBJ-<i>bei2</i>-IO</b>	✓	✓	✓	20%	66.7%	83.3%	80%
<b>SUBJ-DO-<i>bei2</i>-IO</b>	✓	✓	✓	20%	83.3%	83.3%	80%

✓ = Expressed ✗ = Unexpressed

**Table 7: Expression of argument structures and children's correct interpretation of IO**

In a majority of cases, non-achievers acted to the SUBJ of agent themselves and chose an IO of recipient for receiving the DO of theme. In interpreting the IO from the context, their performance was affected by the interaction between the expression of all the three argument structures. As we can see from Table 7, children achieved the lowest score for correct IO interpretation in **SUBJ-*bei2*** construction. In this construction, the IO was unexpressed while the SUBJ was expressed. Children thus had higher tendency to choose the overtly expressed SUBJ to be the IO of recipient. In **SUBJ-*bei2*-IO** construction, both the SUBJ and IO were expressed. It was found children could make use of the saliency of IO information given to interpret the IO of recipient at a high percentage of accuracy despite that the SUBJ was also overtly expressed. This may imply that children had quite intact linguistic knowledge that NP followed the dative verb was the IO of recipient. In contrast, considering both the

**SUBJ-*bei2*-DO** and **DO-SUBJ-*bei2*** constructions in which the SUBJ was expressed while the IO was unexpressed, children achieved lower score as compared to **SUBJ-*bei2*-IO** construction, especially in 3-year-olds and 6-year-olds. As IO information was not saliently given but from the previous conversational discourse only during task explanation, as well as the SUBJ was overtly expressed, children were less able to interpret the IO of recipient correctly. For the remaining constructions in which all the argument structures were overtly expressed, children were achieved the highest scores in correct IO interpretation, except for 3-year-olds. This may suggest that the overt expression of argument structures (the IO of recipient in particular), provides a facilitating effect on children's interpretation of referents.

### **5.3 Relative position of the direct object and indirect object argument structures**

The manipulation of target *bei2*-dative construction also involved displacement of the DO and the IO. As reported in Chapter Four, displacement of DO of theme produced no effect on children's comprehension, no matter it was postposed to the right followed the IO, preposed to the left preceded the dative verb, or topicalized to the front at sentence initial position. Also, this was applicable to *bei2*-dative construction with both empty and overt SUBJ argument structure, as well as to both achievers and non-achievers in SUBJ argument processing. The above discussion on the explicit and implicit expression of DO mentioned that the DO of theme possessed high predicative value for sentence meaning interpretation. By the same token, children's performance on comprehension was not affected by the relative position of the DO as it could be interpreted easily from the immediate context.

There were two types of constructions children found them strikingly difficult. They were constructions with overt SUBJ argument and displacement of IO (DAT-III and DAT-IV in 4.4). It was found that just a few achievers in SUBJ argument processing in constructions with overt SUBJ argument and displacement of DO (DAT-II) could comprehend DAT-III and DAT-IV correctly.

In these two types of constructions, the IO of recipient was topicalized in front of the SUBJ of agent with both the NPs preceded the dative verb. These constructions violated the canonical syntactic-semantic relationship in which the first NP was the agent and the second NP was the recipient or patient of action. For achievers who demonstrated the capability to process both the SUBJ and IO of animate nouns showed participant role reversals. In other words, they interpreted the first NP as the SUBJ of agent and the second NP as the IO of recipient, using the-order-of mentioned sequence in assigning agent and recipient role.

It was worth noted achievers at age 4 showed a somewhat different pattern when the DO was unexpressed in **IO-SUBJ-bei2** construction. Upon hearing sentence construction which violating their canonical syntactic and semantic realizations, 4-year-olds failed to assign participant roles to the two mentioned NPs. Instead, they simply related the two NPs to the DO of theme without obvious “who gives what to whom” relationship. However, when the DO became expressed in **IO-SUBJ-bei2-DO** construction, they were able to assign participant roles although with reversals. This finding was coherent with the discussion in 5.2 above in that the overt expression of argument structures facilitated children’s interpretation of referents.

Here come to the performance for non-achievers. When processing constructions with topicalized IO that violating the canonical order of SUBJ-IO as agent-recipient pattern, children acted to be the agent of action themselves for the transfer event. In interpreting the IO of recipient in this conflicting linguistic environment, non-achievers showed no preference in assigning which NP to be the recipient but in a random pattern.

## **5.4 Children's use of comprehension strategies**

Comprehension strategies are short cuts or heuristics used by a listener in the absence of full comprehension (Chapman, 1978; Golinkoff & Hirsh-Pasek, 1995). According to the authors, one of the earliest strategies used by very young children is "attend-to-the-object-mentioned" where they point to or grasp the object mention. This strategy is followed developmentally by strategies such as "child-as-agent" and "do-what-you usually-do" where children either act on the objects themselves or do what they have done before. Around 30-36 months, children begin shifting away from these highly perceptually grounded strategies and start to rely on their knowledge of conventional object uses and relations to comprehend sentences. As their world knowledge increases, children begin choosing the most probable location or action in their interpretation of sentences which is known as "the probable event strategy". By 3-4 years of age, we see evidence of children's emerging awareness that word-order cues are a critical defining feature of syntax. When word-order strategies first emerge, children initially rely exclusively on the most probable word-cue --- "first-noun-as-agent" --- consistently picking the first noun as the agent regardless of

other syntactic cues (the canonical NV V NP = agent action theme order). At older ages, children are developing better linguistic knowledge for comprehension of other syntactic constructions.

Results of the present study revealed that comprehension of the full three-argument structure in *bei2*-dative construction was not completed before the age of 8, with the difficulty lied solely on the processing of the SUBJ argument structure. In the absence of full linguistic knowledge, it was clear that children employed the “self-as-agent strategy” for arriving at a sentence meaning without full marshalling of the information in the sentence. As they failed to process the SUBJ of the sentence, children acted to be the agent themselves for performing the action. The correct interpretation of DO of theme despite the implicitness in expression and displacement at different position was also suggestive of the use of the “probable event strategy” by transferring an inanimate thing to an animate recipient.

The findings of the present study also suggest the use of “word-order strategy” for decoding sentence meaning. After using “child-as-agent” strategy, children had to look for an IO as the recipient. As suggested by O’Grady (1997), children use the “Extended canonical sentence strategy” in the case of the ditransitive patterns in which the verb takes three arguments. Such strategy is described as: NV V NP...NP= agent action theme goal, in which the first postverbal NP is associated with the theme role and the second postverbal NP is linked to the goal/recipient role. By ignoring the first mentioned NP, children searched for the second mentioned animate NP (animacy cue may also be utilized in this case) appeared after the dative verb to be the IO of recipient (i.e. the *bei2*-IO sequence).

Implicit expression of IO, as discussed in 5.2, decreased the likelihood that children could rely on this word order cue, thus decreasing the correct interpretation of IO. Discussion in 5.3 on the effect of relative position of IO further showed that children at age 4 and above relied heavily on the word order of NPs for the interpretation of SUBJ and IO arguments.

The findings in this study were consistent with a number of other studies suggesting that only after 4 years of age do children draw consistently on syntactic information to assign participant roles whereas 3 year olds apply non-linguistic strategies in comprehension (e.g., Bridges, 1980; Bridges, Sinha, & Walkerdine, 1981; Strohner & Nelson, 1974).

## Chapter Six: Conclusion

The verb and its arguments occupy a central role in all modern theories of linguistic structure, including theories focusing on syntax as well as theories focusing on semantics. Verb-argument structure has received much attention in the last several decades in child language literature and important findings have been derived at. Cantonese acquisition research on verb-argument structure has been so limited. The present study was conducted to add to the body of knowledge on this area. The major finding in this comprehension study was that children were able to fully master all the three argument structures in *bei2*-dative construction only at the age of 8. For constructions with the dative verb carried only two argument structures (the direct object and indirect object) by having children themselves to be the subject of agent, even 3-year-olds achieved near perfect scores. What makes the processing of the subject argument other than self for doing the transfer of things that difficult such that it takes years to develop?

Results in the follow-up experiment and research findings studying development of play skills suggested that children at age 3 have the necessary symbolic play skills to use another animate thing to act out actions. It is then suspected that the complexity of verb-argument structure may be the factor to account for the processing difficulty. The complexity of verb-argument structure is an area which deserves further investigations. Studying the complexity of verb-argument structure can provide useful insights on information processing capacity from a cognitive-linguistic perspective and hierarchy relationship within construction from a structural grammar perspective.

This can also provide valuable information about children who are having difficulty with language acquisition and for therapeutic purposes.

Future research may also look for differences that may exist in processing verbs that take different number of argument structures. Also, production data inspecting the number-and-position aspect of verb-argument structure in Cantonese verbs are also valuable to shed light on children's acquisition of verb-argument structure in the production aspect. From the usage-based view, a detailed analysis of child-directed speech given by adults may yield important insights into input factors that may determine children's acquisition of verb-argument argument. Children with delayed or disordered language development may also be examined to look for any performance difference.

Considerably much research is still needed to better understand the acquisition of verb-argument structure in children.

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## Appendix I: Age Groups

Age Group	Subject Number	Age Range	Mean Age
3-year olds	10 (5 males & 5 females)	2;9-3;2	3;1
4-year olds	10 (5 males & 5 females)	3;9-4;3	3;11
5-year olds	10 (5 males & 5 females)	4;9-5;2	5;0
6-year olds	10 (5 males & 5 females)	5;9-6;1	6;0
7-year olds	10 (5 males & 5 females)	6;9-7;2	6;11
8-year olds	10 (5 males & 5 females)	7;10-8;2	8;0

## Appendix II: Examples of Sentence Types






Type	Structure	Example
I	<i>bei2-IO</i>	bei2    gau2    gau2 give    dog “gives to the dog”
II	<i>bei2-DO</i>	bei2    syut3    gou1 give    ice-cream “gives the ice-cream”
III	<i>bei2-DO-IO</i>	bei2    syut3    gou1    coeng4    geng2    luk2 give    ice-cream                  giraffe “gives the ice-cream to the giraffe”
IV	<i>bei2-IO-DO</i>	bei2    maau1    maau1    ping4    gwo2 give        cat                  apple “gives the cat the apple”
V	<i>DO-bei2-IO</i>	ping4    gwo2    bei2    gau2    gau2 apple    give    dog “the apple gives to the dog”
VI	<i>SUBJ-bei2</i>	wu1    gwai1    bei2 tortoise    give “the tortoise gives”
VII	<i>SUBJ-bei2-IO</i>	daai6    zoeng6    bei2    gai1    gai1 elephant    give    rooster “the elephant gives to the rooster”


VIII	IO-SUBJ- <i>bei2</i>	gai1 gai1 maau1 maau1 bei2 rooster cat give “the rooster the cat gives”
IX	SUBJ- <i>bei2</i> -DO	daai6 zoeng6 bei2 hoeng1 coeng2 elephant give sausage “the elephant gives the sausage”
<b>Type</b>	<b>Structure</b>	<b>Example</b>
X	DO-SUBJ- <i>bei2</i>	coi3 coi3 wu1 gwai1 bei2 vegetable tortoise give “the vegetable the tortoise gives”
XI	SUBJ- <i>bei2</i> -DO-IO	daai6 zoeng6 bei2 hoeng1 coeng2 gai1 gai1 elephant give sausage rooster “the elephant gives the sausage to the rooster”
XII	SUBJ- <i>bei2</i> -IO-DO	maau1 maau1 bei2 maa5 lau1 syut3 gou1 cat give monkey ice-cream “the cat gives the monkey the ice-cream”
XIII	DO-SUBJ- <i>bei2</i> -IO	hoeng1 coeng2 zyu1 zyu1 bei2 coeng4 geng2 luk2 sausage pig give giraffe “the sausage the pig gives to the giraffe”


XIV	SUBJ-DO- <i>bei2</i> -IO	maau1maau1 syut3 gou1 bei2 gai1 gai1 cat ice-cream give rooster “the cat the ice-cream gives to the rooster”
XV	IO-SUBJ- <i>bei2</i> -DO	coeng4 geng2 luk2 daai6 zoeng6 bei2 hoeng1 coeng2 giraffe elephant give sausage “the giraffe the elephant gives the sausage”

## Appendix III: Materials

Experimental set-up	Task explanation
 <p style="text-align: center;"><b>Type I: <i>bei2-IO</i></b></p>	<p style="text-align: center;">呢度有個蘋果, 小動物想食呢個蘋果, 你聽吓畀邊個</p> <p>Here is an apple. The animals want to eat the apple. Listen to “give to whom”...</p>
 <p style="text-align: center;"><b>Type II: <i>bei2-DO</i></b></p>	<p style="text-align: center;">呢度有四樣食物, 長頸鹿想食嘢, 你聽吓畀乜嘢</p> <p>Here are four types of food. The giraffe wants to eat the food. Listen to “give what”...</p>
 <p style="text-align: center;"><b>Type III: <i>bei2-DO-IO</i></b></p>	<p style="text-align: center;">呢度有四樣食物, 小動物想食嘢, 你聽吓畀乜嘢邊個</p> <p>Here are four types of food. The animals want to eat the food. Listen to “give what to whom”...</p>
 <p style="text-align: center;"><b>Type IV: <i>bei2-IO-DO</i></b></p>	<p style="text-align: center;">呢度有四樣食物, 小動物想食嘢, 你聽吓畀乜嘢邊個</p> <p>Here are four types of food. The animals want to eat the food. Listen to “give what to whom”...</p>

 <p><b>Type V: DO-<i>bei2</i>-IO</b></p>	<p>呢度有四樣食物，小動物想食嘢， 你聽吓畀乜嘢邊個</p> <p>Here are four types of food. The animals want to eat the food. Listen to “give what to whom”...</p>
<p><b>Experimental set-up</b></p>	<p><b>Task explanation</b></p>
 <p><b>Type VI: SUBJ-<i>bei2</i>-</b></p>	<p>呢度有條香腸，狗狗想食呢條香腸， 你聽吓邊個畀</p> <p>Here is a sausage. The dog wants to eat the sausage. Listen to “who gives”...</p>
 <p><b>Type VII: SUBJ-<i>bei2</i>-IO</b></p>	<p>呢度有杯雪糕，小動物想食呢杯雪糕， 你聽吓邊個畀邊個</p> <p>Here is an ice-cream. The animals want to eat the ice-cream. Listen to “who gives to whom”...</p>
 <p><b>Type VIII: IO-SUBJ-<i>bei2</i></b></p>	<p>呢度有個蘋果，小動物想食呢個蘋果， 你聽吓邊個畀邊個</p> <p>Here is an apple. The animals want to eat the apple. Listen to “who gives to whom”...</p>
 <p><b>Type IX: SUBJ-<i>bei2</i>-DO</b></p>	<p>呢度有四樣食物，雞雞想食嘢， 你聽吓邊個畀乜嘢</p> <p>Here are four types of food. The rooster wants to eat the food. Listen to “who gives what”...</p>

 <p><b>Type IX: DO-SUBJ-<i>bei2</i></b></p>	<p>呢度有四樣食物，馬騮想食嘢， 你聽吓邊個畀乜嘢</p> <p>Here are four types of food. The monkey wants to eat the food. Listen to “who gives what”...</p>
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Experimental set-up	Task explanation
 <p><b>Type XI: SUBJ-<i>bei2</i>-DO-IO</b>  <b>Type XII : SUBJ-<i>bei2</i>- IO-DO</b>  <b>Type XIII: DO-SUBJ-<i>bei2</i>- IO</b>  <b>Type XIV: SUBJ-DO-<i>bei2</i>- IO</b>  <b>Type XV: IO-SUBJ-<i>bei2</i>-DO</b></p>	<p>呢度有四樣食物，小動物想食嘢， 你聽吓邊個畀乜嘢邊個</p> <p>Here are four types of food. The animals want to eat the food. Listen to “who gives what to whom”...</p>

## Appendix IV: Assessment Form

Subject No : \_\_\_\_\_

Date of Birth : \_\_\_\_\_

Sex/Age : \_\_\_\_\_

Date of Ax : \_- \_\_\_\_\_

Type	Structure	Sentences	Child's Response
I	<i>bei2-IO</i>	1. 俾狗狗	
		2. 俾雞雞	
		3. 俾長頸鹿	
II	<i>bei2-DO</i>	1. 俾雪糕	
		2. 俾香腸	
		3. 俾蘋果	
III	<i>bei2-DO-IO</i>	1. 俾雪糕長頸鹿	
		2. 俾香腸雞雞	
		3. 俾菜菜馬騮	
IV	<i>bei2-IO-DO</i>	1. 俾貓貓蘋果	
		2. 俾烏龜香腸	
		3. 俾豬豬菜菜	
V	<i>DO-bei2-IO</i>	1. 蘋果俾狗狗	
		2. 雪糕俾雞雞	
		3. 香腸俾長頸鹿	
VI	<i>SUBJ-bei2</i>	1. 烏龜俾	
		2. 大象俾	
		3. 貓貓俾	

VII	SUBJ- <i>bei2</i> -IO	1. 大象俾雞雞	
		2. 長頸鹿俾豬豬	
		3. 狗狗俾烏龜	

Type.	Structure	Sentences	Child's Response
VIII	IO-SUBJ- <i>bei2</i>	1. 雞雞貓貓俾	
		2. 狗狗大象俾	
		3. 豬豬長頸鹿俾	
IX	SUBJ- <i>bei2</i> -DO	1. 大象俾香腸	
		2. 烏龜俾菜菜	
		3. 貓貓俾雪糕	
X	DO-SUBJ- <i>bei2</i>	1. 菜菜烏龜俾	
		2. 香腸豬豬俾	
		3. 蘋果大象俾	
XI	SUBJ- <i>bei2</i> -DO-IO	1. 大象俾香腸雞雞	
		2. 馬騮俾蘋果狗狗	
		3. 貓貓俾雪糕烏龜	
XII	SUBJ- <i>bei2</i> -IO-DO	1. 貓貓俾馬騮雪糕	
		2. 大象俾豬豬蘋果	
		3. 長頸鹿俾烏龜香腸	
XIII	DO-SUBJ- <i>bei2</i> -IO	1. 香腸豬豬俾長頸鹿	
		2. 雪糕大象俾豬豬	
		3. 菜菜狗狗俾雞雞	
XIV	SUBJ-DO- <i>bei2</i> -IO	1. 貓貓雪糕俾雞雞	
		2. 馬騮菜菜俾狗狗	

		3. 雞雞香腸俾烏龜	
<b>XV</b>	<b>IO-SUBJ-<i>bei2</i>-DO</b>	1. 長頸鹿大象俾香腸	
		2. 貓貓馬騮俾蘋果	
		3. 狗狗雞雞俾雪糕	

## Appendix V: Follow-up experiment

Token	Instructions
1	daai6 zoeng6 mo2 gai1 gai1 elephant touch rooster “the elephant touches the rooster”
2	maa5 lau1 mo2 zyu1 zyu1 monkey touch pig “the monkey touches the pig”
3	maau1maau1 mo2 coeng4 geng2 luk2 cat touch giraffe “the cat touches the giraffe”