ACQUISITION OF POLARITY-SENSITIVE ITEMS IN MANDARIN CHINESE

BY

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THESIS ABSTRACT

In Mandarin Chinese *wh*-pronouns such as *shenme* 'what' and *shei* 'who' are widely interpreted as negative polarity items, due to the similarity in distribution and interpretation between *wh*-pronouns and the polarity sensitive item *any* in English. Against this general theoretical background, this thesis contends that *wh*-pronouns in Mandarin Chinese are not homogeneous. I illustrate this by examining the interpretation of two *wh*-pronouns, namely, *shenme* 'what' and *ji-ge* 'how many-classifier'. I particularly focus on the interpretation of these two *wh*-pronouns in simple negative statements. While negated *shenme* sentences receive both a 'none' reading and an 'insignificance' reading, negated *ji-ge* sentences receive a 'small-amount' reading. Both cases depart from negative statements containing *renhe* (which is the Chinese equivalent of English *any*); negated *renhe* sentences can only be assigned the 'none' reading. Various semantic and pragmatic factors contribute the interpretation of *renhe*, *shenme* and *ji-ge* in negative statements, and these theoretical issues have implications for child language development. In a series of controlled experiments, I investigated Mandarin-speaking children's comprehension of (i) sentences containing negative polarity item *renhe*; (ii) sentences containing free choice *renhe*; (iii) negated *renhe* sentences versus negated *shenme* sentences; (iv) negated *ji-ge* sentences. The general findings are that while the relevant pragmatic knowledge as related to the interpretation of these polarity items are delayed in Mandarin-speaking children, their semantic knowledge of these polarity items are in place early in the course of language development. This study offers new data on the acquisition of polarity sensitive items, and sheds new light on the linguistic theory of *wh*-pronouns in Mandarin Chinese.

DECLARATION

I certify that the work in this thesis entitled "**Acquisition of polarity-sensitive items in Mandarin Chinese**" has not previously been submitted for a degree nor has it been submitted as part of requirements for a degree to any other university or institution other than Macquarie University. I also certify that the thesis is an original piece of research and it has been written by me. Any help and assistance that I have received in my research work and the preparation of the thesis itself have been appropriately acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis. The research presented in this thesis was approved by Macquarie University Ethics Review Committee, reference number: HE26JUN2009-D06638HS on 26 June, 2009.

Some of the material in this thesis has already been accepted for publication or has been submitted for publication. Chapter 2 is based on the paper as in (1). Chapter 3 is based on the paper as in (2). Chapter 4 is based on the paper as in (3). Chapter 5 is based on the paper as in (4).

(1) Huang, Aijun, and Stephen Crain (In press). Acquisition of the polarity sensitive item *renhe* 'any' in Mandarin Chinese. *Journal of Child Language*.

(2) Huang, Aijun. (2013). Insignificance is significant: Interpretation of *wh*-pronoun *shenme* 'what' in Mandarin Chinese. *Language and Linguistics* 14.1: 1-45.

(3). Huang, Aijun, and Stephen Crain (Submitted). Acquisition of polarity sensitive expressions in Mandarin Chinese. *Language Acquisition*.

(4). Huang, Aijun, and Stephen Crain (Submitted). Acquisition of the numerical *wh*-pronoun *ji* 'how many' in Mandarin Chinese. *Lingua*.

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CHAPTER 1

Introduction

In the last decade, the class of linguistic expressions termed polarity sensitive items has generated vigorous debate in the linguistic literature. From a theoretical perspective, a polarity sensitive item is a lexical item that is restricted to certain kind of "licensing" linguistic contexts or environments. One well-known example of a polarity sensitive item is the word *any* in English. *Any* cannot freely occur in simple affirmative statements, as shown by the sentence in (1). The asterisk indicates ungrammaticality, following the convention in the linguistic literature.

(1) * I have any apples.

Rather, the lexical item *any* has to be licensed in particular linguistic contexts. There are two classes of linguistic contexts in which *any* is licensed. On the one hand, *any* is licensed in 'affective' contexts, such as negation, *yes-no* questions, the antecedent of conditions, the restriction of universal quantifiers (e.g., Klima 1964; Baker 1970; Ladusaw 1980; Giannakidou 1998). These linguistic contexts more or less suggest some 'negative' flavor. Accordingly, *any* licensed in affective contexts is termed a negative polarity item (NPI) (Baker 1970). The NPI *any* receives an existential reading. (2) is a representative example of NPI *any*.

(2) I don't have any apples.

On the other hand, *any* can be used as what is known as a 'free choice' (FC) item. FC *any* is licensed in generic or intentional contexts, such as imperatives and modals (e.g., *may*, *can*, *will*). This is illustrated in (3). FC *any* can be assigned a universal reading, as in (3a), or an existential reading, as in (3b).

(3) a. Any staff can help you.
    b. Press any key.

Polarity sensitive items are very common, and seem to exist in virtually every language across the world (Haspelmath 1997). In Mandarin Chinese, first of all, we have the counterpart of English *any*, which is *renhe*. Like *any*, *renhe* is prohibited in simple affirmative statements, as shown in (4). Moreover, *renhe* can be used as a NPI (5) or as a

FC item (6). While NPI *renhe* is assigned an existential reading, FC *renhe* can be assigned a universal reading (6a) and an existential reading (6b).

(4) **Zhangsan kanjian le   renhe ren*
     Zhangsan see   Asp any   person
     'Zhagnsan saw anyone.'

(5) *Zhangsan mei kanjian renhe ren*
    Zhangsan Neg see   any person
    'Zhangsan did not see anyone.'

(6) a. *Zhangsan neng   pa   shang renhe yi ke shu*
      Zhangsan can   climb up   any   one CL tree
      'Zhangsan can climb up any one of the trees.'

   b. *Qing   gei wo renhe yi zhang pai*
    please give me any one CL card
    'Please give me any one of the cards.'

As illustrated, Chinese *renhe* behaves exactly like English *any* in its interpretation and distribution. However, unlike *any*, *renhe* is generally restricted in the formal register of Mandarin. It is infrequent in spoken Chinese (Zhang 2010). This brings us to a typological feature of Mandarin Chinese. That is, in addition to *renhe*, *wh*-pronouns such as *shenme* 'what' and *shei* 'who' in Mandarin Chinese appear to function as polarity sensitive items. As first proposed by Huang (1982), non-interrogative *wh*-pronouns are licensed in typical NPI-licensing contexts such as negation, *yes-no* questions, and the antecedent of a conditional. For instance, when *shenme* appears in the antecedent of a conditional, as shown in (7), it receives a meaning equivalent to English *some/any*. This similarity in distribution and interpretation between Chinese *wh*-pronouns and English *any* has therefore led Huang and a number of other Chinese linguists to analyze *wh*-pronouns as (negative) polarity items[1] (Li 1992; Cheng 1991, 1994; Lin 1996, 1998; Hsin 1999).

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[1] Different names have been given to characterize the polarity sensitivity properties of *wh*-pronouns in Mandarin Chinese. The name list includes "negative polarity item" (Huang 1982), "existential polarity *wh*-phrases" (Lin 1996, 1998), or simply "polarity items" (Cheng 1991; 1994).

(7) *Ruguo Zhangsan mai le   shenme shu, qing   gaoshu wo*

　　if   Zhangsan buy Asp what book   please tell   me

　　'If Zhangsan buys some/any book(s), please let me know.'

　　　This thesis investigates the interpretation and acquisition of polarity sensitive items in Mandarin Chinese. We focus on three polarity sensitive items, including *renhe* 'any', *shenme* 'what' and *ji-ge* 'how-many-classifier'. In particular, we examine the interpretation of these three polarity sensitive items in simple negative statements. Importantly, these three polarity sensitive items receive distinct interpretations in this linguistic context. Consider the examples in (8)-(10):

(8) a. *Zhangsan mei chi renhe pingguo*

　　　Zhangsan Neg eat any apple

　　　'Zhangsan did not eat any apples'

　　b. * *Ta zhi   chi le   yi   ge   lv   pingguo*

　　　　he only eat Asp one CL green apple

　　　　'He only ate a green apple'

(9) a. *Zhangsan mei chi shenme pingguo*

　　　Zhangsan Neg eat what apple

　　　(i) 'Zhangsan did not eat any apples.'

　　　(ii) 'Zhangsan hardly ate any apples.'

　　b. *Ta zhi   chi le   yi   ge   lv pingguo*

　　　　he only eat Asp one CL green apple

　　　　'He only ate a green apple'

(10) a. *Zhangsan mei chi ji   ge pingguo*

　　　　Zhangsan Neg eat how-many CL apple

　　　　'Zhangsan did not eat many apples.'

　　b. *Ta zhi   chi le   yi   ge   lv   pingguo*

　　　　he only eat Asp one CL green apple

'He only ate a green apple'

The negative sentence with *renhe* in (8a) is interpreted as 'Zhangsan did not eat any apples', so this sentence receives the 'none' reading. Clearly, this 'none' reading is in conflict with a focus clause such as (8b), which spells out the existence of some entity (i.e., he ate a green apple). By contrast, a negative sentence with *shenme*, as in (9a), is ambiguous with two readings. One is the 'none' reading, as glossed in (9a-i). This reading is on a par with the 'none' reading in negated *renhe* sentence in (8a). On the other hand, (9a) can be given the interpretation 'John hardly ate any apples', as shown in (9a-ii). We call this second reading the 'insignificance' reading. On this reading, (9a) is compatible with the focus clause in (9b). Finally, a negative statement containing the *wh*-pronoun *ji* 'how many', as shown in (10a), receives the 'small amount' reading. Obviously, this reading is compatible with the focus cause in (10b). Notice that the 'none' reading is absent in the *ji-ge* sentence in (10a).

In the current theoretical literature on the syntax and semantics of Chinese *wh*-pronouns, it remains unclear how the insignificance reading arises in negated *shenme* sentences and how the 'small-amount' reading arises in negated *ji-ge* sentences. Moreover, Chinese linguists have recently tended to equate negative statements with *shenme* with negative statements with *renhe*, assigning the 'none' reading as the sole reading to these two linguistic structures. The insignificance reading of negated *shenme* sentences is thus generally glossed over in recent literature, even though this reading is common in daily conversation, and is widely acknowledged in traditional Chinese grammar (Li 1924; Wang 1943; Ding et al 1961; Chao 1968; Zhu 1982; Lü 1985). The insignificance reading is probably disregarded due to the fact that *wh*-pronouns in Mandarin Chinese are generally analysed as (negative) polarity items.

In this thesis, we will contend that both the insignificance reading of negated *shenme* sentences and the 'small-amount' reading of negated *ji-ge* sentences are important for theory of Chinese polarity sensitive items. These two readings address some peculiar linguistic properties of *shenme* and *ji-ge*, as distinguished from the linguistic properties of *renhe*. Taking into account the considerations above, we will examine the basic semantics of *shenme* and *ji-ge*, and offer an analysis on the derivation of these two readings. This constitutes the main theoretical component of this thesis.

From the perspective of child language development, it is worthwhile to investigate how Mandarin-speaking children acquire the three polarity items *renhe*, *shenme* and *ji-ge*.

Consider *renhe* first. As noted earlier, Chinese speakers do not produce *renhe* often in spoken language. As an alternative, they can use *wh*-pronouns to express meanings that are equivalent to English *any*. The robustness of *wh*-pronouns is also observed in child language. Mandarin children are found to start using non-interrogative *wh*-pronouns as polarity items as early as 2 years old (Li and Tang 1991; Fan 2012). In view of the paucity of *renhe* in language input and the early acquisition of *wh*-pronouns, it is of interest to find out whether Mandarin-speaking children understand *renhe* early in the course of language development. The experimental study on *renhe* is also motivated by cross-linguistic findings on the acquisition of polarity sensitive items, particularly on the acquisition of *any* in English. Young English-speaking children are reported to have a good command of the linguistic properties of *any*. Specifically, English-speaking children are found to be sensitive to the licensing conditions of *any* (O'Leary 1994; O'Leary and Crain 1994; Song 2003; Tieu 2010a, b), and they also exhibit adult-like understanding of interaction between *any* and its licensing operator (e.g., negation) (Thornton 1995). These findings invite some scholars to hypothesize that some innate mechanism is available guiding English-speaking children to use *any* the same way as adults do (O'Leary 1994; O'Leary and Crain 1994). Presumably, if some innate mechanism is responsible for the acquisition of English *any*, a similar acquisition mechanism should be equally operative in the acquisition of *renhe*. To test our experimental hypothesis, we examined Mandarin-speaking children's comprehension of both NPI *renhe* and FC *renhe*. This constitutes the first empirical objective in this thesis.

As a second goal, we were interested to know how Mandarin-speaking children comprehend negated *shenme* sentences, as compared to their comprehension of negated *renhe* sentences. Would they be able to distinguish the subtle differences in meaning between these two sentence structures, allowing the insignificance reading for the *shenme* sentences but not for the *renhe* sentences? Put differently, how would the insignificance reading and the 'none' reading of negated *shenme* sentences be acquired? There are a number of possible scenarios. One possibility is that both readings are acquired in tandem in the initial stage of language development. Another possibility is that one reading takes precedence over the other one. In this case, we might ask why that particular sequential ordering of the alternative readings occurs. And since the insignificance reading has not previously been investigated, it will be useful to establish the exact age that Mandarin-speaking children obtain the insignificance reading.

Proceeding to the acquisition of *ji-ge*, we can ask how and when Mandarin-speaking children acquire the 'small-amount' reading of negated *ji-ge* sentences. In the adult grammar the 'none' reading is absent in this linguistic structure. Would Mandarin children exhibit the adult-like interpretation of *ji-ge* in this structure? If not, what is the possible developmental pattern? Furthermore, there may be some link between the acquisition of the 'small-amount' reading of negated *ji-ge* sentences and the acquisition of the insignificance reading of negated *shenme* sentences. Both readings suggest a sense of insignificance in quantity. On the other hand, however, the 'none' reading is not possible for negated *ji-ge* sentences, as noted above. So the question is how Mandarin children deal with these two distinct *wh*-pronouns, which convey distinct but somehow related readings when they appear in simple negative statements. Will they display a similar or distinct developmental pattern for these two linguistic structures?

To wrap up, this thesis consists of two main components. Firstly, in the theoretical component, we examine the semantics of the *wh*-pronouns *shenme* and *ji-ge*, as distinguished from that of the polarity item *renhe*. Based on the semantic analysis of *shenme* and *ji-ge*, we will attempt to provide a theoretical account of how the insignificance reading arises in negated *shenme* sentences and how the 'small-amount' reading arises in negated *ji-ge* sentences. Secondly, in the acquisition component, we investigate whether Mandarin-speaking children understand NPI *renhe* and FC *renhe*, and how they comprehend *renhe*, *shenme* and *ji-ge* in simple negative statements. Four experiments will be reported to address these issues. Particularly in the cases of acquisition of negated *shenme* sentences and negated *ji-ge* sentences, we will show that child language can shed light on linguistic theory.

This thesis is organized as follows. In Chapter 2, we report two experiments investigating Mandarin-speaking children's mastery of the semantic meanings of *renhe*. In one experiment, *renhe* is embedded in sentences containing the ability modal word *neng* 'can'. In this case, *renhe* functions as a free choice item. In the second experiment, *renhe* is embedded in sentences containing the temporal conjunction *zai...zhiqian* 'before'. *Renhe* functions as a negative polarity item in this case. This experimental study will examine whether the various semantic meanings of *renhe* are in place early in Mandarin-speaking children, considering the complex linguistic properties of *renhe* and the paucity of positive evidence. Chapter 3 is devoted to the theoretical analysis of the insignificance reading as attested in simple negative statements with *shenme*. In this chapter, we examine various syntactic, semantic and pragmatic conditions that conspire to license the insignificance

reading. Chapter 4 investigates the acquisition of the insignificance reading. In this chapter, Mandarin children's comprehension of negated *shenme* sentences and negated *renhe* sentences is compared. The interpretations that Mandarin-speaking children assign are probed in order to test whether they can distinguish the subtle meaning difference between negative statements containing *shenme* and ones containing *renhe*, allowing the insignificance reading for the *shenme* sentences but not for the *renhe* sentences. Chapter 5 offers a semantic analysis of *ji-ge* and assesses this theoretical analysis by investigating Mandarin-speaking children's comprehension of *ji-ge* in simple negative statements. Chapter 6 concludes the thesis.

As a final note in this introduction, we would like to note that there are two main repetitions in this thesis. These repetitions are unavoidable, as the format of thesis by publication requires each chapter stands as a self-contained paper. One repetition concerns the description of research methodology. We adopted the same experimental method (i.e., the Truth Value Judgement Task (Crain and Thornton 1998)) for all the experiments in this thesis, so we have to give a full description of research methodology in each of relevant chapters. Second, Chapter 4 repeats the main theoretical issues proposed in Chapter 3 on the construction of the insignificance reading, to prepare for the discussion of the experimental study of this research topic.

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CHAPTER 2

Acquisition of the polarity sensitive item *renhe* 'any' in Mandarin Chinese

Abstract

The present study investigated Mandarin-speaking children's acquisition of the polarity sensitive item *renhe* 'any' in Mandarin Chinese. Like its English counterpart *any*, *renhe* can be used as a negative polarity item (NPI), or as a free choice (FC) item, and both the distribution and interpretation of *renhe* are governed by the same syntactic and semantic constraints as English *any*. Using a Truth Value Judgement Task, the present study tested 5-year-old Mandarin-speaking children's comprehension of FC *renhe* in sentences containing the modal word *neng* 'can', and tested children's comprehension of NPI *renhe* in sentences containing the temporal conjunction *zai…zhiqian* 'before'. Most children demonstrated knowledge of the interpretation of both FC *renhe* and NPI *renhe* despite a paucity of relevant adult input. Like adults, however, Mandarin-speaking children do not use *renhe* frequently in ordinary conversation, due to the availability of alternative colloquial expressions (*wh*-pronouns) that also convey children's intended meanings.

Keywords: *Renhe*, Negative polarity items, Free choice items, Mandarin Chinese, Acquisition

1. INTRODUCTION

In English, the expression *any* is prohibited in simple positive sentences such as (1). By contrast, *any* is licensed in two linguistic contexts. First, *any* is licensed in downward entailing linguistic contexts, such as in negative statements, in the antecedent of conditionals, and in the restriction (roughly, the subject NP) of the universal quantifier (e.g., Baker, 1970; Giannakidou, 1998; Klima, 1964; Ladusaw, 1980). In these contexts, *any* is assigned an existential reading, and is referred to as a Negative Polarity Item (NPI). The use of *any* as an NPI is illustrated in (2).

(1) *John ate any apples.

(2) John did not eat any apples.

The expression *any* can also be used as a Free Choice item. Free Choice *any* is licensed in generic or intentional contexts, such as in sentences with imperatives and modals (e.g., *may*, *can*, *will*), as illustrated in (3). Free Choice *any* can either be assigned a universal reading, as in (3a), or an existential reading, as in (3b).

(3) a. Any clerk can help you.
    b. Press any key.

The distributional and interpretative properties of English *any* are typical of polarity sensitive items, and various syntactic, semantic and pragmatic principles have been postulated to account for these properties (e.g., Baker, 1970; Carlson, 1980, 1981; Chierchia, 2006; Davison, 1980; Fauconnier, 1975; Giannakidou, 1998, 2001; Horn, 2000, 2005; Kadmon & Landman, 1993; Klima, 1964; Krifka, 1995; Ladusaw, 1980; Vendler, 1967). Previous studies of the acquisition of English *any* have found that English-speaking children command both the distributional and interpretive properties of *any* by around age four (O'Leary, 1994; O'Leary & Crain, 1994; Song, 2003; Thornton, 1995). The findings on the acquisition of English *any* invite us to ask whether the acquisition of polarity sensitive items follows the same developmental path in historically unrelated languages, such as Mandarin Chinese.

Renhe is the Mandarin Chinese equivalent of English *any*. Like *any*, Mandarin *renhe* is prohibited in simple affirmative statements such as (4). Also like English *any*,

renhe can be used as a Negative Polarity Item (NPI), as in (5), and as a Free Choice (FC) item, as in (6). Moreover, when *renhe* is an NPI, it is assigned an existential reading, like English *any*, and when *renhe* is a FC item, it can be assigned both a universal reading, as in (6a), and an existential reading, as in (6b).

(4) **Zhangsan kanjian le   renhe ren*
    Zhangsan see   ASP any person
    'Zhagnsan saw anyone.'

(5)   *Zhangsan mei   kanjian renhe ren*
     Zhangsan Neg see   any person
    'Zhangsan did not see anyone.'

(6) a. *Zhangsan neng   pa   shang renhe yi ke shu*
     Zhangsan can   climb up   any   one CL tree
     'Zhangsan can climb up any one of the trees.'

   b. *Qing   gei wo renhe yi zhang pai*
     please give me any one CL card
     'Please give me any one of the cards.'

The present study investigated the acquisition of *renhe* by Mandarin-speaking children. There were two experiments. One examined children's comprehension of FC *renhe*, and the other examined children's comprehension of NPI *renhe*. The main finding was that Mandarin-speaking children exhibited adult-like command of *renhe* in both experiments, in keeping with the observation, based on previous research, that young English-speaking children demonstrate awareness of the linguistic properties of *any*.

The paper is organized as follows. First we introduce the basic linguistic properties of *renhe*. Then we provide a literature review on the acquisition of English *any*. Following the literature review, we report two experimental studies we designed to assess Mandarin-speaking children's comprehension of *renhe*. Experiment 1 examined children's interpretation of FC *renhe* in sentences with the modal verb *neng* 'can'. Experiment 2 examined children's interpretation of NPI *renhe* in the scope of the temporal conjunctive

zai...zhiqian 'before'. In the concluding section, we discuss why Mandarin-speaking children, like adults, do not often produce *renhe*.

2. LINGUISTIC PROPERTIES OF *RENHE*

Like English *any*, *renhe* in Mandarin Chinese is not tolerated in simple affirmative sentences (cf. (4)). Mandarin *renhe* is licensed in two linguistic contexts. First, as a Negative Polarity Item, *renhe* is licensed in downward entailing contexts (Ladusaw, 1980). Downward entailing contexts license inferences from general terms (e.g., *animal*) to specific terms (e.g., *monkey*). To illustrate, negation (e.g., *not*) is downward entailing. The statement *John did not see an animal* contains the general term *animal*, and we can replace this general term with a more specific term *monkey*, *salva veritate*. So, if the statement *John did not see an animal* is true, it follows that the statement *John did not see a monkey* is also true. Other downward entailing linguistic contexts include the antecedent of conditionals, negative predicates like *deny* and *prevent*, the temporal conjunction *zai...zhiqian* 'before', and many other linguistic constructions (See Hsiao, 2002; Kuo, 2003; Wang & Hsieh, 1996). Examples are given in (7).

(7) a. *Zhangsan mei   kanjian renhe ren*   Negation
      Zhangsan Neg see   any   person
    'Zhagnsan did not see anyone.'

   b. *Ruguo you renhe ren   qifu   ni,   qing   gaosu wo*   Antecedent of conditionals
      if   have any person bully you please   tell me
      'If anybody bullies you, please let me know.'

   c. *Ta fandui wo zuo renhe shiqing*   Negative predicates
      he prevent me do any   thing
       'He prevents me from doing anything.'

   d. *Xiaolaohu zai renhe xiao dongwu zhiqian pao dao le zhongdian*   *Before*
      Tigger   at any   little animal before run to ASP finish line
       'Tigger ran to the finish line before any of the other little animals.'

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As noted earlier, Mandarin *renhe* can also function as a Free Choice (FC) item. FC *renhe* is licensed in generic or intentional contexts, such as in sentences with modals and ones with imperatives. FC *renhe* receives an existential reading in (8), and it receives a universal reading in (9).

(8) *Qing   xuan renhe yi zhang   pai*
    please pick   any one CL   card
     'Please pick any card.'

(9) *Women yao   dadao renhe yi ge   diren*
     we   should beat   any   one CL enemy
      'We will defeat any enemy!'

The variation between NPI and FC meanings for Mandarin *renhe* shows that these meanings are evoked by properties of their licensors. In (10a), the licensing operator *neng* is an ability modal word. Consequently, *renhe* receives a universal reading. This sentence is false if there is even one big tree that Zhangsan cannot climb. By contrast, *renhe* is assigned an existential reading in (10b), where it is licensed by the permission modal word *neng*. The speaker of (10b) is asserting that Zhangsan is permitted to take any one of the apples, but he is not being given permission to take all of them (cf.Vendler, 1967).

(10) a. *Zhangsan neng   pashang renhe da shu*
        Zhangsan can   climb-up any big tree
        'Zhangsan can climb up any big tree.'

   b. *Zhangsan neng   nazou renhe pingguo*
      Zhangsan can   take   any apple
      'Zhangsan can take any apple.'

We have chosen to analyze English NPI *any* and Mandarin NPI *renhe* as existential quantifiers which are interpreted within the scope of their licensors (cf. Carlson, 1980; Chierchia, 2006; Ladusaw, 1980; Kadmon & Landman 1993). An alternative analysis was advanced by Quine (1960:138-140) (cf. Shimoyama 2011). The alternative is to analyze these expressions as universal quantifiers that obligatorily take scope over their licensors.

In our view, there are strong empirical arguments in favor of the existential account. First, the wide-scope universal account generates the incorrect interpretation of sentences like (11) (see Carlson, 1980). On the universal account, example (11) would mean that 'for every pet, Mary decided not to marry a man who has that pet.' However, if NPI *renhe* is interpreted as an existential quantifier under negation, then (11) receives the correct meaning, which can be paraphrased as 'Mary decided not to marry a man who has even a single pet.'

(11) *Mali jueding bu   jiagei chiyou renhe chongwu de nanren*

     Mary decide Neg marry have   any   pet   De man

     'Mary decided not to marry a man who has any pet.'

We will present just one further argument. The existential interpretation of NPI *renhe* is rendered explicit when it appears with negation in the antecedent of conditional statements, as illustrated in (12) and (13), which are instructions one frequently hears on airplanes. Both examples have the same meaning, regardless of the word order of *renhe* and negation (*bu*). They are instructions to passengers to inform the flight attendant if **anything/something** was not understood. These sentences are not instructions that are limited to people who failed to understand everything (i.e., EVERY > NOT). As (12) and (13) also indicate, *renhe* can be replaced by the existential *yixie* 'some' without a change in meaning. Because Mandarin *yixie* is a positive polarity item, like English *some*, it is not expected to be interchangeable with a universal quantifier, on the wide-scope universal account, contrary to the facts.

(12) *Ruguo ni bu mingbai   wo gei ni   jieshi   guo de renhe/yixie shiqing, qing gaosu*

    if   you Neg understand I to you explain Asp De any/some thing   please   tell

    wo

    me

    'If you do not understand anything/something I have explained to you, please tell me.'

(13) *Ruguo you renhe/ yixie wo gei ni jieshi guo dan ni bu   mingbai   de shiqing, qing*

    if   have any/some   I to you explain Asp but you Neg understand De thing, please

    gaosu wo

    tell   me

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'If there is anything/something I have explained to you that you do not understand, please tell me.'

2.1. Domain widening

In a seminal study, Kadmon and Landman (1993) argue that English *any* extends the domain of quantification that would otherwise be the denotation of the accompanying common noun used as a bare plural. Both NPI *any* and FC *any* are argued to invoke the domain widening effect. Let us consider NPI *any* first using example (14).

(14) a. I don't have potatoes.

 b. I don't have any potatoes.

Sentence (14a) is true even if I have a few rotten potatoes in my back yard. This is because in a context of utterance, the domain of quantification associated with the common noun (i.e., *potatoes*) includes typical potatoes (i.e., cooking potatoes), but leaves out atypical potatoes (e.g., rotten potatoes). However, when *any* is added, as in (14b), the sentence is no longer true if I have a few rotten potatoes. The denotation of *potatoes*, when combined with *any*, is extended to include both typical and atypical potatoes. This semantic function of *any* is known as 'domain widening'.

 A similar domain widening effect is manifested in the use of FC *any*, as illustrated in (15).

(15) a. An owl hunts mice.

 b. Any owl hunts mice.

Example (15a) is true even if there are some sick owls which do not hunt mice. These sick owls are legitimate exceptions to the indefinite *an owl* in (15a). By contrast, the use of *any* in (15b) extends the set of owls that count, so even sick owls are included as part of the widened domain of quantification in sentence (15b).

 Turning to *renhe* in Mandarin Chinese, *renhe* exhibits similar domain widening properties, both as an NPI and as a FC. Consider NPI *renhe* first, as in (16). Like the corresponding English sentences in (14), the use of NPI *renhe* in (16a) makes all kinds of

potatoes relevant in the domain of quantification. So if I have some rotten potatoes, (16a) but not (16b) can be taken as a true description of my situation.

(16) a. *Wo mei   you malingshu*

    I   NEG have potato

   'I don't have potatoes.'

   b. *Wo mei   you   renhe malingshu*

    I   NEG have any   potato

   'I don't have any potatoes.'

In a similar vein, FC *renhe* in (17b) widens the extension of the common noun *maotouying* 'owl', such that even sick owls are relevant to the rule that owls hunt mice. Such domain widening effect is absent in sentences containing plain common nouns such as *maotouying*, as in (17a).

(17) a. *Maotouying zhua laoshu*

    owl   hunt mouse

   'An owl hunts mice.'

   b. *Renhe maotouying dou zhua laoshu*

    any   owl   all hunt mouse

   'Any owl hunts mice.'

2.2 Freedom of choice

If I say to you (18) when I offer a basket of apples, you may ask the question in (19).

(18) Pick one apple.

(19) Which one?

By contrast, if I substitute FC *any* for *one* in (20), the question *Which one*? fails to make sense. This is because when I use FC *any*, this indicates that it doesn't matter which apple

is selected. When one uses FC *any*, the hearer has "unrestricted liberty of individual choice" (Vendler 1967, p.132).

(20) Pick any apple.

Another meaning associated with FC *any* is illustrated in (21) (from Jennings, 1994; cited in Horn, 2005). In this sentence, the continuation of *any* after a plain indefinite *a bicycle* does not give rise to a semantic redundancy; rather *any* strengthens the freedom of choice.

(21) I am looking for a bicycle, *any* bicycle that works.

This brings us to the universal reading associated with FC *any*. If I declare (22), I convey that, no matter which person you select from the domain of quantification, I can beat that person. This gives rise to a universal reading for (22) (Bolinger, 1960; Giannakidou, 2001; Horn, 2000, 2005; Tovena & Jayez, 1999; Vendler, 1967).

(22) I can beat any one of you.

Turning to Mandarin Chinese, the freedom of choice meaning is attested in sentences containing FC *renhe*. Like its English counterpart (20), (23) conveys the speaker's intention that the hearer can pick any apple that he fancies. Therefore, it would be redundant for (23) (*Pick any apple*) to be followed by the question (24b) (*Which one*?). By contrast, with the plain indefinite *yi ge pingguo* 'one-CL-apple', as in (24a), the freedom of choice meaning is missing, as verified by the fact that it is felicitous to follow (24a) with the question (24b).

(23) *Tiao renhe yi ge   pingguo*
       pick any   one CL apple
       'Pick any apple.'

(24) a. *Tiao yi   ge   pingguo*
        pick one CL apple
        'Pick one of the apples.'

b. *Na   yi   ge*?

   which one CL

   'Which one?'

To sum up, *renhe* in Mandarin Chinese can be used as a negative polarity item (NPI) and as a free choice item (FC), just like its English counterpart *any*. *Renhe* is restricted in distribution; its interpretation is dependent on its licensing operator. Both NPI *renhe* and FC *renhe* invoke domain-widening effects. Before we discuss the acquisition of Mandarin *renhe*, it will be useful to review the findings of previous research on the acquisition of English *any*.

3 THE ACQUISITION OF ENGLISH *ANY*

In the literature, it is reported that English-speaking children exhibit adult-like syntactic and semantic knowledge of NPI *any*. In an experimental study, O'Leary (1994) (see also O'Leary & Crain 1994) reports that four-to-five-year-old English-speaking children, like adults, did not produce NPI *any* in positive contexts; these children only allowed *any* in negative contexts. In particular, in a Truth Value Judgement task with an elicitation component, 11 children (age range: 4;4-5;4) were presented with two types of target sentences. These sentences, uttered by a puppet, were incorrect descriptions of stories acted out by one of the two experimenters. The first type of target sentences contained the NPI *anything* and the expected adult-like response was to use a positive polarity item (PPI) such as *something*; NPIs are not allowed in this situation. An example is given in (25a). By contrast, the other type of target sentences, as illustrated in (25b), contained the PPI *some/something*. In this case, an adult-like response would be to replace the PPI with an NPI.

(25) a. <u>Type 1</u>

      Story: Two of the Ninja turtles did not get any toy from Santa, but the third one got a ball from Santa.

      Puppet: *None of the Ninja Turtles got ANYTHING from Santa.*

      Adult-like response: *No, this one got SOMETHING from Santa.*

b. Type 2

Story: None of the three friends had presents for Gonzo.

Puppet: *Only one of the friends had SOME presents for Gonzo.*

Adult-like response: *No, none of the friends had ANYTHING for Gonzo.*

It was found that children never produced NPIs in response to Type 1 sentences in (25a), even though NPIs were produced by the puppet in the immediately preceding discourse. This finding constitutes compelling evidence in support of the claim that English-speaking children are aware of the distributional constraints of the NPIs *any/anything*. On the other hand, children were found to use PPIs like *some* or *something* in their responses to Type 2 sentences in (25b). Apparently, PPIs were initially used to provide the meaning of the corresponding NPIs, though this is not our concern here (see Crain 2012; Goro & Akiba 2004a, b).

In another elicited production study, Song (2003) found that English-speaking children are well aware of the distributional constraints of NPI *any*. This study tested whether children conform to a subject-object asymmetry with regard to the distribution of *any*. In particular, *any* is not allowed in subject position, which is syntactically higher than the sentential negation, as shown in (26a). Alternatively, negative pronouns are used in subject position, as in (26b). By contrast, *any* can occur in object position, i.e., inside the scope of the sentential negation, as shown in (26c). A negative pronoun is also possible in object position, as shown in (26d).

(26) a. *Anyone didn't meet John.

b. Nobody met John.

c. John didn't meet anyone.

d. John met nobody.

Taking advantage of the subject-object asymmetry of NPI *any*, Song (2003) tested three-to-five-year-old English-speaking children in their use of NPI *any* in two test conditions (the Subject Condition and the Object Condition). In the Subject Condition, a picture was shown to the child and the investigator, but this picture was hidden from the third person. In this picture, there are two animal characters but neither of them are doing the activity described by the test sentence. In a typical trial, a picture showed two rabbits under a tree and no one is on the tree. The investigator told the child 'Tell her (the third person) WHO

is climbing the tree right now'. Under this condition, children, like adults, were observed to use sentences containing negative pronouns in the targeted subject position, e.g., *NOBODY (or NO ONE) is climbing the tree*, to respond the experimenter's request. No children produced an *any* sentence in the Subject Condition. In the Object Condition, the child and one experimenter were presented with a picture showing an animal character doing something other than the activity described by the test sentence. For instance, in a typical trial the child and the investigator were shown a picture of a monkey sitting far away from some toys and a bag. The investigator then said to the child "Tell her (the third person) WHAT the monkey is touching right now". Under this condition, younger children (three-to-four-year-olds) preferred to use negative pronouns in the targeted object position (*The monkey is touching NOTHING*), while older children (five-years-olds) tended to used *any* (*The monkey is not touching ANYTHING*). The percentage of using *any* in the Object Condition increased with age (31% of the time in three-year-olds, and 45% of the time in four-year-olds, and 57% of the time in five-year-olds). In short, the experimental findings reported in Song (2003) show that English-speaking children observe the subject/object asymmetry in their use of NPI *any*. This indicates that the distributional constraints of NPI *any* are already in place in young English-speaking children.

Moreover, English-speaking children distinguished some subtle differences in meaning when *any* interacts with negation. Using a comprehension methodology, Thornton (1995) presented children with questions like (27).

(27) a. Did any of the turtles not buy an apple?   (*any > not*)

    b. Didn't any of the turtles buy an apple?   (*not > any*)

In (27a), *any* takes scope over negation (*any > not*), so the question asks if there are turtles that did not buy an apple. In (27b), by contrast, negation takes scope over *any* (*not > any*), so this question asks if there are or are not turtles that bought apples. Using a Truth Value Judgement task, Thornton tested ten children ranging in age between 3;6 and 4;11. In a scenario, two of the three turtles bought an apple, but the third one did not. In response to (27a), children correctly pointed to the third turtle 93% of the time, saying "This one didn't!' On the other hand, in response to (27b), children correctly pointed to the two turtles that had bought apples 85% of the time, saying 'These two did!" In short, Thornton (1995) offers convincing data showing English-speaking children are sensitive to subtle

difference in meaning arising from interaction between negation and *any* (see also Musolino 1998).

To summarize, English-speaking children have a good command of the syntactic and semantic properties of *any* by the time they are 4 years old. Children have been found to be sensitive to the licensing conditions of *any,* including knowledge about the linguistic contexts in which *any* ca<u>nnot</u> appear (O'Leary, 1994; O'Leary & Crain, 1994; Song, 2003). In the absence of negative evidence, children's command of such 'negative' linguistic facts has been used by several researchers to argue for an innateness account of the acquisition of Negative Polarity Items (cf. Crain, 1991; Crain & Pietroski, 2001, 2002; Marcus, 1993; Pinker, 1984). If this account is on the right track, we are led to expect children to be sensitive to the licensing properties of the corresponding polarity sensitive items in other languages, including the NPI *renhe* in Mandarin Chinese.

4. EXPERIMENTS

The present study investigates Mandarin-speaking children's understanding of the polarity sensitive item *renhe*. We examined their comprehension of *renhe* in two linguistic contexts. One was in sentences containing the (ability) modal word *neng* 'can', and the other was in sentences containing the temporal connective *zai…zhiqian* 'before'. When *renhe* appears in sentences with the modal word *neng*, it is assigned a 'free choice' (universal) interpretation by adult Mandarin speakers. On the other hand, when *renhe* appears in the scope of the downward entailing operator *zai…zhiqian*, it is assigned an (existential) interpretation, as a negative polarity item. Two experiments were conducted to see whether Mandarin-speaking children assign these different interpretations to the same lexical item *renhe* in the two linguistic contexts.

4.1. Experiment 1: Acquisition of Free Choice *renhe*

Experiment 1 investigated Mandarin-speaking children's comprehension of FC *renhe* in sentences containing the ability modal word *neng* 'be able to, can'. The experiment contrasted minimal pairs of sentences with *renhe* and ones without *renhe*. A typical minimal pair is illustrated in (28) and (29):

(28) *Gongfuxiongmao neng   tuidong renhe yi   ge chezi*
    Kung-Fu-Panda   be-able-to push   any   one CL car

'Kung-Fu-Panda is able to push any one of the cars.'

(29) *Gongfuxiongmao neng   tuidong yi ge chezi*
Kung-Fu-Panda   be-able-to push   one CL car
'Kung-Fu-Panda is able to push one of the cars.'

In (28), *renhe* appears in combination with the ability modal word *neng*. Here *renhe* invokes a 'free choice' reading. Suppose there are three cars. No matter which of these three cars is on offer, Kung-Fu-Panda is able to push that car. The sense of free choice attributed to *renhe* thus gives rise to a universal reading. Let us refer to these sentences as the '*any-one*' type of sentence. In (29), without *renhe*, the indefinite common noun *yi ge chezi* 'one-CL-car' appears. Therefore, the sentence simply means that Kung-Fu-Panda is able to push one of the cars. We call this second type the '*one*' sentences. The only difference between the two types of the sentences is the presence versus the absence of *renhe*. When *renhe* is present, the sentences receive a universal reading; when *renhe* is absent, the sentences receive an existential reading. We exploited this difference in meaning in order to assess Mandarin-speaking children's awareness of the semantic contribution of FC *renhe*.

4.1.1. *Participants*
We tested 55 Mandarin-speaking children between the ages of 4;5 and 6;3, with a mean age of 5;4. The children were recruited from the kindergarten affiliated to Beijing Language and Culture University (BLCU), Beijing. In addition, twenty Mandarin-speaking adults were tested as the control group. The adults were postgraduate students from BLCU.

4.1.2. *Procedures*
We used the Truth Value Judgement Task (Crain & Thornton, 1998). The task involves two experimenters. One experimenter acts out and narrates a story using toys and props, and the other experimenter plays the role of a puppet, who watches the story alongside the child. At some point in each of the stories, the puppet tells the child what he thinks happened in the story. The child's task is to judge whether or not the puppet's description of the story was right or wrong. If the child informs the puppet that he was wrong, then the child is asked to explain what had really happened in the story. When the child judges that

the puppet accurately described what had taken place, the child is instructed to reward the puppet by feeding him something he likes to eat, say, a strawberry. Sometimes the puppet doesn't pay close attention, however, and says the wrong thing. In that case, the child is instructed to give the puppet something to remind him to pay closer attention, some food that he doesn't like as much, say a pepper. These procedures make it fun for children to play the game, and they encourage children to attend to the puppet's statements.

The child participants were introduced to the task individually and were tested individually. There was a brief warm-up at the beginning of the test session to ensure that the child could perform the task. In addition, each child was given two practice trials before the formal test session. Each practice trial was divided into two parts. At the end of each part, a simple sentence was produced by the puppet. One sentence was obviously true and was expected to evoke a 'Yes' response from the child participant, and the other one was obviously false, and was expected to evoke a negative 'No' response from the child participant.

The twenty adult participants were tested on the same stories, but using pictures. The adults were asked to indicate on an answer sheet whether the puppet was right or wrong. As with the child participants, the adult participants were asked to provide a justification if they judged that the puppet had offered an inaccurate description of the story. Practice trials were also given to the adult participants in the beginning of the session.

4.1.3 *Test conditions*

There were four test conditions, corresponding to the four parts of each story. In the actual testing, the story consisted of two competitions between two animal characters. For the ease of exposition, here we just use one animal character (Kung-Fu-Panda) and one competition (Car-pushing) to illustrate. In the next section, we provide a representative trial that was used in the actual testing sessions.

In Condition 1, Kung-Fu-Panda pushed a small car but failed with a medium-sized car and a large car. This scenario is followed by a '*one*' sentence, *Gongfuxiongmao neng tuidong yi ge chezi* 'Kung-Fu-Panda can push one of the cars'. This sentence is a true description of the scenario for adults. Condition 2 used the array of objects as Condition 1, and Kung-Fu-Panda performed the same actions as in Condition 1, but the story was followed by an '*any-one*' sentence, i.e., *Gongfuxiongmao neng tuidong renhe yi ge chezi* 'Kung-Fu-Panda was able to push any one of the cars.' This sentence constitutes an incorrect description of the scenario for adults. In short, Condition 1 and Condition 2

employed the same situations, and the test sentences differed only in the presence or absence of *renhe*. In combination, these two conditions allow us to assess Mandarin-speaking children's understanding or lack of understanding of the semantic contribution of *renhe*.

Condition 3 and Condition 4 both used the '*any-one*' type of sentence, but these conditions differed in the events that were acted out. In Condition 3, Kung-Fu-Panda pushed two cars, but failed to push the third one. In Condition 4, Kung-Fu-Panda successfully pushed all three of the cars. Therefore, if children assigned the universal reading to the targeted '*any-one*' sentences in these two conditions, they were expected to reject the puppet's statements in Condition 3, but accept the puppet's statements in Condition 4.

The number of 'YES' and 'NO' responses was counter-balanced, with two 'Yes' responses (in Condition 1 and Condition 4) and two 'NO' responses (in Condition 2 and Condition 3). The four test conditions and the adult-like responses are summarized in Table 1. We adopted a within-subject design, testing all four conditions with each participant.

Table 1 Four test conditions and expected adult-like responses

Conditions	Sentence type	Scenarios	Adult-like response
Condition 1	*'one'* sentences	success-with-one out of three-objects	YES
Condition 2	*'any-one'* sentences	success-with-one out of three-objects	NO
Condition 3	*'any-one'* sentences	success-with-two out of three-objects	NO
Condition 4	*'any-one'* sentences	success-with-all of three-objects	YES

4.1.4. *Materials*

There were three test stories for each participant. These stories exhibited the same overall pattern of events. In particular, each story consisted of two competitions between two animal characters. This allows us to divide the story into four distinct parts, each corresponding to one test condition. To illustrate, in a typical trial, Kung-Fu-Panda and Grasshopper have a car-pushing competition and a fence-jumping competition. In each competition, the two animals each had a chance to try three different objects. The puppet was invited to comment on the animal's performance immediately after each trial.

In the first part of the story, we introduced two animal characters, Kung-Fu-Panda and Grasshopper. Both claim they were the most powerful person in the world. So they decided to have a car-pushing competition. Grasshopper took his turn first, and he only pushed one small car, failing with the other two bigger cars. Then the puppet was invited to comment on Grasshopper's performance. The puppet produced a '*one*' sentence, as shown in (30). This represents an instance of Condition 1.

(30) *Zhameng   neng   tuidong yi ge chezi*
     Grasshopper be-able-to push   one CL car
     'Grasshopper was able to push one of the cars.'
     Expected adult-like response: "Yes."

After the puppet produced the test sentence (30), the child was invited to judge whether the puppet said it right or wrong. This concluded the first part of the story.

Now it is Kung-Fu-Panda's turn. This started the second part of the story. Kung-Fu-Panda tries the three cars, and eventually he pushes the smallest car and the medium-sized car, but fails to push the biggest car. The narration of the story paused at this point, and the puppet produced an '*any-one*' sentence, as in (31). The child was invited to make a judgement. The second part represents an instance of Condition 3.

(31) *Gongfu Xiongmao neng   tuidong renhe yi   ge chezi*
     Kung-Fu-Panda   be-able-to push   any   one CL car
     'Kung-Fu-Panda was able to push any one of the cars.'
     Expected adult-like response: "No, he only pushed two cars."

Grasshopper fails in the first competition, so he proposes to have a fence-jumping competition. This introduced the third and fourth parts of the story. These parts were conducted in a similar way to the first two parts. In Part 3, Kung-Fu-Panda only jumps over a low fence, failing with the other two higher fences. The puppet produced an '*any-one*' sentence, as in (32). This represents a scenario for Condition 2. In Part 4, Grasshopper jumps over all the fences without any trouble. The puppet produced an '*any-one*' sentence, as in (33). This represents a scenario for Condition 4.

(32) *Gongfu xiongmao neng   tiaoguo   renhe yi ge zhalan*

    Kung-Fu-Panda   be-able-to jump-over any   one CL fence

    'Kung-Fu-Panda was able to jump over any one of the fences.'

    Expected adult-like response: "No, he only jumped over one fence."

(33) *Zhameng   neng   tiaoguo   renhe yi ge zhalan*

    Grasshopper be-able-to jump-over any one CL fence

    'Grasshopper was able to jump over any one of the fences.'

    Expected adult-like response: "Yes."

In addition to the four test sentences, there were two filler sentences in each story. One was obviously true (34), and the other was obviously false (35). They were produced before or after a test sentence. For instance, (34) was produced in the third part of the story, followed by the test sentence (32). (35) was produced in the first part of the story, after the test sentence (30). The filler sentences were used to obscure the pattern of study, and to check children's attention.

(34) *Gongfu xiongmao zhi tiaoguo   le   zui   ai   de zhalan*

    Kung-Fu-Panda   only jump-over ASP most low DE fence

    'Kung-Fu-Panda only jumped over the lowest fence.'

(35) *Zhameng   tuidong le   na ge zui da   de chezi*

    Grasshopper push   ASP that CL most big DE car

    'Grasshopper pushed the biggest car.'

To sum up, three stories were presented in the main session. Each story contained four test sentences, plus two filler sentences. Together, each child received 18 sentences, including 12 test sentences and 6 filler sentences. Half of the sentences were expected to receive 'Yes' responses and the other half 'No' responses. The 18 sentences were presented in a pseudo-random order. The whole experimental session took about 15-20 minutes, and was audio recorded.

4.1.5. *Results*

Fifty-one of the 55 children produced appropriate responses in the practice trials, and hence were included for the data analysis. The other four children were excluded from the actual tests either because they experienced difficulty in understanding the task in the practice trials, or they always said 'Yes' in the practice trials. We report the findings according to the remaining participants' performance in each test condition. The car-pushing and fence-jumping story is used again to illustrate how the participants responded in the experiment.

In Condition 1, Grasshopper managed to push the smallest car and the puppet produced a '*one*' sentence i.e., *Zhameng neng tuidong yi ge chezi* 'Grasshopper was able to push one of the cars.' In this condition, the child participants accepted the target sentences 100% of the time (153/153 trials), on a par with the adults' total acceptances of the target sentences (100% of the time, 60/60 trials).

In Condition 2, Kung-Fu-Panda jumped over the lowest fence but not the other two fences, and the puppet produced an '*any-one*' sentence, i.e., *Gongfu xiongmao neng tiaoguo renhe yi ge zhalan* 'Kung-Fu-Panda was able to jump over any one of the fences.' In this condition, children rejected the target sentences 83% of the time (127/153 trials). They informed the puppet that Kung-Fu-Panda had only jumped over one fence (the lowest one). The adult participants rejected the test sentences 100% of the time (60/60 trials). A Mann-Whitney test shows no significant difference between the child group and the adult group in this condition (Z=1.994, p=.076).

In Condition 3, Kung-Fu-Panda pushed the smallest car and the medium-sized car, but not the biggest car. The puppet produced an '*any-one*' sentence i.e., *Gongfu Xiongmao neng tuidong renhe yi ge chezi* 'Kung-Fu-Panda was able to push any one of the cars.' In this condition, children rejected the '*any-one*' sentences with an appropriate justification at 82% of the time (125/153 trials). In justifying their rejections of the puppet's statements, these children said that Kung-Fu-Panda only pushed two cars (i.e., the smallest car and the

medium-sized car), and he failed to push the largest car. The adult group rejected the '*any-one*' sentences in this condition 100% of the time (60/60 trials). A Mann-Whitney test shows that the children are no different from the adults in their rejections of the '*any-one*' sentences in this condition (Z=2.117, p =.053).

In Condition 4, Grasshopper jumped over all of the three fences, and the puppet produced an '*any-one*' sentence, i.e., *Zhamen neng tiaoguo renhe yi ge zhalan* 'Grasshopper was able to jump over any one of the fences.' In this condition, children accepted the test sentence 83% of the time (127/153 trials). Adults accepted the test sentences 100% of the time (60/60 trials). A Mann-Whitney test shows no significant difference between the children's and adults' acceptances of the target sentences in this condition (Z=1.996, p=.053).

Based on the children's response and their corresponding justifications in the four test conditions, we conclude that Mandarin-speaking children assigned a universal reading to the *any-one* sentences, in contrast with the existential reading they assigned to the *one* sentences. The child and adult data are summarized in Table 2.

Table 2 Summary of the child and adult responses

Response Type	Children	Adults
'Yes' responses in Condition 1	100% (153/153 trials)	100% (60/60 trials)
'No' responses in Condition 2	83% (127/153 trials)	100% (60/60 trials)
'No' responses in Condition 3	82% (125/153 trials)	100% (60/60 trials)
'Yes' responses in Condition 4	83% (127/153 trials)	100% (60/60 trials)

An examination of the individual child data reveals that the child participants were consistent in their responses across the four test conditions. In particular, 42 out of the 51 children accounted for the majority of the acceptances/rejections of the target sentences listed in Table 2. These children accepted the target sentences in Condition 1 and in Condition 4, but rejected the target sentences in Condition 2 and in Condition 3.

On the other hand, the remaining nine children exhibited a distinct pattern of response. These children appeared not to understand the lexical meaning of *renhe*, and they seemed to ignore *renhe* when they encountered the '*any-one*' sentences in Condition 2, Condition 3 and Condition 4. More specifically, these nine children accepted both the '*one*' sentences in Condition 1, and the '*any-one*' sentences in Condition 2. On the other hand, these children rejected the '*any-one*' sentences in Condition 3, and informed the puppet that Kung-Fu-Panda can push two cars, not one. In Condition 4, these children antithetically rejected the '*any-one*' sentences, on the grounds that Grasshopper jumped over three fences, not one. Taken together, the responses and justifications offered by the nine children suggested that they did not process *renhe*. Among the nine children, only three were under five years old; the other six children were five years old or above.

To sum up, most of the five-year-old Mandarin-speaking children we tested behaved like adults in their comprehension of FC *renhe* in the sentences containing the ability modal word *neng* 'can'; this finding invites us to conclude that by the time they reach 5, Mandarin-speaking children generally understand FC *renhe* when *renhe* interacts with some external operator like the ability modal word *neng* 'can'.

4.2. Experiment 2: Acquisition of the negative polarity item *renhe*

Experiment 2 investigated Mandarin-speaking children's comprehension of NPI *renhe*. The linguistic context we chose contains the temporal conjunction *zai…zhiqian* 'before'. As discussed earlier, *renhe* is interpreted as an NPI in this linguistic context. Consider (36).

(36) *Xiaoma zai renhe yi ge xiao dongwu zhiqian you   dao* le   *zhongdian*
    Horse   at any one CL little animal before swim to   ASP finish line
    'Horse swam to the finish line before any of the other animals.'

In (36), the nominal phrase *renhe yi ge xiao dongwu* 'any-one-CL-little-animal' is embedded in the scope of *zai…zhiqian* . This sentence states that Horse swam to the finish line before any of the other little animals.

4.2.1. *Participants*

We interviewed 37 Mandarin-speaking children. The children ranged in age between 4;5-6;3, with a mean age of 5;1. They were recruited from the kindergarten affiliated to Beijing Language and Culture University (BLCU). In addition, we tested twenty Mandarin-speaking adult controls. The adults were postgraduate students who attended BLCU.

4.2.2. *Methodology*

As in Experiment 1, a variant of the Truth Value Judgement Task was employed in the present experiment (Crain & Thornton, 1998; Goro & Akiba, 2004a, b). A difference between this experiment and Experiment 1, however, was that the test sentences in this experiment were presented at the end of the story. The child participants were introduced to the task and tested individually. After a brief warm-up, each child was given one practice trial before the formal test session. On the practice trial, the puppet produced two simple sentences. The temporal connective *zai…zhiqian* was embedded in one of the sentences, as shown in (37) below. The sentence was a false description of the story, as what really happened is that Donald Duck arrived at the garden before Mickey.

(37) *Milaoshu   zai Tanglaoya   zhiqian dao da le   huayuan*
    Mickey   at   Donald Duck before arrive at ASP garden
  'Mickey arrived at the garden before Donald Duck.'

The other sentence was a true description of the practice trial. These control trials were used to verify that children could answer both 'Yes' and 'No' correctly and that they had no difficulty understanding *zai…zhiqian* when it appeared alone. Only the child participants who passed the practice trial could proceed to the main session.

A test story was designed for the formal test session. This story was about a swimming challenge among a group of animals. Crocodile and Frog were the champions of the swimming competitions in the two previous years. This year they would be challenged by eight animals, including Horse, Goose, Sea Dragon, Sea Lion, Whale, Dolphin, Pig and Penguin. Each of the eight animals had a chance to challenge Crocodile and Frog, so this challenge consisted of eight rounds of competitions, acted out by one experimenter. Big Bird was the judge in this challenge.

Before the competitions started, Big Bird announced a reward system to the challengers: if an animal came in first, beating both Crocodile and Frog, the animal would

receive a gold medal. If an animal came in second, beating one of the former champions, either Crocodile or Frog, but not both of them, then the animal would receive a silver medal. If, unfortunately, an animal did not beat either Crocodile or Frog, the animal would receive a dark cross (a symbol of failure in Chinese culture).

In the first round of competition, the challenger was Horse. He swam to the finish line before Frog, but after Crocodile. Since Horse got second place, Big Bird gave Horse a silver medal. The other seven competitions were conducted in a similar way except in one aspect. Starting from the second round of competition, the child participant was invited to help Big Bird present a reward to the animal characters, after he was shown how to do this in the first round of competition. This practice enhanced the child's understanding of the reward system, and encouraged interaction between child and experimenter. In the end, three animals (Sea Dragon, Whale and Penguin) got a gold medal, three animals (Horse, Sea Lion, and Dolphin) got a silver medal, and two animals (Goose and Pig) got a dark cross.

When the competitions concluded, the eight challengers lined up in a row, with their reward in front of them. This is illustrated with Figure 1 below.

Figure 1. The last scene of the sample story in Experiment 2

The reward served as a reminder to the child of the order in which the animals had come (gold medal for the first place, silver medal for the second place, and dark cross for the third place). Next, the puppet, played by another experimenter, talked to the child what he thought about all of the challengers' performance in the competitions. Starting from the first competition, the puppet considered each animal in turn. He first mentioned the color

of the medal in the lead-in sentence and then commented on the challenger's performance by using the *renhe* target sentence. In particular, when reporting the performance of the three gold medalists, the puppet used the sentence (38), where X represents Sea Dragon, Whale or Penguin. This constitutes the 'gold-medal' condition. Since the animals in question got the first place, (38) is a true description of the competitions in question.

Gold-medal condition

(38) <u>Lead-in sentence</u>

   X na le   jinpai.   Na zai zhe ci bisai   zhong,

   X get Asp gold medal   then in this CL competition middle

   'X got a gold medal. So in this competition...'

   <u>Test sentence</u>

   X zai renhe yi   ge xiao dongwu zhiqian you dao le zhongdian

   X at any one CL little animal before swim to ASP finish line

   'X swam to the finish line before any of the other little animals.'

   (X= Sea Dragon/Whale/Penguin)

Moreover, when the puppet reported the performance of the three silver medalists, he produced the sentence (39), where X represents Horse, Sea Lion or Dolphin. This condition is called the 'silver-medal' condition. In these three competitions, the animals in question got the second place, so the test sentence in (39) is a false description of the competitions.

Silver-medal condition

(39) <u>Lead-in sentence</u>

   X na le   yinpai.   Na zai zhe ci bisai   zhong...

   X get ASP silver medal then in this CL competition middle

   'X got a silver medal. Then at this competition...'

Test sentence

X zai renhe yi ge xiao dongwu zhiqian you dao le zhongdian

X at any one CL little animal before swim to ASP finish line

'X swam to the finish line before any of the other little animals.'

(X= Horse/Sea Lion/Dolphin)

To recap, three of the *renhe* test sentences in the gold-medal condition described contexts in which the referent of the subject NP (e.g., Sea Dragon) came first, and three of the *renhe* test sentences in the silver-medal condition described contexts in which the referent of the subject NP (e.g., Horse) came second. We expected that if children understood NPI *renhe* in this context, they would judge the *renhe* sentence to be a true description of the story in the gold-medal condition, but a false description in the silver-medal condition.

The test sentences were interspersed with two filler sentences, which did not contain *renhe* or *zai…zhiqian*, as shown in (40) and (41). Both were used by the puppet to describe the dark cross cases. (40) is a true statement and (41) is a false statement. The filler trials were included to provide variety in the task, and to ensure that children remained aware of the task.

Fillers

(40) *Xiao'e na le heicha. Na zai zhe ci bisai zhong, xiao'e you*

Goose get ASP dark-cross then in this CL competition middle Goose swim

de zui man

DE most slow

'Goose got a dark cross. In this competition, Goose was the slowest one.'

(41) *Xiaozhu na le heicha. Na zai zhe ci bisai zhong, xiaozhu you*

Pig get ASP dark-cross then in this CL competition middle Pig swim

de zui kuai

DE most quick

'Pig got a dark cross. In this competition, Pig was the fastest one.'

In total, the children responded to eight items in this task (three test sentences in the gold-medal condition, three test sentences in the silver-medal condition and two filler sentences).

The test sentences and fillers were administered in a pseudo-random order. As in Experiment 1, if the child informed the puppet that he was wrong, then he was asked to explain 'what really happened.' The entire testing session, including the warm-up, the practice trial and the test trials and fillers, lasted about 15 minutes.

The adult controls received the same practice trial and test trials, but not the warm-up. The adults were tested on the same story, using pictures. As we did with the child participants, the adult participants were asked to give a justification if they judged the puppet to be wrong.

4.2.3. *Results*

Consider first the results from the gold-medal condition. In this condition, the adult controls accepted the *renhe* sentences 100% of the time (60/60 trials). Children also overwhelmingly accepted the *renhe* sentences in the gold-medal condition (99% of the time, 110/111 trials). There was no significant difference between the child group and the adult group in their acceptances of the target sentences (Mann-Whitney test, Z =.735, p =.462).

In the silver-medal condition, the adult controls rejected the *renhe* sentences 100% of the time. Like adults, children rejected the *renhe* sentences in this condition 92% of the time (102/111 trials). No significant difference was found between the child group and the adult group in their rejections of the target sentences (Mann-Whitney test, Z =.239, p =.811). In justifying their rejections of the puppet's statements, both adults and children indicated that the relevant animal character did not get the first place, or the animal character was in second place. For example, one child said *Yinwei xiaoma de le yinpai, you bi ta kuai de* 'Because Horse got a silver medal. Someone was quicker than him.', when he responded to the test sentence *Xiaoma zai renhe yige xiao dongwu zhiqian you dao le zhongdian* 'Horse swam to the finish line before any of the other little animals'.

To conclude, Mandarin-speaking children correctly accepted the *renhe* sentences in the adult-true condition (the gold-medal condition) and rejected the *renhe* sentences in the adult-false condition (the silver-medal condition). Therefore, this experiment shows that Mandarin-speaking children as young as five years old understood NPI *renhe* when it is embedded in NPI-licensing contexts like sentences containing the temporal conjunction *zai…zhiqian*.

5. CONCLUSION

The present study reported two experiments investigating five-year-old Mandarin-speaking children's comprehension of FC *renhe* and NPI *renhe*. In the FC *renhe* experiment (Experiment 1), FC *renhe* was tested in sentences containing the ability modal word *neng* 'can'. We compared children's comprehension of minimal pair sentences, i.e., sentences with FC *renhe* and ones without FC *renhe*. Most of the children we tested were found to be able to differentiate these two types of sentences; they correctly assigned the universal reading to sentences containing FC *renhe*, in contrast with the existential reading they assigned to sentences containing indefinites (without *renhe*). In the NPI *renhe* experiment (Experiment 2), *renhe* was tested in sentences with the temporal conjunction *zai…zhiqian* 'before'. Children correctly assigned the NPI reading to *renhe* in this context, accepting the *renhe* sentences in the adult-true condition and rejecting the *renhe* sentences in the adult-false condition. The finding is then that five-year-old Mandarin-speaking children behaved like adults in their comprehension of NPI *renhe* and FC *renhe*.

The findings that Mandarin-speaking children as young as five years old understand FC *renhe* and NPI *renhe* are consistent with the innateness account of the acquisition of polarity items (O'Leary, 1994; O'Leary & Crain, 1994). The innateness account contends that the linguistic knowledge of polarity items is part of children's a priori knowledge of Universal Grammar. This account maintains that children master a rich and highly structured system of linguistic knowledge on the basis of minimal input data (cf. Crain, 1991; Crain & Pietroski, 2001; Crain & Thornton, 1998). The alternative experience-based account (e.g., Tomasello, 2000, 2003) would seem less plausible in the case of the acquisition of the polarity sensitive item *renhe*. According to the experience-based account, children's linguistic knowledge is largely based on their experience. In the case of *renhe*, however there is little, if any, input available to Mandarin-speaking children. *Renhe* is generally restricted in the formal register of Mandarin Chinese, so it is infrequently used in spoken Mandarin. Attesting to this is a report by Zhang (2010: 37), who found not a single token of *renhe* in the Chinese Coco Corpus (a spoken Chinese corpus) (Note Zhang does not mention the corpus size).

We anticipated, therefore, that *renhe* would be infrequent in child-direct speech. To verify this, we examined three Mandarin Chinese corpora from the CHILDES database, including the Beijing (2) corpus and the Zhou (1) and Zhou (2) corpora (MacWhinney, 2000), and the Beijing Early Language Acquisition (BJCELA) corpus built by Thomas Hun-tak Lee and colleagues. All four corpora contain transcripts of conversations between

adults and individual children between ages one and six, and these four corpora contain a total of 686,559 adult utterances.[1] There was not a single adult utterance containing *renhe* in the entire corpora. Obviously children must encounter at least some instances of *renhe*, or they would perform at chance on the experiments we reported. However, the absence of *renhe* in these corpora clearly establishes the fact that *renhe* is highly infrequent in the input to children, thereby undermining the experience-based account of children's performance.

In view of both the poverty of the stimulus and the early competence of linguistic knowledge of *renhe*, it seems reasonable to suppose that Mandarin-speaking children's knowledge of polarity item *renhe* is part of children's innate endowment of linguistic knowledge. This invites us to ask how children acquire the meaning of *renhe*, despite the paucity of input. Here is a sketch of an answer. Innately, children know that certain words in the speech stream will be associated with the existential quantifier, represented by the symbol $\exists$ in classical logic. It turns out that one such word is *renhe*. The question is how the child figures this out. Let us suppose that the child knows the meanings of several of the remaining words that make up the sequences of words the child encounters. These words include *Mali* 'Mary', *mei* 'not', *chi* 'eat', and *pingguo* 'apple', and so on, but they do not include the meaning of *renhe*. Suppose further, however, that the child encounters a sequence of familiar words, which surround the unfamiliar word *renhe*. One such experience would be the sequence: *Mali mei chi renhe pingguo.* We must suppose, further, that the child can tell that, in the present circumstance, the speaker intends to convey the message that Mary did not eat any of the apples. So, the child knows the intended meaning ('Mary did not eat any of the apples'), and knows that the words surrounding *renhe* combine to mean that *Mary did not eat __ apples*. A child in this situation can infer that the semantic contribution of *renhe* is roughly equivalent to a class of expressions that have the meaning associated with $\exists$ in classical logic, which include *a single*, *any*, *one* and the like. Further experience will be required to enable the child to narrow down the meaning of *renhe* to a more specific meaning, one that is associated with the polarity item, rather than expressions that are close in meaning.

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[1] The corpus size and the child age information of each of the four corpora are as follows. In the Beijing (2) corpus, there are ten children aged between 1;9 and 2;2, and the total number of adult utterances is 34,529. In the Zhou (1) corpus, there are 50 children aged between 1;2 and 4; the total number of adult utterances in Zhou (1) is 8,643. In the Zhou (2) corpus, there are 140 children aged between 3 and 6, and the total number of adult utterances is 37, 593. In the BJCELA corpus, there are four children aged between 0; 10 and 2;6, and the total number of adult utterances is 605,794.

One may ask, further, how children figure out the domain widening effect that existential *renhe* contributes to sentences, over and above the bare plural alone (i.e., *Mary does not eat apples*). Following Kadmon and Landman (1993), we would suggest that statements with *renhe* often follow statements with a bare plural, as a way of extending the set of entities that is usually associated with the bare plural NP. For example, in response to a speaker's assertion *Mary does not eat apples*, the hearer may inquire whether Mary eats apples in fruit salad. In response, the speaker may add the existential 'any' (*renhe*) (i.e., *Mary does not eat* **any** *apples*), so as to exclude apples of any kind, even apples in fruit salad. Children who experience such dialogues could be expected to glean the 'domain widening' nature of polarity sensitive items like *renhe*.

As a final note in this paper, we wish to highlight a production/comprehension asymmetry observed in Mandarin-speaking children's acquisition of *renhe*. That is, while Mandarin-speaking children understand *renhe*, as our experiments have shown, they produce few instances of *renhe*. The paucity of *renhe* in child speech is verified by a survey of five child speech corpora, including four Mandarin Chinese corpora from CHILDES (i.e., Beijing 2, Zhou1, Zhou2, and Chang), and the Beijing Early Language Acquisition (BJCELA) corpus. There is no child utterance of *renhe* in these corpora.

We assume that the low-frequency of *renhe* in spoken Chinese is correlated to a typological feature of Mandarin Chinese. In particular, *wh*-pronouns in Mandarin Chinese function as polarity sensitive items (Cheng, 1991; Cheng, 1994; Huang, 1982; Li, 1992; Lin, 1996, 1998). Particularly in spoken Chinese, Mandarin speakers tend to use *wh*-pronouns to convey meanings that are similar to Chinese *renhe* or English *any*. For instance, the basic semantic properties of *renhe*, including domain widening and freedom of choice can be conveyed by sentences containing *wh*-pronouns (Lin, 1996: 107-111). This is illustrated in (42) and (43). Consider (42) first. Speaker A asks whether there are some children's books. Speaker B replies with a *dou*-conditional containing the indefinite *wh*-pronoun *shenme* 'what', i.e., *Women zheli shenme shu dou you* 'No matter what (kind of) book you want, we have it here.' Speaker B's response implies that a wide range of books is available, including those (e.g., adult books) which are previously regarded as irrelevant in speaker A's utterance. This is the domain-widening effect in the sense of Kadmon and Landman (1993), as discussed earlier. The *shenme* sentence is semantically equivalent to the corresponding *renhe* sentence *Women zheli renhe shu dou you*.

(42) A: *Nimen zheli you-mei-you   xiaohaizi kan   de   shu?*

       you   here   have-Neg-have   children   read   DE   book

       'Do you have books for children to read here?'

    B: *Women zheli shenme (=renhe)shu dou you*

       we   here   what   any   book   all   have

       'No matter what (kind of) book you want, we have it here.'

(43) a. *Wo shenme(=renhe) dongxi dou keyi   mai gei ni*

       I   what   any   thing   all   can   buy   to   you

     'No matter what you want, I can buy it for you.'

    b. *Buguo ni   zhi   neng xuan   yi-yang*

      but   you only can choose one-kind

     'But you can only choose one.'

     Now consider example (43). Example (43a) expresses the idea that I can buy you any one of the things you like, though not necessarily everything you fancy. This freedom of choice reading becomes transparent when (43a) is followed with the continuation (43b) (Lin, 1996: 107-108). Again, a similar meaning is conveyed by the corresponding *renhe* sentence.

     Since Mandarin-speaking children can resort to sentences containing *wh*-pronouns to express meanings similar to sentences containing *renhe*, they do not need to use *renhe* in their speech. Indeed, in the five corpora we used to check the production of *renhe*, children use *wh*-pronouns, particularly, the *wh*-pronoun *shenme* 'what', to substitute for the use of *renhe*, as illustrated in (44)-(48). (44)–(47) show the NPI use of *shenme,* and (48) show the FC use of *shenme*.

(44) *Mei you   shenme*   (3;06 from Beijing 2 corpus)

    Neg have   what

    'Nothing exists.'

(45) *Shenme ye   mei   you*   (ZTX 02;01;12 from Fan 2012)[2]

     what   also NEG have

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[2] Fan (2012) uses the BJCELA corpus.

'Nothing exists here.'

(46) *Wo shenme dou de bu   zhao le*   (ZHZ 02 ;04 ;11 from Fan 2012)

    I   what   all get NEG ASP ASP

    'I did not get anything.'

(47) *Wo neng-bu-neng suibian   da   yi ge shenme dongxi a*   (5;5 from Zhou 2 corpus)

    I   can-NEG-can randomly make one CL what   thing Q

    'Can I just randomly build up anything?'

(48) *Ni   suibian   hua shenme*   (5;5 from Zhou 2 corpus)

    you randomly draw what

    'You can draw anything (you like).'

The data above show that Mandarin-speaking children start using *wh*-pronouns as polarity sensitive items as young as two years old; a variety of linguistic structures was employed to express both the NPI use and the FC use of *wh*-pronouns. Moreover, previous studies report that, by the time they reach age 4, Mandarin-speaking children use *wh*-pronouns as polarity items at a nearly adult-like level (Li & Tang, 1991).[3]

    Considering the abundance of indefinite *wh*-pronouns in the input, it is reasonable to ask whether Mandarin-speaking children could acquire the linguistic properties of *renhe* on analogy with *wh*-pronouns such as *shenme*. In our view, this is unlikely for several reasons. First, there are linguistic contexts that license *wh*-pronouns but not *renhe*, and vice versa (Hsiao, 2003; Kuo, 2003). Examples are provided in (49) and (50).

(49)   *Qing an   renhe/*shenme jian*

    please press any   what   button

    'Press any button.'

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[3] A similar production/comprehension asymmetry is attested in English-speaking children's acquisition of *any*. It is reported that English-speaking children do not often produce *any*, for both FC *any* and NPI *any* (Tieu, 2010a, b), but they have no problem in their comprehension of *any* (Musolino, 1998; Thornton, 1995). To substitute for the uses of NPI *any*, younger English children tend to use negative pronouns like *no one*, *nobody* (Song, 2003). For instance, younger children in the study of Song (2003) preferred to use the sentence *The rabbit is putting NOTHING on the table* instead of the sentence *The rabbit is not putting ANYTHING on the table*.

(50) *Ta haoxiang mai le shenme/*renhe dongxi*

     he seem   buy Asp what any   thing

     'He seems to have bought something.'

There is a second difference between *renhe* and *wh*-pronouns. These expressions sometimes receive different interpretations in the same linguistic contexts. For instance, simple negative sentences with *renhe* only permit a 'none' reading, as in (51a). By contrast, simple negative sentences with the *wh*-pronoun *shenme* 'what' can receive an 'insignificance' reading, in addition to a 'none' reading. This is shown in (51b) (Huang 2013).

(51) a. *Zhangsan mei jian renhe ren*

       Zhangsan Neg meet any person

      'Zhangsan did not meet any person.'   'None' reading

    b. *Zhangsan mei jian shenme ren*

     Zhangsan Neg meet what   person

     (i) 'Zhangsan hardly met any person.'   'Insignificance' reading

     (ii) 'Zhangsan did not meet any person.'   'None' reading

In short, although there are some overlapping properties between *renhe* and *wh*-pronouns, as discussed above, *renhe* and *wh*-pronouns differ in both distribution and interpretation. *Renhe* and *wh*-pronouns belong to two distinct types of polarity sensitive items in Mandarin Chinese (Hsiao, 2003; Huang, 2013; Kuo, 2003), and should be acquired separately by Mandarin-speaking children.

     To conclude, Mandarin-speaking children understand both FC *renhe* and NPI *renhe* by the age of 5 years old, although they do not often produce *renhe*. These findings give support to the innateness account of acquisition of polarity items. We attribute the paucity of *renhe* in child speech to the availability of alternative expressions (*wh*-pronouns) that convey the intended polarity meanings.

Acknowledgements

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CHAPTER 3

Interpretation of the *wh*-pronoun *shenme* 'what' in Mandarin Chinese

This chapter is based on the following publication:

Huang, Aijun (2013). Insignificance is significant: interpretation of *wh*-pronoun *shenme* 'what' in Mandarin Chinese. *Language and Linguistics* 14.1: 1-45.

Abstract

This paper offers a semantic analysis of the 'insignificance' reading observed in negative sentences with the *wh*-pronoun *shenme* 'what' in Mandarin Chinese. We propose that *shenme* is a proform of NP modifiers, partitioning the denotation of the NP it modifies into kinds of entities. Under certain pragmatic conditions, this semantic property of *shenme* determines that the insignificance reading can be assigned to negative sentences with *shenme*. The proposed analysis is extended to explain the lack of the insignificance reading in a class of cases, including (i) sentences with the Negative Polarity Item *renhe* 'any'; (ii) sentences with 'head' *wh*-pronouns, such as *shei* 'who'; (iii) sentences with the adverb of quantification *dou* 'all'; (iv) sentences with bare nouns; (v) sentences involving imperfective aspect; and (vi) sentences with non-local negation. The examination of the insignificance reading hence indicates that a variety of aspects of Chinese grammar play a role in licensing this reading.

1. Introduction

In Mandarin Chinese, *wh*-pronouns [1] like *shenme* 'what' and *shei* 'who' are generally prohibited in simple positive declarative sentences, but are licensed in typical affective contexts such as negation, yes-no questions, and the antecedent of a conditional (e.g. Klima 1964). These contexts are also known to license Negative Polarity Items (NPIs) like English *any* (e.g., Baker 1970; Ladusaw 1980; Giannakidou 1998). This similarity in distribution has led some scholars to analyze *wh*-pronouns as (negative) polarity items (Huang 1982; Li, A. 1992; Cheng 1991, 1994; Lin 1996, 1998a; Hsin 1999).[2] This explains why *wh*-pronouns under negation have the same 'none' interpretation as *renhe*, which is the counterpart of English *any* in Mandarin Chinese. Consider the examples in (1):

(1) a. *Zhangsan mei chi shenme dongxi.*[3]

Zhangsan Neg eat what thing

'Zhangsan did not eat anything'

b. *Zhangsan mei chi renhe dongxi*

Zhangsan Neg eat any thing

'Zhangsan did not eat anything'

Both sentence (1a) and sentence (1b) are interpreted as the meaning that Zhangsan did not eat anything.

However, a second reading is available for the *shenme* NP in negative statements, in addition to the 'none' reading (Li 1924; Wang 1943; Ding et al. 1961; Chao 1968; Zhu 1982; Lü 1985; Li, W.H.1992; Lin 1996, 1998a, 2004; Hsiao 2002; Hole 2004; Dong 2009;

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[1] In traditional Chinese grammar, *wh*-phrases are generally called *yiwen daici*, roughly equivalent to '*wh*-pronouns', to refer to both the interrogative and non-interrogative uses of *wh*-phrases (e.g., Ding et al 1961). In more recent studies of *wh*-phrases in Mandarin, linguists give the name '*wh*-indefinites' to refer to the non-interrogative use of *wh*-phrases (e.g., Li, A. 1992). In this study, we follow the traditional Chinese grammar, and refer to *wh*-phrases as '*wh*-pronouns'. We focus on the non-interrogative use of *shenme* unless specified otherwise.

[2] Note that the licensing contexts of Mandarin *wh*-pronouns only partially overlap with the licensing contexts of English *any* (Li, A. 1992; Lin 1996, 1998). There are some linguistic contexts that license Mandarin *wh*-pronouns but not English *any*. Conversely, there are some linguistic contexts that license English *any* but not Mandarin *wh*-pronouns (See Lin 1998a for details). However, the discrepancy in distribution between Mandarin *wh*-pronouns and English *any* does not necessarily lead to dismiss the idea that Mandarin *wh*-pronouns are (negative) polarity items. For instance, Lin (1996, 1998a) suggest that both Mandarin *wh*-pronouns and English *any* are licensed by the semantic constraint of 'non-existence'.

[3] This paper uses the following abbreviations: ASP = aspect marker; Aux=Auxiliary; CL = classifier; De: the modificational marker *De*; Neg = negation marker; Pass=Passive; Q = question particle.

Zhang 2010; Cui 2012). We call this second reading the 'insignificance' reading, as illustrated in (2a). The corresponding statement with *renhe*, as in (2b), is not acceptable.

(2) a. *Wo mei you shenme youpiao, zhi   you yixie   hen   lao de (youpiao)*

     I   Neg have what   stamp   only   have some very old De stamps

     'I hardly have any stamps, only some old ones.'

  b. *Wo mei you renhe youpiao, * zhi   you yixie hen lao   de (youpiao)*

     I   Neg have any   stamp   only   have some very old De stamps

     'I don't have any stamps, * only some old ones.'   (Li, W.H.1992: 148)

Examples (2a) and (2b) reveal a semantic difference between *shenme* and *renhe*. The focus operator *zhi you* 'only have' in the second conjunct of (2a) draws attention to the existence of some 'insignificant' kind of entities (i.e., old stamps) that are in the possession of the speaker,[4] thereby ruling out the 'none' reading (Li, W.H.1992: 140-149; Hsiao 2002: 126-127). We have glossed the example using the English word *hardly* to convey the insignificance reading of negated *shenme* (p.c. Rosalind Thornton). Notice that the same continuation (with the focus operator *zhi you*) is deviant with the NPI *renhe*, as in (2b). Negative sentences with *renhe* exclusively generate the 'none' meaning.

This difference in interpretation between *shenme* and *renhe* can be further demarcated using another diagnostic test. As example (3a) show, a negative sentence with *shenme* can follow a contrastive topic, marked with *shi*, but *renhe* is not permitted in this structure, as indicated by the unacceptability in (3b).

(3) a. *Jintian zaofan,   Zhangsan chi shi   chi le,   keshi mei chi shenme dongxi*

     Today breakfast Zhangsan eat Aux eat Asp but   Neg eat what   thing

     'Zhangsan did eat breakfast today, but he hardly ate any food'

  b. *Jintian zaofan,   Zhangsan chi shi   chi le, * keshi mei chi renhe dongxi*

     Today breakfast Zhangsan eat Aux eat Asp but   Neg eat any   thing

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[4] If the subsequent focus clause specifies the existence of 'significant' kinds of entities, the sentence will sound weird. Consider the sentence below:

  (i) *Wo mei you shenme youpiao, ??? zhi   you yixie   hen   guizhong de youpiao*
     I   Neg have what   stamp   only   have some very precious De stamp
    'I hardly have any stamps, ??? only some precious ones.'

'Zhangsan did eat breakfast today, * but he did not eat any food'

The insignificance interpretation (i.e., Zhangsan hardly ate any food) expressed by the second conjunct of (3a) adds a comment to the meaning of the first conjunct (i.e., Zhangsan did eat breakfast today). In a negative sentence with *renhe*, as in (3b), the same contrastive comment amounts to a contradiction.

Taking stock, the insignificance reading is attested in negative sentences with *shenme*, but this reading is not possible for negative sentences with *renhe*. The insignificance reading is widely acknowledged, but how this reading arises remains obscure. The goal of this paper is to provide a semantic analysis to account for the insignificance reading. The remainder of this paper is organized as follows. Section 2 offers a comprehensive examination on the distribution of the insignificance reading. It will be shown that this reading has to do with various aspects of Chinese grammar, including *wh*-morphology, sentential aspect, locality and pragmatic inference. Section 3 reviews the treatment of the insignificance reading in traditional Chinese grammar and recent works. In section 4, we introduce some linguistic properties of the *wh*-pronoun *shenme* that are relevant to the analysis of the insignificance reading. We propose that *shenme* is a proform of NP modifiers, partitioning the denotation of the NP it modifies into kinds of entities. Section 5 offers an analysis of the insignificance reading. In section 6, the proposed analysis is extended to explain the lack of the insignificance reading in a class of cases, including (i) sentences with NPI *renhe*; (ii) sentences with the adverb of quantification *dou*; (iii) sentences with head *wh*-pronouns; (iv) sentences with bare nouns; (v) sentences with imperfect aspect; and (vi) sentences with non-locality negation. Section 7 concludes the paper.

2. Distribution of the insignificance reading

The insignificance reading is common in daily conversation in Mandarin Chinese. Related to the wide distribution of the insignificance reading, there is no restriction with the semantic type of common nouns following *shenme*. Specifically, the common noun could be an NP denoting a concrete object like *pingguo* 'apple' (i.e. (4a)), or an NP denoting an abstract notion like *zuoyong* 'positive effect' (i.e. (4b)); furthermore, the

common noun could be an NP denoting an individual, as is the case with *ren* 'person' (i.e. (4c)), or it could be an NP denoting a non-individual, as with *shui* 'water' (i.e. (4d)). [5]

(4) a. *Zhangsan mei chi shenme pingguo*

    Zhangsan Neg eat what   apple

    (i) 'Zhangsan hardly ate any apples.'

    (ii) 'Zhangsan did not eat any apples.'

  b. *Laoshi de xunhua mei qi   shenme zuoyong*

    teacher De criticism Neg cause what   positive effect

    (i) 'The teacher's criticisms hardly made any positive effect (to students).'

    (ii) 'The teacher's criticisms did not make any positive effect (to students).'

  c. *Zhangsan zuotian   mei jian   shenme ren*

    Zhangsan yesterday Neg meet what   person

    (i) 'Zhangsan hardly met any persons yesterday.'

    (ii) 'Zhangsan did not meet any persons yesterday.'

  d. *Zhangsan zuotian   mei he   shenme shui*

    Zhangsan yesterday Neg drink what   water

    (i) 'Zhangsan hardly drank any water yesterday.'

    (ii) 'Zhangsan did not drink any water yesterday.'

Since the insignificance reading is not confined to any particular noun type, this interpretation is also available when *shenme* is embedded in a NP structure in which the

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[5] An anonymous reviewer pointed out that the insignificance reading is not obvious with nouns like *miao* 'cat' or *gou* 'dogs'. For instance, the reviewer judged the following sentence to be awkward.

 (i) *Wo jintian mei kanjian shenme mao, zhi kanjian yi zhi xiao-zhi de.*
   I   today Neg see   what cat   only see   one CL small-CL MOD
   'I hardly saw any cats today, only saw a little one.'

In our view, this sentence would be very natural once a felicitous context is provided. A possible felicitous context is like this. Suppose you told me that Zhangsan had adopted many kinds of cats, and I was very curious about it and went to visit Zhangsan. However, I ended up seeing only one little cat in Zhangsan's place. I was a little bit disappointed and said sentence (i) to you. Against this backdrop, (i) sounds perfect. As it will be explained shortly, the context we provide here sets up a contrast set, which serves to trigger the insignificance reading.

noun phrase is elided. This is illustrated in (5a), where the NP *dongxi* 'thing' can be elided, as indicated by the bracket:

(5) *Bingxiang li mei shenme chi de <dongxi> le*

     fridge   in Neg what eat De thing   Asp

    (i) 'There is hardly any food left in the fridge.'

    (ii) 'There isn't any food left in the fridge.'

Despite the lack of the constraint in the noun type, the distribution of the insignificance reading is subject to a range of constraints that involve various aspects of Chinese grammar. Let us take them in turn.

2.1 *Wh*-morphology

The first linguistic constraint governing the distribution of the insignificance reading concerns *wh*-morphology. Specifically, *shenme* is the only *wh*-pronoun that licenses this reading. A relevant observation is contributed by Lin (1998a: 251). Lin points out that sentences containing *shenme ren* 'what person', as in (6a), can be assigned the insignificance reading (in addition to the 'none' reading); by contrast, sentences with the *wh*-pronoun *shei* 'who' can only receive the 'none' reading, as illustrated in (6b):

(6) a. *Mei you   shenme ren   yuanyi bang ta*

    Neg have what   person willing help him

    (i) 'There are hardly any persons who are willing to help him.'

    (ii) 'Nobody is willing to help him.'

  b. *Mei you   shei yuanyi bang ta*

    Neg have who willing help him

    'Nobody is willing to help him.'

The presence/absence of the insignificance reading is not merely an idiosyncratic property of *shenme ren* and *shei*. A similar discrepancy can be found in the pair *shenme difang*

'what place' and *nali* 'where'. The insignificance reading is available for the sentences containing *shenme difang*, but not for the sentences containing *nali*. Consider (7)[6]:

(7) a. *Zhangsan jintian mei qu shenme difang,   zhi qu le   tang caishichang*

   Zhangsan today Neg go what   place   only go Asp CL market

   'Zhangsan hardly went to any places today, and he only went to the market.'

   b. *Zhangsan jintian mei qu nali,   *zhi qu le   tang caishichang*

   Zhangsan today Neg go where only go Asp CL market

   'Zhangsan did not go to any place today, * and he only went to the market.'

In (7a), a negative statement containing *shenme difang* 'what place' is followed by a clause with the focus operator *zhi* 'only'. This clause indicates that Zhangsan went to a place, i.e., the market, though this place is not 'significant'. So it is not true that Zhangsan did not go anywhere. In other words, the subsequent follow-up clause suggests the existence of the insignificance reading in (7a). However, the same focus structure is not appropriate in (7b), in which *nali* 'where' is embedded in the first clause.

   The grammatical contrast in (6) and (7) thus indicates that the *wh*-pronoun *shenme* is the only *wh*-pronoun that can generate the insignificance reading.

2.2 Sentential aspect[7]

   Sentential aspect is another linguistic constraint governing the license of the insignificance reading. This is manifested by the selection of the negation operator that is used in negative statement with *shenme*. In particular, there are three negation operators in

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[6] An anonymous reviewer pointed out that example (7b) is acceptable, and that there does not seem to be a contrast between *shenme difang* 'what place' and *nali* 'where'. However, most of our informants confirmed the meaning difference between (7a) (with *shenme difang*) and (7b) (with *nali*), as we are arguing here. Nevertheless, we found that the meaning difference between *shenme difang* and *nali* is more transparent in another linguistic structure as in (i).

(i) *Beijing huozhe Shanghai, nali/*shenme difang   hao-wan jiu   qu nali/*shenme difang*
   Beijing or   Shanghai where/what place   good-play then go where/what place
   (lit.) 'Among Beijing or Shanghai, which city is attractive then I will go which city.'

 In (i), the first clause provides a limited set of individuals (i.e., Beijing and Shanghai), which the *wh*-pronoun in the second clause can refer back to. In this individual-denoting context, it is *nali* 'where' but not *shenme difang* 'what place' that is legitimate. This is confirmed with all of our informants. We will get back to this in section 4, where the denotation of these two distinct types of *wh*-pronouns will be discussed.

[7] We are grateful for a reviewer pointing out the aspectual factors involved in the licensing of the insignificance reading.

Mandarin Chinese, *mei, bu* and *bie,* which encode distinct aspectual features, but only the perfective negation operator *mei* can license the insignificance reading.

(8) *Zhangsan mei chi shenme pingguo.*

    Zhangsan Neg eat what   apple

    (i) 'Zhangsan hardly ate any apples.'

    (ii) 'Zhangsan did not eat any apples.'

(9) *Zhangsan bu chi shenme pingguo.*[8]

    Zhangsan Neg eat what   apple

    'Zhangsan does not like to eat any apples.'

(10) *Bie chi shenme binjiling. (Tian tai leng le)*

    Neg eat what   icecream (weather too cold Asp)

    'Don't eat any icecream. (it is too cold.)'

It is widely known that the negation operators *mei* differs from the negation operators *bu* and *bie* in the selection of aspectual viewpoint and situation type (Wang 1965; Teng 1973; Li and Thompson 1981; Ernst 1995; Hsieh 2001; Lin 2003; among many others). Generally speaking, *mei* associates with dynamic situations, including activities, accomplishments and achievements (Hsieh 2001; Lin 2003; Cf. Vendler 1967). Importantly, *mei* is taken as the negative counterpart of the perfective aspect marker *le* (Wang 1965; Chao 1968: 439; Cf. Li and Thompson 1981:430-438); in this regard, the use of *mei* then invokes a perfective viewpoint. The perfective viewpoint represents a situation as a single whole, and spans the initial and final endpoints of the situation (Comrie 1976; Smith 1991, 1994).

On the contrary, the negation operator *bu* selects unbounded or static situations, or situations that do not change or develop over time (Ernst 1995; Hsieh 2001; Lin 2003). As for the negation operator *bie*, it is suggested that *bie* selects an unbounded or imperfective event. This is because by using a negative imperative, the speaker is actually urging that it *not* happen (Li and Thompson 1981: 211). In short, both *bu* and *bie* invoke an imperfective viewpoint. Imperfective viewpoints present the internal temporal constituency of a

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[8] A reviewer pointed out that the use of *shenme* in (9) exhibits a metalinguistic use of *wh*-pronouns. In this case, it means "whatever apple you mention, Zhangsan does not like to eat."

situation, with no information about its endpoint. In this regard, imperfectives are open informationally (Comrie 1976; Smith 1991, 1994)

In view of the fact that the perfective negation operator *mei* is the only negation operator associated with the construction of the insignificance reading, we conclude that the licensing of the insignificance reading requires a dynamic situation type and a perfective viewpoint. The negation operators *bu* and *bie* do not accommodate such aspectual features, thus fail to license the insignificance reading.

Interestingly, the use of the perfective negation operator *mei* cannot guarantee the insignificance reading. When an imperative aspect marker, such as the progressive aspect marker *zai* or the durative aspect marker *zhe* is present, the insignificance reading disappears.

(11) a. *Zhangsan mei zai tui   shenme che*

        Zhangsan Neg Asp push what   car

        'Zhangsan is not pushing any cars.'

    b. *Zhangsan mei   tui   zhe shenme che*

        Zhangsan Neg push Asp what car

        'Zhangsan is not pushing any cars.'

The aspect marker *zai* indicates that an action or an event is in progress, hence the name of progressive marker. The aspect marker *zhe* indicates that a situation is viewed as enduring or continuing. Both the progressive aspect marker *zai* and the durative aspect marker *zhe* are categorized as imperfective aspect makers in Mandarin (Li and Thompson 1981; Smith 1991, 1994). The presence of these two aspect markers in (11) renders the sentences an imperfective viewpoint. The lack of the insignificance reading in (11) gives further support on the generalization that the aspect of perfectivity constitutes a licensing condition for the insignificance reading.

2.3 Local negation

To license the insignificance reading, the negation operator *mei* and the *wh*-pronoun *shenme* have to be part of the same clause. When *mei* and *shenme* are separate in different clauses, the insignificance reading is not available.

(12) *Wo mei shuo Zhangsan chi le shenme pingguo.*

    I   Neg say   Zhangsan eat Asp what apple.

    'I did not say Zhangsan ate any apples.'

In (12), the clause that contains *Zhangsan chi le shenme pingguo* is embedded in the clause with the negation *mei*. The insignificance reading is not available in this case.

2.4 Pragmatic inference

      As noted earlier, negative sentences with *shenme* are generally assigned the 'none' reading when they are processed out of context (Cf. Example (1)). This seems to be the cause of why most Chinese linguists fail to identify the insignificance reading. Importantly, we find that the insignificance reading is more transparent when negative sentences with *shenme* are used for a comparison. For instance, the insignificance reading is obvious in (13). On the insignificance reading, this sentence means the food eaten by Lisi is trivial (i.e., close to nothing) compared to the food eaten by Zhangsan.

(13) *Zhangsan chi le henduo pingguo, keshi Lisi mei chi shenme pingguo.*

    Zhangsan eat Asp lots of apple   but   Lisi Neg eat what apple

    (i) 'Zhangsan ate a lot of apples, but Lisi hardly ate any apples.'

    (ii) 'Zhangsan ate a lot of apples, but Lisi did not eat any apples.'

As will be discussed in more detail in section 5, the comparison in question sets up a contrast set, and this contrast set triggers some pragmatic inferences that give rise to the insignificance reading.

      To wrap up, we have exhibited a cluster of licensing conditions for the insignificance reading. These conditions are related to a wide range of aspects of Chinese grammar: *wh*-morphology, sentential aspect, locality and pragmatic inference. The listing of these licensing conditions is not sufficient for the understanding of the insignificance reading. We need to explain *how* the insignificance reading emerges by taking into account the licensing conditions. This is the main task for the remainder of the paper. Before we present the analysis, let us see how the insignificance reading is treated in previous literature.

3 Traditional Grammars and recent works

The insignificance reading is widely documented in traditional Chinese grammar (Li 1924; Wang 1943; Ding et al 1961; Chao 1968; Zhu 1982; Lü 1985). The accepted view is that *shenme* softens the tone of negative sentences, as compared to the same sentence without *shenme*. For instance, if somebody says *wo mei shuo shenme hua* 'I-not-say-what-word', it could be the case that he did not say anything; alternatively, this sentence could mean he did not say anything important, implying he may have said one or two irrelevant things. The two readings are exactly what we identify here as the 'none' reading versus the insignificance reading in negative sentences containing *shenme*. By contrast, the sentence *wo mei shuo hua* 'I-not-say-word', in which the common noun *hua* 'words' occurs immediately following the verb *shuo* 'say', means only 'I did not say anything' (the examples are from Lü Shuxiang 1985: 160-161).

In recent studies of Chinese *wh*-pronouns, the insignificance reading of *shenme* is largely ignored, probably due to the trend of analyzing *wh*-pronouns as (negative) polarity items (Cf. Lin 1996)[9]. To the best of our knowledge, among a large body of literature on Mandarin *wh*-pronouns, only a handful of studies are aware of this phenomenon (Lin 1996, 1998a, 2004; Hole 2004; Dong 2009; Cui 2012). Hole (2004) and Cui (2012) offer an account of the insignificance reading that goes in any relevant detail. Next we take a close look at these two studies.

3.1 Hole (2004)

In Hole (2004: 203-209), the insignificance reading and the 'none' reading are illustrated with the sentences in (14) (Hole's example 127: 204):

(14) a. *Lao Li mei   mai shenme*

    Old Li Neg buy what

    'Old Li hasn't bought anything special.'   Insignificance reading

  b. *Lao Li shenme   dou/ye mei mai*

    Old Li what   all/also not buy

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[9] Lin (1996) argues that *wh*-pronouns cannot receive a unified account. Particularly, Lin contends that *wh*-pronouns in *wh*-dou constructions are not polarity items. Readers are invited to refer to Lin's work for details.

'Old Li hasn't bought ANYTHING AT ALL.'[10]   'None' reading

In (14a), *shenme* occurs in the post-verbal position, under the scope of negation. In (14b), *shenme* is preposed to the pre-verbal position followed by the adverb of quantification *dou* 'all' or *ye* 'also'. Hole contends that *shenme* has different interpretations in these two structures. Suppose Lao Li goes shopping to buy a big present for his wife, such as a diamond ring or something else expensive like a fur coat. However, Lao Li ends up buying a pair of socks, which is much undervalued compared to what Lao Li is expected to buy. Under this scenario, (14a), where *shenme* is in the post-verbal position, can still truthfully hold. This is because the denotation of *shenme* 'thing', which is only applicable to costly presents in this context, does not include trivial things like a pair of socks that is beyond the speaker's expectation. In this regard, Lao Li can be said to have bought 'nothing' for his wife. According to Hole, this gives rise to the 'weak' interpretation of (14a) (or the insignificance reading in our terminology).

On the other hand, when *shenme* is in the pre-verbal position followed by *dou* or *ye* as in (14b), it becomes the focus of the sentence. According to Hole, then, the criterion of defining the 'thing' is "relaxed" in this focalized context: things that would not count in (14a) are instantaneously considered to be something. In this circumstance, even a pair of socks does count as something in (14b). So this situation cannot be rendered true by (14b), as one cannot say that Lao Li has not bought anything for his wife when a trivial thing like a pair of socks is under consideration for the denotation of *shenme*. As a consequence, the negation in (14b) is semantically stronger than the negation in (14a).

To sum up, Hole attributes the alternation of the 'none' reading and the insignificance reading to the particular linguistic contexts in which *shenme* NP occurs: while the 'none' reading corresponds to the pre-verbal focus structure containing *dou* 'all', the insignificance reading is tied to the post-verbal structure in which *shenme* NP is under the scope of negation. Hole's account captures the intuition that the existence of entities conveyed by the 'weak' reading must be insignificant: in his story the socks are undervalued, and are not the kind of expensive and valuable gifts Liao Li is expected to buy. However, there are several points in Hole's analysis that deserve consideration.

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[10] Hole analyzes (14a) and (14b) along the lines of Krifka's (1995a) treatment of *anything* and stressed *ANYTHING (AT ALL)* in English. Technical details aside, these two are taken as representatives of weak and strong negative polarity items, respectively. So sentences like *Mary did not get anything* can be rendered true in a situation in which Mary got the petty stuff like a piece of chewing gum from her friend as her birthday gift, but the same situation is considered as false for the interpretation of the sentences like *Mary did not get ANYTHING (AT ALL)*, with the stress on *anything (at all)*.

First, this analysis does not provide a complete picture on the interpretation of *shenme* in negative statements. Essentially, the 'none' reading does not necessarily resort to the preposed focus structure as in (14b); the 'none' reading is also available when *shenme* is in the post-verbal structure as in (14a). In other words, the one-to-one correspondence does not hold between the 'none' reading and the preposed focus structure on the one hand, and between the insignificance reading and the post-verbal structure on the other hand. A more appropriate description of the phenomenon is that, while the post-verbal structure accommodates both the 'none' and the insignificance readings, the pre-verbal focus structure allows only the 'none' reading.

Second, Hole's analysis does not draw a distinction between the *wh* phrases like *shenme ren* 'what person' and the *wh*-pronouns like *shei* 'who', so the (un)availability of the insignificance reading associated with these two groups of *wh*-pronouns is not explained. In particular, on Hole's analysis, sentences containing *shei* would be assigned an insignificance reading when *shei* is put in the postverbal position. This is contrary to fact, as shown in (4b) *Mei you shei yuanyi bang ta* 'Nobody is willing to help him.' This sentence can only receive the 'none' reading, and the insignificance reading is not available for the *wh*-pronouns like *shei* 'who'.

3.2 Cui (2012)[11]

Cui (2012) identifies the insignificance reading by using the following scenario and example.

(15) Scenario: a person asked his friend what movies she watched lately.

   (*Wo zui-jin mei kan shenme dianying,)jiu   yi   bu Ha-li Bo-te*.

    I   lately not watch what movie   only one CL Harry Potter

    'I didn't watch SHENME movies lately; only Harry Potter.'

(15) is described with the meaning 'there is at least one movie the speaker watched'. This reading is called Existential Inference reading by Cui (Hereafter we provisionally use this term to refer to the insignificance reading when we review Cui's account). The Existential Inference reading is formally represented as (16).

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(16) $\exists$x [CN'(x) & Pred' (Subj', x)]

Cui contrasts the negative sentences containing *shenme* with negative sentences containing bare nouns. Importantly, negative sentences with bare nouns do not accommodate the Existential Inference reading:

(17) # *Wo zui-jin mei kan dianying; jiu   yi   bu Ha-li Bo-te.*

     I   lately not watch movie only one CL Harry Potter

  'I didn't watch movies lately; only Harry Potter.'

(17) is infelicitous, as only the 'none' reading is possible when a bare noun is under the scope of negation.

     To explain the Existential Inference reading, Cui advances two theoretical assumptions. First, the Existential Inference reading is a conversational implicature, and not an entailment. This is supported with the defeasibility of this reading, as shown in (18).

(18) *Wo zui-jin mei kan shenme dianying. yi   bu dou mei kan.*

    I   lately not watch what movie   one CL all   not see

  'I didn't watch SHENME movies lately; Not even one.'

Second, *shenme* is argued to have the domain selection function *f*. This function takes the common noun that *shenme* combines with, and returns a subset of the extension of that common noun. The domain selection function of *shenme* is formalized as (19).

(19) Components of the meaning of *shenme*:

    $\exists$: quantification over individuals

   f: selection of the domain of quantification

    [|*shenme* |^f = λP.λQ.$\exists$x [x $\in f$ (P) & Q (x)]

Applying the domain selection function of *shenme*, Cui uses the logical form (20b) to characterize the interpretation of the negative sentence with *shenme* (20a) (formally the first conjunct of (15)). This differs from the logical form associated with the negative sentence with bare noun (21a) (formally the first conjunct of (17)), as indicated in (21b).

(20) a. *Wo mei kan shenme dian-ying*

    b. ¬∃x[x∈*f*(movie) & Watch (I, x)]

(21) a. *Wo mei kan dian-ying*

    b. ¬∃x[movie (x) & Watch (I, x)]

Now, when the domain selection function returns a domain smaller than the extension of the common noun that *shenme* combines with, (21b) entails (20b), such that sentence (21a) is stronger than sentence (20a).

    Taken together, the Existential Inference reading is inferred through the following Gricean pragmatic principles:

(22) i. The speaker said (20a) rather than (21a), which would have also been relevant.

    ii. (21a) is stronger than (20a).

    iii If (21a) is true, the speaker would have said so.   Maxim of quality

    iv. The speaker has not evidence that (21a) holds.

    v. It is not the case that (21a) holds. This is the Existential Inference ∃x [Movie (x) & Watch (I, x)]

    There are some interesting insights in Cui's analysis. First, she recognizes that the Existential Inference reading is not part of the compositional meaning of negative sentences with *shenme*. Instead, the Existential Inference reading is an outcome of conversational implicature. Second, she contends that *shenme* has a semantic function that can select a subset of entities denoted by the common noun. However, there are several issues that deserve our careful reflections.

    First, Cui does not recognize that, apart from the insignificance reading, the 'none' reading is also associated with negative sentences with *shenme*. This problem is similar to one we pointed out for Hole's (2004) account.

    Second, Cui advances the idea that *shenme* can select a subset of entities denoted by the common noun. However, this proposal does not explain **why** *shenme* has such a semantic function. A related point is that, without identifying the grammatical status of *shenme*, it would be a mystery for Cui to explain why some other *wh*-pronouns such as *shei* 'who' do not embrace the domain selection function in their meaning, if one ascribes

the domain selection function to the construction of the insignificance reading. Remember that only *wh*-pronoun *shenme* can receive the insignificance reading (Cf. section 2.1).

Third, Cui simply imputes an existential reading to the Existential Inference reading, without recognizing a sense of insignificance involved in this reading. For instance, (20a) is semantically represented as $\exists x$ [Movie (x) & Watch (I, x)], which says there exists at least one movie that I watched. This is not an appropriate way to capture the Existential Inference reading, because the logical form $\exists x$ [Movie (x) & Watch (I, x)] does not say anything about the significance of the movie(s). In principle, it would allow the situation that the movie(s) is/are 'significant'. As noted earlier (footnote 4), negative statements with *shenme* are not appropriate to describe the situations that allow the existence of significant kinds of entities. As will become clear in the remainder of the paper, the sense of insignificance is crucial for the appreciation of the insignificance reading.

Taking stock, we have seen that negative statements containing *shenme* NPs have a peculiar insignificance reading, in addition to the 'none' interpretation. However, Chinese linguists generally do not recognize these two alternative meanings in a comprehensive way. Two kinds of extremes are identified. Some Chinese linguists intend to assign only the 'none' reading to the sentence structure, ignoring the insignificance reading (e.g., Huang 1982, Li, A. 1992); conversely, some other Chinese linguists admit of the insignificance reading, but precluding the 'none' reading (e.g., Hole 2004, Cui 2012). Furthermore, it remains obscure how the insignificance reading is derived, and how various licensing conditions as discussed in section 2 are integrated into the analysis of the insignificance reading. In section 5, we will offer an alternative analysis on the interpretation of *shenme* NPs in negative statements. To prepare for the analysis, we need to examine first some basic linguistic properties of *shenme*. This is the task for section 4.

4. Linguistic properties of *shenme*

In this section, we first propose that *shenme* is a proform of NP modifiers. The modifier status of *shenme* makes it distinguished from other *wh*-pronouns such as *shei* 'who', which are proforms of nominal heads. Then we will provide a range of independent evidence supporting the idea that *shenme* partitions the denotation of NP it modifies into kinds.

4.1 *Shenme* is a proform of NP modifiers

Traditional Chinese grammarians contend that the *wh*-pronoun *shenme* can be used as a modifier, functioning as a proform that substitutes for a set of attributes (or kind) (Li 1924; Wang 1943; Ding et al 1961; Chao 1968; Zhu 1982; Lü 1985). This can be illustrated by Zhu's (1982:90) characterization of the meaning difference that arises in questions with *shenme ren* 'what person' as compared to questions with *shei* 'who'. The difference in interpretation is illustrated in (23):[12]

(23) a. *Zhangsan shi shenme ren*?

Zhangsan be what person

'What kind of person is Zhangsan?'

b. *Zhangsan shi shei*?

Zhangsan be who

'Who is Zhangsan?'

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[12] *Shenme ren* and *shei* in (23) can be answered with the same definite description, such as *wo tongxue de didi* in sentence (i):

(i) *Ta shi wo tongxue   de didi*
   He Be my classmate De younger-brother
   "He is the younger brother of my classmate"

However, the definite description functions differently in responding to *shenme ren* and *shei*. In responding to the *shenme ren* question in (23a), this definite description is predicated of the subject *Zhangsan*, specifying the attribute of being a person who is my classmate's younger brother. This suggests that (23a) is a typical copular sentence in Mandarin, consisting of a referential term in the subject (*Zhangsan*) and a non-referential term in the predicate (*shenme ren*). Due to the structural constraint of the copular sentence, we can not reverse the position of subject and predicate in this structure. This explains the ungrammaticality of (ii).

(ii) * *Shenme ren shi Zhangsan*?
     What   person Be Zhangsan
     '*What person is Zhangsan?'

On the other hand, in responding to the *shei* question in (23b), the definite description *wo tongxue de didi* is used to identify a particular person. In this case, (i) constitutes an identity statement, x=y, where both x and y are referential terms. Since the two referential expressions in an identity statement are identical, we can freely reverse their position, such that [x=y]↔ [y=x]. This explains why the proper name *Zhangsan* and the referential *wh*-pronoun *shei* in (23b) can freely swap their position without causing much meaning difference, as shown in (iii).

(iii) *Shei shi Zhangsan*?
    Who Be Zhangsan
    'Who is Zhangsan?'

The grammatical contrast between (ii) and (iii) is consistent with the categorical distinction between *shenme* and other *wh*-pronouns to be discussed in this section.

According to Zhu (1982), *shenme ren* in (23a) is used to query about the kind of person Zhangsan is. By contrast, *shei* in (22b) is used to simply identify a particular person among a set. A similar interpretive difference between *shenme ren* and *shei* is found in statements, as in (24):

(24) a *Wo bu   zhidao Zhangsan shi shenme ren*

     I   Neg know Zhangsan be what   person

     'I don't know what kind of person Zhangsan is.'

    b. *Wo bu   zhidao Zhangsan shi shei.*

     I   Neg know Zhangsan be who

     'I don't know who Zhangsan is.'

    Since *shenme ren* 'what person' and *shei* differ in their semantic denotation, it is not a surprise that they can line up in a sequence of questions, as shown in (25):

(25) *Zhe Meiding shi   shei a?   shi ge   shenme ren ya*?

    this Meiding Aux who Q   Aux CL what   person

    'Who is this Meiding? What kind of person is he?'   (Lü 1985: 116)

In (25), the speaker is first locating a particular person named Meiding by using the sentence containing *shei*; then he goes further to ask what kind of person Meiding is by using the sentence containing *shenme ren*. These two *wh*-phrases are used to query about different aspects of a single entity, so no redundancy is observed here.

    Zhu's (1982) characterization of the meaning difference between *shenme ren* and *shei* reflects a categorical distinction between two types of *wh*-pronouns. On the one hand, *shenme* occupies a modifier position; it combines with a common noun to form a phrase*, shenme* NP. In this regard, we refer to *shenme* as the modifier *wh*-pronoun. The *shenme* NPs such as *shenme ren* 'what person', *shenme yuanyin* 'what reason', or *shenme fangshi* 'what way' are examples of modifier *wh*-phrases. On the other hand, *wh*-pronouns such as *shei* 'who', *nali* 'where', *weishenme* 'why', or *zenmeyang* 'how' form a phrasal unit by itself; they serve as the syntactic head of the phrase.

    The syntactic difference between the modifier *wh*-pronoun *shenme* and head *wh*-pronouns determines that these two types of *wh*-pronouns have distinct denotational

meanings. In particular, denotation of a head *wh*-pronoun involves a set of individual objects. For instance, (26) indicates that the speaker believes at least one person came in.[13] In this case, *shei* substitutes for a set of individual persons such as John, Mary, etc. By using the indefinite *wh*-pronoun *shei*, the speaker indicates that he does not have the knowledge which individual person came in, or he intends not to spell out the name. In this regard, *shei* in (26) introduces an open set of individual persons: without specifying the exact name(s), the person(s) in question could be John, or Mary,… or Jeff. In short, *shei* in (26) introduces a disjunctive sequence of names.

(26) *You shei jin   lai le*.

    have who come in Asp

    'Somebody came in.'

    On the other hand, the modifier *wh*-pronoun *shenme* partitions the denotation of the NP it modifies into kinds, such that *shenme* introduces a set of kinds of entities. To illustrate, consider (27).

(27) *Zhangsan haoxiang mai le shenme pingguo*

    Zhangsan seem   buy Asp what apple

    'Zhangsan seems to have bought some apple(s) of some kind or other.'

In (27), the speaker states that Zhangsan bought at least one, possibly more than one apple (Cf. footnote 13). Suppose Zhangsan bought three apples. One possibility is that all three apples are of the same kind, say Pink Lady apples. Another possibility is that one of them is a Pink Lady, but the other two are Granny Smith apples. Alternatively, each of the three apples could belong to different kinds. The basic intuition is this. The speaker of (27) asserts that Zhangsan bought at least one apple, but the speaker is not committed to knowing the specific kind of apple or kinds of apples that Zhangsan bought. So, *shenme* is an indefinite proform without explicit descriptive content. In this regard, *shenme* in (27)

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[13] In Mandarin Chinese, there is no plural marker attached to the nominal phrases. Instead, the quantification function is taken by the classifier system (Greenberg 1972; Krifka 1995b; Chierchia 1998; Borer 2005; Au Yeung 2005; Huang 2009; Huang and Lee 2009). In (26), no classifier is used, so the number of persons that came in is underspecified.

introduces an open set of (possibly different) kinds of apples {Granny Smith apples, Pink Lady apples, red apples, big apples, …}.[14]

To recap, the categorical distinction between head *wh*-pronouns (functioning as a proform of syntactic Head) and the modifier *wh*-pronoun *shenme* (functioning as a proform of NP modifiers) has a profound impact on their semantic denotation. While head pronouns stand for an open set of individual objects, the modifier *wh*-pronoun *shenme*, when combined with a NP, stands for an open set of individual kinds.

Since modifier *wh*-pronoun and head *wh*-pronoun have distinct denotations, it is predicted that a pair of modifier *wh*-pronoun and head *wh*-pronoun cannot forge a co-reference. This prediction is borne out in Chinese donkey sentences like (28) (see Cheng and Huang 1996; Lin 1996; Chierchia 2000; Pan and Jiang (to appear) for relevant theoretical discussions of Chinese donkey sentences). This observation is due to Cheng and Huang (1996), but now we have a straightforward explanation on the inconsistency.

(28) *Ni xihuan shei, wo jiu   piping   shenme ren*

    you like   who I then criticize what   person

    'If you like X, I will criticize X.'   (Cheng and Huang 1996: 129)

4.2 More on the kind concept of *shenme*

There is nothing new to claim that head *wh*-pronouns denote individual objects (e.g., Lin 1999). However, we need elaborate more on our claim that *shenme* partitions the denotation of the NP it modifies into kinds. In this section, more independent evidence will be provided to support the claim. First of all, a kind-denoting co-reference can be established in Chinese donkey sentences containing *shenme*, an observation due to Lin (1999). To illustrate, (29) states that, the object you go to buy, say, a bowl, should be the same kind of entities you break. In this respect, the co-referential link established between the pair of *shenme dongxi* 'what thing' in the antecedent and in the consequent of (29) is built at the kind-denoting level. Thus, the pair of *wh*-pronoun *shenme* in Chinese donkey sentences may refer to a different object but of the same kind. Actually, the pair of *shenme*

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[14] The underspecification in denotation contributed by *shenme* and other *wh*-pronouns is expressed in traditional Chinese grammar with the terms *xu zhi* 'null denotation' and *wuding zhicheng* 'nonspecific denotation' (e.g., Li 1924; Lü 1985).

NP in (29) cannot refer to the same object, because, once an object is broken, we cannot compensate the owner with the original object.

(29) *Ni   daopo shenme dongxi, jiu   de   qu mai shenme dongxi lai   pei*
     you break what   thing   then must go buy what   thing   come compensate
       'If you break something, then you must go to buy another object of the same kind
       for compensation.

Interestingly, it is observed that the pair of the modified common nouns does not need to be identical for the licensing of a kind-level co-reference. A set of illustrative examples is given in (30) (Hua 2000: 184-187).

(30) a. *Bo   shenme zhong, jiu   jie   shenme guo*
       sow what   seed   then grow what   fruit
       'What fruit will grow depends on what seed one sows.'

    b. *Jian shenme ren,   jiu   jiang shenme hua*
      see what   person then say   what   words
      '(Always) say the thing that suits the person you meet with.'

    c. *Dao shenme changhe, jiu   chuan shenme yifu*
      go   what   occasion then wear   what   clothes
      'What one wears should best suit the occasion one finds himself in.'

    d. *Women he   shenme jiu,   jiu   yong shenme bei*
      we   drink what   wine then use   what   cup
      'We should use a type of cup that fits the type of wine one drinks.' (Hua 2000: 184)

In each of the sentences in (30), the pair of modifier *wh*-phrases denotes two distinct types of entities, but these two types of entities share certain properties that define their categorical identity; *shenme* as a modifier stands for the relevant defining properties. For example, sentence (30a) means: every kind of crop should be planted in its matching kind of land (e.g., rice should be planted in paddy fields, and corn should be planted in drylands,

etc). That is, the two sets of things denoted by the pair of modifier *wh*-phrases match the identity in kind.

By contrast, head *wh*-pronouns in Chinese donkey sentences accommodate only the object-level co-reference. For instance, (31) states that if a person comes first, the same person will eat first.

(31) *Shei xian lai,   shei xian chi*

    who first come   who first eat

    'If x comes first, x eats first.'

The fact that a kind-denoting co-reference is involved in Chinese donkey sentences containing *shenme* thus constitutes one piece of evidence showing that a kind-concept is involved in the semantics of *shenme*. This kind concept is missing in head *wh*-pronouns, as attested by the lack of the kind-denoting co-reference in donkey sentences with head *wh*-pronouns.[15]

Secondly, since *shenme* partitions the denotation of the NP it modifies into kinds of entities, it is anticipated that *shenme* is prohibited if a partition of kinds is not possible. This explains why *shenme* in (32a) cannot precede and modify the nominal expression *gebi de ren* 'in-the-next-room-De-person'. This nominal expression only describes a temporary location of a group of people, without specifying regularities that occur in nature. So it is not possible to carve out a sub-kind of entities with the denotation of *gebi de ren*.[16]

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[15] Lin (1999) points out that some Chinese donkey sentences containing *shenme*, such as (i) below, exhibit the object-denoting co-reference.

(i) *Wo zheli de dongxi, ni   yao shenme jiu   na shenme*
    I   here De thing   you want what   then take what
    'As for my things here, if you want x, then you can take x.'   (Lin 1999: 573).

    Notice that Lin (1999) takes a different approach dealing with *shenme* in (29) and in (i). To Lin, while (29) accommodates the kind-denoting co-reference, (i) allows only the object-denoting co-reference. In our view, the apparent object-denoting co-reference in (i) is a derived concept, and the kind-denoting co-reference is also involved in this sentence. Specifically, sentence (i) can be interpreted as 'If you want an object x of kind y, then you can take the same object x of kind y'. That is, the denotation of the *shenme* NP in the antecedent and the one in the consequent of (i) are identical both at the object-denoting level and at the kind-denoting level. In this regard, both (i) and (29) allow the kind-denoting co-reference, but (i) additionally requires the object-level co-reference. In a sense, (i) is a special case of (29). Our analysis of the modifier *wh*-pronoun *shenme* and head *wh*-pronouns in Chinese donkey sentences is consistent with the grammatical distinctions between these two types of *wh*-pronouns discussed throughout the paper.

[16] If we replace *shenme ren* with *shei* 'who' in (32b), as shown in (i), two kinds of responses are solicited from our informants. Some of the informants judged (i) to be unacceptable. This is conceivable, as *shei* is a substitute for individual persons, and hence it cannot be partitioned into kinds of persons by attaching to a modifier. Alternatively, some other informants said (i) is grammatical, but this sentence is used in a situation different from that for (32b). That is, the use of *shei* in (i) implies that the speaker has a particular person in mind but he momentarily fails to retrieve the person's name from his memory. Such 'specific' use of *shei* is identified in the literature (Cf. Ding et al 1961: 166). In

(32) a. * *Ta haoxiang tingdao shenme gebi   de ren   zai   jianghua*

        He seem   hear   what   in-the-next-room De person Asp talk

   b . *Ta haoxiang tingdao gebi   de shenme ren   zai   jianghua*

        He seem   hear   in-the-next-room De what   person Asp talk

        'He seemed to hear someone of some sort in the next room talking.'

    Note that it is not a problem to say *shenme ren* 'what-person', as shown in (32b). In this case, *shenme* modifies the common noun *ren* 'person'. This is allowed, because *shenme* picks up persons at a more specific sub-kind level, for instance, kind persons, elegant persons, etc. There is no restriction for *shenme* here to pick up a kind of entities denoted by the common noun *ren* 'person'.[17]

    Sentence (33) represents another case showing *shenme* is banned when a partition of kinds is not possible. In (33a), the first clause *wo you yi ge erzi he yi ge nü'er* (I have a son and a daughter) specifies that the speaker is talking about two particular persons, i.e., his son and daughter, without resorting to a kind concept. In this case, the modifier *wh*-phrase *shenme ren* cannot be used to establish an anaphoric relation in the second clause. Instead, the head *wh*-pronoun *shei* is obligatory in this structure, as shown in (33b). Note that the second clause of (33a) *Shenme ren xiaoshun wo, wo jiu ba   yichan liu gei shenme ren* (lit. what person$_i$ shows filial obedience to me, I will give my legacy to what person$_i$)

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this case, *gebi de* seems to function as a non-restrictive relative clause, though the theoretical assumption is not crucial for us. By the contrast, the same informants pointed out that the speaker of (32b) does not know the person in question.

(i) *Ta haoxiang tingdao gebi   de shei   zai   jianghua*
   He seem   hear   in-the-next-room De who   Asp   talk
   'He seemed to hear someone in the next room talking.'

Again, the meaning difference between (32b) and (i) supports the divide between modifier *wh*-pronoun *shenme* and head *wh*-pronouns.

[17] The argument here is analogous to the one put forward by Carlson (1977: 230-236) arguing *such* in English is a proform of NP modifiers (Cf. Siegel 1994; Spinillo 2003). Specifically, Carlson observes that modifiers like *in the next room* cannot be an antecedent of *such*, as shown by the question marks in (i). This is because this kind of expressions describes a temporary location or state of a group of entities, rather than picking out a kind of things with regularities that occur in nature.

(i) People *in the next room*…??*Such* people (are obnoxious)

Note that *shenme* and *such* differs in one aspect. While the semantic value of *such* is always specific, picking up some contextually salient kind, the semantic value of *shenme* is underspecified by default, as discussed above.
    Another related expression, i.e., one with a 'kind' interpretation is English *what*. Heim (1987) suggests that *what* takes a kind interpretation that distinguishes it from other *wh*-phrases such as *which* and *who*. We refer the reader to a detailed discussion in Heim (1987).

can stand on its own as a Chinese donkey sentence (Cf. (29) and (30)); in this case, the denotation of *shenme ren* is not restricted to any particular person.

(33) a. *Wo you yi ge erzi he yi ge nü'er.   *Shenme ren xiaoshun*

      I   have one CL son and one CL daughter.   what person show-filial-obedience

      wo, wo jiu   ba yichan liu   gei shenme ren

      me I   then BA legacy leave to what person

  b. *Wo you   yi ge erzi he yi ge nü'er.   Shei xiaoshun   wo, wo jiu*

    I   have one CL son and one CL daughter. who show-filial-obedience me I then

    ba yichan liu   gei shei

    BA legacy leave to whom

  (lit)'I have a son and a daughter, who shows filial obedience to me, I will leave the legacy to whom.'

In a similar vein, the use of *shenme* would not be felicitous if the head noun denotes a unique entity in certain linguistic and pragmatic contexts. This is due to the fact that, it is not possible to make any further partition if the denotation includes just one entity. An example is given in (34):

(34) ?? *Zhangsan haoxiang kanjian le   shenme taiyang*

    Zhangsan seem   see   Asp what sun

     'Zhangsan seemed to see a sun of some sort'

Our real world knowledge tells us that one can see one and only one sun in the world at a time. In other words, a unique entity is presupposed for the denotation of the common noun *taiyang* 'sun' in this context. On the other hand, the semantics of *shenme* requires that it must delineate kinds of entities denoted by the modified common noun, as we are arguing here. Taken together, the denotation of *taiyang* in (34) is paradoxical with the semantics of *shenme*. This contradiction explains why *shenme* is absurd in (34), as shown by the question marks. However, one can draw different kinds of sun, e.g., red sun, green sun, as much as one can imagine. This explains why *shenme taiyang* 'what sun' is less awkward in (35), in which the predicate is changed to *hua* 'draw':

(35) ? *Zhangsan haoxiang   hua   le   shenme taiyang*
       Zhangsan seemingly draw Asp what   sun
       'Zhangsan seemed to draw a sun of some sort.'

Now let us summarize section 4. Inspired by traditional Chinese grammar, we propose that the *wh*-pronoun *shenme* is a proform of NP modifiers, and it partitions the denotation of the NP it modifies into kinds of entities. A range of data is presented showing that a kind-concept is involved in the denotation of *shenme*. We also show that *shenme* exhibits systematic distinctions from head *wh*-pronouns such as *shei* 'who' and *nali* 'where'. Head *wh*-pronouns are a proform for an entire NP and denote individual objects.

From the perspective of indexicality, *shenme* in (35) and many other similar cases in simple statements exhibit a 'free' use of pronominals (Recanati 2005), as the semantic value of *shenme* in these cases are open-ended. This is the default or unmarked interpretation of *shenme*. As a pronominal element, *shenme* exhibits context-dependent features, restricting to a subset of kinds of entities that are salient in the context (Cf. Recanati 2005, and references therein). This is where the insignificance reading comes into the picture. This interpretation of *shenme* is more 'marked', as contextual support is required in this case. Now we turn to next section for details.

5. Analysis on the insignificance reading

To show how the insignificance reading arises in negative sentences with *shenme*, let us consider a felicitous context for this reading. As noted earlier, the insignificance reading is felicitous when a contrast set is provided. To illustrate, consider the story in (36), where both Mr. Dog and Mr. Pig are hoping to eat lots of food. Mr. Dog gets his wish, but Mr. Pig is only able to eat a small prawn.

(36) *Mr. Dog and Mr. Pig were going to Mickey Mouse's birthday party. Mr. Pig was eating a hard walnut before they started off to the party, and unfortunately he broke some of his teeth. At the party, Mr. Dog ate a big pizza, a big hamburger and vegetable noodles; Mr. Pig also wanted to eat all these kinds of the food, but he was only able to eat a small soft prawn taken from a big seafood noodle dish, because he was suffering from a toothache. In the end, Mr. Dog was very full and happy and went to sleep, but Mr. Pig was still very hungry, and regretted eating the hard walnut.*

With this story as backdrop, consider how sentence (37) is interpreted, with *shenme* in the second conjunct.

(37) *Xiaogou chi le   henduo dongxi, keshi xiaozhu mei   chi shenme dongxi*
    Mr. Dog eat Asp a lot food   but   Mr. Pig Neg eat what food
    'Mr. Dog ate a lot of food, but Mr. Pig hardly ate any food.'

The first conjunct in (37) explains that Mr. Dog ate lots of food (a big pizza, a big hamburger and a vegetable noodles). This sets the standard of comparison for Mr. Pig, who is the protagonist mentioned in the second conjunct, with *shenme*. The food eaten by Mr. Dog is 'significant', as underscored by the fact that Mr. Dog was full and happy after the meal. As weighed against these criteria, the small prawn eaten by Mr. Pig was insignificant (i.e., close to nothing). This is emphasized with the story that Mr. Pig was still very hungry at the end of the party. In these respects, a contrast between significant versus insignificant kinds of food is established in the story. Then it follows that the modifier *shenme* NP *shenme dongxi* picks up those significant kinds of food, precluding insignificant kind of food in the domain of quantification.[18] When *shenme* NP is combined with negation, it yields the insignificance reading: for (37), if Mr. Pig did not eat significant kinds of food, then by implicature he may have eaten some insignificant kind of food. The formation of the insignificance reading in (37) thus undergoes a series of pragmatic inferences.

(38) Step 1: *Shenme* is combined with negation. The literal 'none' meaning is derived.
         Mr. Pig did not eat any food. This reading makes the sentence false.
  Step 2: Assuming that the speaker is attempting to say something that is true, the hearer seeks an alternative to the literal meaning.
  Step 3: This is accomplished by partitioning the entities in the domain of discourse into significant kinds versus insignificant kinds.

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[18] This context-dependent feature of *shenme* is analogous to that of *such* in English, which is also a proform of NP modifiers (Cf. footnote 17). Siegel (1994) contributes a discussion on this. Consider Siegel's sentence below:

(i) Conscientious students know that everyone resents such students.　　　　(Siegel 1994: 482)

If (i) is uttered while watching students attending a wild three-day party, *such* might be taken to mean the sort of *un-*conscientious students who might attend such a party. This is a case showing that pronominals like *such* pick up a meaning from the surrounding non-linguistic context.

Step 4: The *wh*-pronoun *shenme* is anaphorically linked to the <u>significant</u> kinds of entities in the discourse context.

Step 5: When *shenme* is combined with negation, it yields the <u>insignificance</u> reading

Mr. Pig did not eat significant kinds of food → *Mr. Pig ate some insignificant kind of food.*

Since the insignificance reading is derived by a pragmatic inference, it is anticipated that this reading will be cancelled by interjections like *shijishang* 'in fact' (Cui 2012; Cf. Chierchia 2004). This prediction is verified, as illustrated in (39).

(39) *Zhangsan mei chi shenme pingguo. Shijishang, ta mei chi renhe pingguo*

Zhangsan Neg eat what apple in-fact he Neg eat any apple

'Zhangsan hardly ate any apples. In fact, he did not eat any apples.'

The analysis is supported by some empirical data. We tested 10 Mandarin-speaking adults by using a variant of Truth Value Judgement Task (Crain and Thornton 1998). These participants were tested individually. In particular, we presented a story script to each of the participants, and this story script is organized based on the story summary in (36), but in a more detailed version. After they finished reading the story script, we then presented the sentence (37), and asked them to judge whether (37) is true or false based on their understanding of the story. If they indicated that the sentence was false, we asked them why.

The results confirm our analysis. All of the Chinese speakers stated that (37) is true. The acceptance of the test sentence against the context specified by (36) indicates that the Chinese speakers assigned the insignificance reading to the negative sentence with the modifier *wh*-phrase *shenme dongxi* 'what food'.

This experimental setting offers support for our hypothesis on the insignificance interpretation. However, we note that insignificance readings can also appear in more 'natural' contexts. In everyday conversations, the contrast set could be implicitly assumed in conversational settings, due to social or cultural conventions; in this case, the insignificance reading could also arise. For example, if you are thanking me for doing you a favor, then I am likely to respond by saying (40) below:

(40) *Wo mei bang shenme mang*

    I   Neg help   what   favor

    'I did not do much for you.'

This reply indicates that what I did for you was insignificant compared to what I would have been willing to do for you; it is a way signaling my enthusiasm to help you. So, the contrast set of significant versus insignificant kinds of things can be inferred, in the opportune extra-linguistic conditions.

On the proposed analysis, a contextually-determined partition into significant versus insignificant kinds is required to license the insignificance reading. When such a partition is established, the semantic value of *shenme* is 'marked' as restricting to the set of significant kinds of entities. Following this analysis, it is predicted that whenever a partition is not viable in the domain of discourse, the insignificance reading will not be generated. The semantic value of *shenme* is open-ended in the absence of a partition in the domain of discourse, and is hence assigned the 'none' reading when *shenme* is associated with negation. This prediction is borne out in a range of cases. In the remainder of this section, we will show one of the cases, namely, the lack of the insignificance reading in negative sentences with *shenme* when a contrast set is not provided. Other cases will be covered in the next section.

Consider the story in (41). In this story, Mr. Dog sets the condition for a prize: as long as Mr. Pig finds some of the treasure (whatever treasure it is), he will get the Thomas Train. Mr. Pig ends up finding a small pearl and the big diamond, and he gets the Thomas Train from Mr. Dog.

(41) *Mr. Pig is always careless, and his friend Mr. Dog enjoys making fun of him. One day, Mr. Dog invited Mr. Pig to play a seek-the-treasure game with him. Mr. Dog promised Mr. Pig that if Mr. Pig found any one of the treasure he was going to hide, he would give Mr. Pig his favorite toy-a Thomas Train. Mr. Dog then hid a lot of small pearls and a diamond. Mr. Pig eventually stumbled upon a pearl and the diamond by accident, and Mr. Dog gave the Thomas train to Mr. Pig as promised.*

Following this story, consider now how the sentence in (42) would be interpreted.

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(42) *Xiaozhu zhaodao le baoshi,   keshi ta   meiyou zhaodao shenme zhenzhu*
     Mr. Pig find   Asp diamond but   he Neg   find   what   pearl
     'Mr. Pig found the diamond, but he did not find any pearl.'

The first conjunct asserts that Mr. Pig found the diamond. This constitutes a correct description of one event that took place in the story. The second conjunct is a negative statement with the *wh*-phrase *shenme zhenzhu* 'what pearl'. The question is whether or not the small pearl that Mr. Pig found suffices for Mr. Pig to have found any of the pearls. In the present context, it does, because the pearl is just as significant as the big diamond--both are categorized as 'treasure' in the story. It does not matter what kind of pearl Mr. Pig finds, small or large. Any kind of pearl will suffice for Mr. Pig to receive the prize he was promised. When the underspecified *shenme* NP in (42) is negated, therefore, the 'none' reading is generated, to the effect that Mr. Pig did not find any kind of pearl.[19] Clearly, this is an inaccurate description of the story. In short, the story (41) sets up a story in which a partition between significant versus insignificant kinds is prohibited. Against this backdrop, the insignificant reading is not available for the negative statement with *shenme* in (42).

To examine our analysis, we presented sentence (42) to 10 Mandarin-speaking adults against the story (41). We used the same experimental method as we used for testing the 'insignificance' reading above. That is, we first presented each of the participants the story (41); after they finished reading the story, we proceeded to ask whether the test sentence (42) was true or false based on their understanding of the story. To make a within-subject comparison, we used the same Mandarin-speaking adults that participated in the testing of the insignificance reading above. The two testings were conducted on different days, with 3 days apart for each participant.

As expected, all of the Chinese speakers stated that the test sentence (42) is false. When asked to justify their response, they indicated that Mr. Pig did find a pearl. From their judgment and the corresponding justification, it is clear that they assigned the 'none' reading to the second conjunct of sentence (42). Note that we did provide a small amount

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[19] The informal intuition is the following. Suppose that the discourse contains four types of pearls in total: *p, q, r* and *s*. Then the second conjunct of (42) means Mr. Pig did not find the types of pearls that are labeled as *p*, or *q* or *r* or *s* (Cf. section 4.1). By applying one of de Morgan's Laws (A ∨ B) ⇒ ¬ A ∧ ¬ B), where '∨' and '∧' correspond to Boolean disjunction and conjunction, respectively , we end up with a circumstance in which Mr. Pig did not find any of the pearls, i.e., the 'none' reading of the sentence. The derivation of the 'none' reading is represented in (i):

(i)   ¬ ∃x[**found** '(p,x) & **pearl'**(x) & x∈ *{p, q, r, s}*]
       = ¬ [**found'** (p, *p*) ∨ **found'** (p,*q*) ∨ **found'** (p,*r*) ∨ **found'** (p,*s*)]
       = ¬**found'** (p,*p*) ∧ ¬ **found'** (p,*q*) ∧ ¬ **found'** (p,*r*) ∧ ¬ **found'** (p,*s*)}

context in the story, as manifested by the design that the small pearl Mr. Pig stumbled upon is one from a large number of pearls that Mr. Dog hid. But the story is manipulated to prohibit a partition between significant versus insignificant kinds. With this design, the 'none' interpretation is biased, even though negative sentences with *shenme* are open to both the 'none' reading and the insignificance reading. The fact that the same Mandarin-speakers rejected (42) but accepted (37) supports our analysis that a partition between significant versus insignificant kinds in the domain of discourse is vital for the triggering of the insignificance reading.

Now we move on to other cases in which the insignificance reading is not licensed. We will show that all of the cases could be traced back to the lack of a partition between significant versus insignificant kinds.

6 The Lack of the insignificance reading

In this section, we discuss a range of linguistic structures that cannot generate the insignificance reading, including (i) sentences with the Negative Polarity Item *renhe* 'any'; (ii) sentences with 'head' *wh*-pronouns, such as *shei* 'who'; (iii) sentences with the adverb of quantification *dou* 'all'; (iv) sentences with bare nouns; (v) sentences involving imperfective aspect; and (vi) sentences with non-local negation. The lack of the insignificance reading in these structures will be eventually traced back to the prohibition of a partition among significant versus insignificant kinds, for various semantic reasons.

6.1 NPI *renhe*

As mentioned in Section 1, the insignificance reading is not possible for negative statements with the NPI *renhe*, and only the 'none' reading is available for this case (Li. W.H. 1992; Hsiao 2002).

(43) *Zhangsan mei   chi renhe dongxi*
     Zhangsan Neg eat any thing
     'Zhangsan did not eat anything'

Basically, the absence of the insignificance reading in (43) is due to the semantic properties of the NPI *renhe*. In particular, *renhe*, like its English counterpart *any*, extends the domain of quantification, so as to encompass entities that are not typically associated

with the accompanying common noun, i.e., atypical entities of the same class. This semantic property is called 'domain widening' (Kadmon and Landman 1993. (For further details on the syntax and semantics of *renhe,* see Wang and Hsieh 1996; Hua 1997; Hsiao 2002; Kuo 2003; Hua and Zeng 2009; Cheng and Giannakidou (to appear); Zhang 2010.) An example of domain widening is given in (44).

(44) Q: *Ni you   gan wazi ma*?
        You have dry sock Q
        'Do you have dry socks?'

     A. *Wo mei you renhe wazi*
       I   Neg have any   sock
       'I don't have any socks.'

In the dialogue (44), the question is about dry socks. But, in responding to this question, the speaker's use of *renhe* extends the class of socks to include socks of any kind. The domain widening effect of *renhe* renders it impossible to make any further partitioning of socks in the domain of discourse, let alone a partition between significant versus insignificant kinds. Consequently, the entire domain of kinds of socks has been exhausted. Furthermore, the domain widening effect of *renhe* determines that the semantic interpretation of *renhe* is not affected by context. This explains why the insignificance reading is not possible for negative sentences with *renhe*, no matter how the context is manipulated. The insignificance reading is not possible even when a contrast set is set up, as shown in (45).

(45) *Xiaogou chi le   henduo dongxi, keshi xiaozhu mei   chi renhe dongxi*
     Mr. Dog eat Asp a lot food   but   Mr. Pig Neg eat any food
     'Mr. Dog ate a lot of food, but Mr. Pig did not eat any food.'

6.2 Adverb of quantification *dou*

We have another case showing that the insignificance reading is not possible when a partition among the kinds of entities denoted by *shenme* NP is prohibited. This is the case when the adverb of quantification *dou* 'all' occurs with the modifier *wh*-pronoun *shenme* (Hole 2004).

(46) *Shenme ren   dou mei pa   shang zhe ke shu*[20]

     what   person all Neg climb up   this CL tree

     'Nobody climbed up the tree.'

Setting aside the various controversies on the complex semantics of the universal *dou* (see Lee 1986; Cheng 1995; Huang 1996; Lin 1998b; Hole 2004, among others), it is appropriate for us to say this adverb of quantification requires that negation must be associated with **all** of the kinds of entities denoted by *shenme* NP. In this example, (46) means it is not the case that any kind of people was able to climb up the tree, i.e., the 'none' reading of the sentence.[21]

6.3 Head *wh*-pronouns

     As noted in section 2.1, head *wh*-pronouns in negative statements do not receive the insignificance reading, and only 'none' reading is possible for this type of *wh*-pronouns (Cf. Lin 1999). An example is given in (47).

(47) *Lisi mei   piping   shei*

     Lisi Neg criticize who

     'Lisi did not criticize anyone.'

     The lack of the insignificance reading in (47) is due to the semantics of head *wh*-pronouns. As discussed in section 4, head *wh*-pronouns serve as a proform for an entire NP, and they denote individual objects. For instance, the head *wh*-pronoun *shei* 'who' in (47)

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[20] Due to the distributional constraint of the universal *dou, shenme ren* in (46) has to occur to the left of *dou* (e.g. see Lee 1986). So on the surface, *shenme ren* is not in the scope of negation. However, we assume that the association between negation and denotation of *shenme ren* is derived at some level of logical form. We leave aside more specific syntactic matters, as they are not crucial here.

[21] *Dou* can also be used as a scalar operator (in the sense of Fauconnier 1975), when it occurs in the *lian-dou* construction. This use of *dou* is semantically similar to that of English *even* (Jiang 2008, Xiang 2008). Interestingly, the insignificance interpretation is available when *dou* takes this *even*-like interpretation. Consider the example below.

(i) *(Lian)   Zhangsan dou   mei chi shenme shuiguo*
   LIAN Zhangsan DOU Neg eat what   fruit
    (a) 'Even Zhangsan did not eat any fruit.'
    (b) 'Even Zhangsan hardly ate any fruit.'

When used as a scalar operator, *lian-dou* is associated with the focused subject *Zhangsan*, introducing a set of alternative propositions: among a set of persons specified in a discourse, Zhangsan is the least likely person who hardly ate any fruit. In other words, since the scalar operator *dou* does not prevent a partition of the denotation of *shenme* NP, the insignificance reading can be triggered when relevant felicity conditions are provided (Cf. section 5).

stands for a set of individual persons, such as Zhangsan, Lisi, Wangwu, etc. In a sense, these individual persons constitute a single kind, the kind of being a person. Since only one kind is involved here, it does not make sense to make any further partition with the kind. Therefore, a partition between significant versus insignificant kinds is not possible with negative sentences with head *wh*-pronouns. Without a partition among its referents, the entire set of individual entities denoted by head *wh*-pronouns is 'connected' to an external operator like negation. This explains why the insignificance reading is not attested in head *wh*-pronouns like *shei* 'who', and only the 'none' reading is possible when they appear under a negation in sentences like (47).

6.4 Bare nouns

The insignificance reading is not possible for negative statements with bare nouns (Cui 2012). An illustrative example is given in (48) below:

(48) *Zhangsan mei chi pingguo*

   Zhangsan Neg eat apple

   'Zhangsan did not eat any apples.'

(48) can only mean Zhangsan did not eat any apples, the 'none' reading. Or put it in different way, (48) says that Zhangsan did not eat any instantiation of the apple kind.[22] Here, only one individual kind, the apple kind, is involved. So, it is not possible to make any further partition within the denotation of the bare noun *pingguo*, let alone a partition between significant vs. insignificant entities. Thus, the absence of the insignificance reading for negative sentences with bare nouns is eventually due to the lack of a partition of significant versus insignificant kinds in the domain of discourse.

6.5 Imperfectivity

In section 2.2, it is shown that the imperfective situations do not license the insignificance reading. This was illustrated by the facts that the insignificance reading is not possible with sentences containing the imperfective negation operators *bu* and *bie*, and when imperfective aspect markers like *zhe* and *zai* are present. Relevant examples are reproduced below.

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[22] Readers are referred to Krifka (1995b), Chierchia (1998) and Lin (1999) for the arguments that bare nouns in Mandarin Chinese refer to kinds.

(49) a. *Zhangsan bu chi shenme pingguo.*

    Zhangsan Neg eat what   apple

  'Zhangsan does not like to eat any apples.'

   b. *Bie chi shenme binjiling. (Tian tai leng le)*

    Neg eat what   icecream (weather too cold Asp)

   'Don't eat any icecream. (it is too cold.)'

(50) a. *Zhangsan mei zai   tui shenme che*

    Zhangsan Neg Asp push what car

    'Zhangsan is not pushing any cars.'

   b. *Zhangsan mei tui   zhe shenme che*

    Zhangsan Neg push Asp what car

    'Zhangsan is not pushing any cars.'

The lack of the insignificance reading in sentences with imperfective operators follows naturally from our analysis. Crucially, making a partition between significant versus insignificant kinds requires a perfective event, which is closed informationlly (Smith 1991). Only in perfective situations can one judge which kinds of entities are significant and which kinds of entities are insignificant. In imperfective situations, the activities or events are still in progress and are open to additional information, thus the evaluation of the significance of entities in the domain of discourse cannot be conducted. In this regard, it is straightforward that the insignificance reading does not arise in imperfective situations, because this kind of situation type can not generate a partition between significant versus insignificant kinds.

6.6 Non-local negation

     We now explain why a non-local negation does not license the insignificance reading, as the empirical data in section 2.2 shows.

(51) *Wo mei shuo Zhangsan chi le   shenme pingguo.*

  I   Neg say   Zhangsan eat Asp what apple.

   'I did not say Zhangsan ate any apples.'

In (51) (formally (10)), the negation operator *mei* applies to the matrix clause verb *shuo* 'say', denying that the speaker thinks a certain proposition constituted by the embedded clause *Zhangsan chi le shenme pingguo*. In other words, the linguistic elements within the embedded clause will not be accessible to the negation *mei* in the matrix clause. Furthermore, embedded clause *Zhangsan chi le shenme pingguo* is an affirmative clause, and a partition between significant versus insignificant kinds is not possible in affirmative clauses.[23] Taken together, the insignificance reading does not arise in (51), as we expect.

If a local negation occurs, then the insignificance reading resurfaces. This is the case in (52).

(52) *Wo mei   shuo Zhangsan mei chi shenme pingguo*.
    I   Neg say Zhangsan Neg eat what apple.
    (i) 'I did not say Zhangsan ate any apples.'
    (ii) 'I did not say Zhangsan hardly ate any apples.'

On the insignificance reading, (52) states that the speaker does not think (external negation) that Zhangsan ate apples of the significant kind. Local, or internal negation negates that the apples Zhangsan didn't eat, according the speaker's thoughts, are the significant ones. The implicature arising from this interpretation is that the speaker thinks Zhangsan ate some 'insignificant' kind of apples. Then the external negation denies that the speaker thinks a certain proposition, which involves a certain set of apples. So, under the opportune licensing conditions in embedding contexts with the local negation *mei*, the insignificance reading can be licensed (Cf. section 4.1).

Summing up, in this section we discussed the lack of the insignificance reading in a range of cases, including (i) sentences with NPI *renhe*; (ii) sentences with the universal *dou* 'all'; (iii) sentences with head *wh*-pronouns; (iv) sentences with bare nouns; (v) sentences involving imperfective aspect; (vi) sentences with non-local negation. This is by no means an exhaustive list of the lack of the insignificance reading. There are many other

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[23] A reviewer asked why a partition is not possible in affirmative sentences. A possible answer is this. A context of utterance may indicate some kinds of entities are relevant (or significant) and other kinds of entities are not relevant (hence insignificant). However, in affirmative sentences, there is no linguistic means to tease apart those relevant/significant kinds of entities from those irrelevant/insignificant kinds of entities formulated in the non-linguistic context. By the contrast, negation is a focus sensitive operator (Jackendoff 1972; Xu and Li (1993); Lee and Pan 2001), facilitating an anaphoric relation between *shenme* and relevant/significant kinds of entities when *shenme* is associated with negation.

cases that *shenme* cannot be assigned the insignificance reading. But what we attempted to show here is that the lack of the insignificance reading in these cases always follows from the proposed analysis on the insignificance reading, namely, the lack of the insignificance is traced back to the lack of a partition between significant versus insignificant kinds. When such a partition is absent, the semantic value of *wh*-pronoun *shenme* takes its unmarked form, as being an open-valued proform of NP modifiers (Cf. section 4). This explains why the 'none' reading is the only reading when unmarked *shenme* is associated with negation.

7. Discussion and conclusion

This paper offers a semantic analysis on the insignificance reading associated with negative sentences with *shenme*. On the proposed account, we showed that the construction of the insignificance reading needs extra contextual support. That is, when a contrast set of significant entities versus insignificant entities is provided in the discourse, the insignificance reading can be obtained through a series of pragmatic inferences. Essentially, when the *wh*-pronoun *shenme* anaphorically selects a set of significant kinds of entities, and these significant kinds of entities are denied as existing in the domain of discourse, one can infer that some insignificant kind of entities may exist. The proposed analysis is extended to explain the lack of the insignificance reading in a set of cases, including (i) sentences with NPI *renhe*, (ii) sentences with the universal *dou*, (iii) sentences with head *wh*-pronouns, (iv) sentences with bare nouns, (v) sentences involving imperfective aspect, and (vi) sentences with non-local negation. The lack of the insignificance reading in these cases is traced back to the lack of a partition between significant versus insignificant kinds.

From a broader theoretical perspective, the study of the insignificance reading allows us to see that various aspects of Chinese grammar, including *wh*-morphology, sentential aspect, locality and pragmatic inference, have a bearing on the interpretation of *wh*-pronouns. In this respect, the research of the insignificance reading is significant. Two points are worth highlighting here. First, this study supports a divide between modifier *wh*-pronoun *shenme* and head *wh*-pronouns. While modifier *wh*-pronoun *shenme*, when combined with a NP, denotes a set of individual kinds, head pronouns denote a set of individual objects (or a single kind). The divide between modifier *wh*-pronoun *shenme* and head *wh*-pronouns underscores the non-uniformality of *wh*-pronouns in Mandarin Chinese with particular reference on the denotational properties of *wh*-pronouns (Cf. Lin 1999; Cheng and Giannakidou (to appear)).

Now we turn to the second theoretical issue we would like to highlight. Discourse information is identified to be a crucial factor determining the alternation of the insignificance reading and the 'none' reading. Specifically, the *wh*-pronoun *shenme* is restricted to a set of significant kinds of entities in the case of the insignificance reading, whereas the semantic value of *shenme* is open-ended in the case of the 'none' reading. This brings us to an important semantic distinction between *wh*-pronouns and the NPI *renhe*. That is, unlike *wh*-pronouns, the interpretation of *renhe* is not subject to change in the discourse. This is probably due to the domain widening effect of *renhe*.

Three issues remains. First, one may observe that *shenme* can sometimes stand alone without attaching to a common noun. Actually it is implicitly assumed in the literature that *shenme* functions as a proform of bare nouns when it occurs alone. This idea is explicitly spelled out in Lin (1999: 573): "*shenme* can be a proform of bare NPs and hence has the same kind of denotation as bare NPs". The main argument Lin presents is that a bare noun, such as *shu* 'book' in (53), can be used to answer a *shenme*-question.

(53) Q: *Ni xihuan shenme*

你 you like   what

'What do you like?'

A: *Wo xihuan shu*

I   like   book

'I like books.'

However, some independent evidence shows the bare *shenme* account cannot hold. As widely acknowledged in traditional Chinese grammar (Ding et al 1961:189; Zhu 1982: 90; Lü 1985: 152), bare *shenme* is highly restricted in distribution. In particular, the common noun following *shenme* can be elided only when a generic noun like *dongxi/shiqing* 'thing' is assumed. Common nouns denoting animate entities, such as *ren* 'person' in (54a), cannot be elided without changing the meaning of the sentence. Moreover, common nouns denoting a specific kind, say *pingguo* 'apple' in (54b), cannot be elided either.

(54) a. *Zhangsan shi shenme *(ren)*?

Zhangsan be   what   person

'What kind of person is Zhangsan?'

b. *Zhangsan chi le shenme * (pingguo)?*

   Zhangsan eat Asp what   apple

   'What kind of apple did Zhangsan eat?'

By contrast, a *bona fide* proform of NP, like *one* in English, has no such distributional restriction. In English, DPs containing *one* could refer to anything, either animate or inanimate, as long as the associated denotation is countable. For instance, *one* in (55) can denote any countable entity salient in the context.

(55) This one is imported from China.

 Thus, the restriction in distribution of *shenme* as shown in (54) casts doubt on the claim that *shenme* is proform of bare nouns. It is more reasonable to assume that a covert generic NP follows *shenme* when *shenme* stands alone. Therefore, *shenme* uniformly functions as a modifier, as we are arguing here.

     A second remaining issue is to explain the object-level denotation associated with some *shenme* questions. This concerns whether we can maintain the proposal that *shenme* uniformly partitions the denotation of the NP it modifies into kinds. To illustrate, a *shenme* question can be answered with a sentence containing a definite object-denoting expression (Cf. Lin 1999).

(56) A: *Ni mai   le   shenme*?

    you buy Asp what

    'What did you buy?'

   B: *Wo mai le   zhe ge pingguo*

    I   buy Asp this CL apple

    'I bought this apple.'

In (56), B uses a sentence containing the object-denoting expression *zhe ge pingguo* 'this apple' to answer A's *shenme* question.

     The object-denoting concept in the conversation of (56) can be explained by using Carlson's (1977) account of kinds. That is, a *shenme* NP is a kind-denoting term, and the object-denoting concept involved in the conversation is attributed to the verbal predicate

mai 'buy'. *Mai* is a stage-level predicate, and it makes the *shenme* question in (56) apply to the stages of the kind picked up by *shenme*. This is so because one can only buy some instances of the apple kind, not the whole apple kind. To compare, a *shenme* sentence containing an individual-level predicate, like *xihuan* 'like' in (57), cannot be answered with a sentence containing an object-denoting expression.

(57) A: *Ni xihuan chi shenme pingguo*

      You like eat what apple

      'What apple do you like to eat?'

    B: **Wo xihuan chi zhe ge pingguo-*

      I   like   eat this CL   apple

      'I like to eat this apple.'

    B': *Wo xihuan chi zhe zhong pingguo*

      I   like eat this CL   apple

      'I like to eat this kind of apples.'

In (57), a sentence containing the individual classifier *ge*, which singles out the unit of apple objects, is not an appropriate answer to the *shenme* question *Ni xihuan chi shenme pingguo* 'what apple do you like to eat?'. Instead, a sentence with the kind classifier *zhong* is a suitable answer. So when a *shenme* question containing a stage-level predicate is used to search for a particular kind, a possible answer could be a sentence with an object-denoting NP. But this does not constitute a counterexample arguing against the idea that the *wh*-pronoun *shenme* introduces a set of kinds. The object-denoting notion is just a derived concept, being a stage of the kind associated with *shenme*.

      The third remaining issue concerns about the notion of insignificance. Apparently, two kinds of insignificance readings are viable in negative sentences with *shenme* (Lü 1985). For instance, the insignificance reading expressed by (58) seems to be: (i) Zhangsan hardly ate any 'significant' kinds of fruit, or (ii) Zhangsan did not eat much fruit, i.e., he ate only a small amount of fruit. The first reading represents an insignificance in quality, and the second one represents an insignificance in quantity.

(58) *Zhangsan mei chi shenme shuiguo*

    Zhangsan Neg eat what   fruit

(i) 'Zhangsan hardly ate any fruit.'

(ii) 'Zhangsan did not eat any fruit.'

Some independent evidence shows that the insignificance in quality is the basic reading. Attesting to this is the fact that, a negative sentence with *shenme* is felicitous in a context in which reference is being made to a large quantity of entities, as long as the kinds of these entities are insignificant as defined by the context. (59) is such a case. Suppose Zhangsan is planning to buy some clothes, to dress up for an important meeting. I expect Zhangsan to buy some formal and smart clothes, say, a suit. However, it turns out he buys a lot of cheap T-shirts and jeans, none of which I think is appropriate for such a formal situation. In this context, I can use (59) to convey the opinion that the large quantity of clothes Zhangsan buys is not useful.

(59) *Zhangsan jintian mei mai shenme yifu,   jiu   mai le   yi   da dui meiyong de yifu*
     Zhangsan today Neg buy what   clothes only buy Asp one big pile useless De clothes
     'Zhangsan hardly bought any useful clothes today. He only bought a lot of useless
      clothes.'

Furthermore, a small amount of entities could be significant. This is so when a partition is prohibited between the denotations of the NP modified by *shenme*. The little pearl in our Mr. Pig-find-treasure story dicussed in section 6 is such an example. In short, quantity is not a crucial thing for the licensing of the insignificance reading; it can be small amount or large amount. Therefore, we conclude that insignificance in quality is the *basic* meaning of the insignificance reading, and insignificance in quantity is just a special case of insignificance in quality.[24]

A related point is raised by a reviewer regarding the notion of insignificance. The reviewer pointed out that a quantity reading seems to be more salient than the quality reading when a mass noun is used. Examples in (60) are offered by the reviewer.

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[24] To express insignificance in quantity, Chinese speakers resort to another *wh*-pronoun, i.e., *ji* 'how-many'. When *ji*, with an accompanying classifier such as *ge* appears in a simple negative statement, it receives a 'small-amount' interpretation, i.e., the insignificance in quantity, as in (i). Note that no insignificance in quality is licensed in this example.

(i) *Zhangsan mei chi ji   ge pingguo*
     Zhangsan Neg eat how-many CL apple
     'Zhangsan did not eat many apples.'

(60) a. *Wo mei he   shenme shui.*

    I   Neg drink what water

    (i)'I hardly drank any water.'

    (ii) 'I did not drink any water.'

  b. *Ta mei zhuan shenme qian.*

    he Neg earn   what   money

    (i) 'He hardly earned any money.'

    (ii) 'He did not earn any money.'

Furthermore, the reviewer pointed out that the salience of the quantity reading in (60) can be diagnosed using the adverb of quantification *dou* 'all', as in (61). It is said the use of the universal *dou* invokes a quality reading; this quality reading, however, is not compatible with the quantity reading associated with the mass noun. According to the reviewer, this quality versus quantity mismatch explains why the two sentences in (61) sound odd, as indicated by the question mark.

(61) a. ?*Wo shenme shui dou mei he.*

    I   what   water all Neg drink

    'I didn't drink any water.'

  b. ?*Ta shenme qian dou mei zhuan.*

    he what   money all Neg earn

    'He didn't earn any money.'

In our view, the oddness in (61) comes from the assumption that only one kind is involved in the domain of discourse (one kind of water in (61a) and one kind of money in (61b)). When such an assumption is removed, the oddness will disappear. Suppose there are different kinds of water under consideration, for instance, tap water, boiled water, bottle water, and the speaker did not drink any kind of the water. Against this backdrop, (61a) sounds perfect. Likewise, if we are talking about different kinds of currency, like US dollar, Renminbi, British pound, Australia dollar, etc, (61b) does not sound weird at all. Therefore, the apparent oddness in (61) comes from real world knowledge, not from the grammar. As long as the denotation of a mass noun can be partitioned into a set of kinds by *shenme*, the

basic quality reading will surface. This can be further confirmed by replacing *shui* 'water' in (60a) and (61a) with another mass noun, i.e., *yao* 'medicine'.

(62) a. *Wo mei he   shenme yao*.

   I   Neg drink what medicine

   (i)'I hardly drank any medicine.'

   (ii) 'I did not drink any medicine.'

   b. *Wo shenme yao   dou mei he.*

   I   what medicine all   Neg drink

    'I didn't drink any medicine.'

It is easy to think of a variety of kinds of medicine existing in the domain of discourse. This explains why the insignificance reading in (62a) is not biased to the quantity reading, and (62b) is a very good sentence. To wrap up, the insignificance reading speaks of insignificance in kind. This concept of insignificance is consistent with the proposal that *shenme* introduces a set of kinds.

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CHAPTER 4

Acquisition of the *wh*-pronoun *shenme* 'what' in Mandarin Chinese

This chapter is based on the following paper which has been submitted for publication.

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Abstract

In addition to serving as question markers, *wh*-words such as *shenme* 'what' in Mandarin Chinese have a non-interrogative meaning. On the non-interrogative meaning, these words have been typically analyzed as negative polarity items, i.e., as *wh*-pronouns that are similar in meaning to the English NPI *any* and to its Mandarin counterpart *renhe*. This accounts for the 'none' reading that is generated in negative statements with *wh*-words. However, negative sentences with *wh*-words can also be assigned another reading, in certain circumstances. We refer to this as the 'insignificance' reading. This reading is not possible for sentences with the NPI *renhe*. Like *renhe*, the 'none' reading is the default interpretation for negative sentences with *shenme*, because the insignificance reading requires specific contextual support. Another observation is that the insignificance reading makes sentences true in a broader range of circumstances than they are true on the 'none' reading. Both the fact that the significance reading requires contextual support, and considerations of language learnability in the absence of negative evidence lead us to expect the insignificance reading to emerge later than the 'none' reading in the course of language development. An experimental study of Mandarin-speaking children of different ages reveals that only the youngest group of children assigned the 'none' reading to negative sentences with *shenme* as well as to sentences with *renhe*. Older children, like adults, were able to access the insignificance reading. The present paper attempts to explain the gradual accrual of both of these interpretations of negative sentences with *shenme* by Mandarin-speaking children.

Key words: *wh*-pronouns, Negative Polarity Items, language acquisition, Mandarin Chinese

1 Introduction

In addition to serving as question markers in Mandarin Chinese, *wh*-words such as *shenme* 'what' and *shei* 'who' have a non-interrogative meaning. Non-interrogative *wh*-pronouns are generally prohibited in simple positive declarative sentences.[1] The linguistic environments that license *wh*-pronouns are mainly ones that license Negative Polarity Items (NPIs) such as English *any* and Mandarin *renhe* 'any'. For example, *wh*-pronouns are licensed in negative sentences, in Yes-No questions, and in the antecedent of conditionals, (Huang 1982; Li, A. 1992; Cheng 1991, 1994; Lin 1996, 1998; Cf. Klima 1964; Baker 1970; Ladusaw 1980; Giannakidou 1998). The similarity in distribution between *wh*-pronouns and Negative Polarity Items has led many researchers to analyze *wh*-pronouns as Negative Polarity Items (Huang 1982; Li, A. 1992; Cheng 1991, 1994; Lin 1996, 1998; Hsin 1999).[2] This explains why negative sentences with *wh*-pronouns have the same 'none' interpretation as negative sentences with the NPI *renhe*. To illustrate, both (1a) (with *shenme*) and (1b) (with *renhe)* have the same meaning -- that Zhangsan did not eat any food.

(1)   a. *Zhangsan mei chi shenme dongxi.*

      Zhangsan Neg eat what food

      ' Zhangsan did not eat any food.'

    b. *Zhangsan mei chi renhe dongxi.*

      Zhangsan Neg eat any food

      'Zhangsan did not eat any food.'

However, a second reading is available for negative statements with *shenme* (see Li 1924; Wang 1943; Ding et al 1961; Chao 1968; Zhu 1982; Lü 1985; Li, W.H.1992; Lin 1996; 1998, 2004; Hsiao 2002; Hole 2004; Dong 2009; Zhang 2010; Cui 2012). We call this the 'insignificance' reading. This reading is illustrated in (2a). The corresponding statement with *renhe*, as in (2b), is not acceptable.

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[1] In this study, we focus on the non-interrogative use of *shenme*. For the sake of brevity, we refer to non-interrogative *wh*-pronouns simply as *wh*-pronouns unless specified otherwise.

[2] In the Chinese literature, *wh*-pronouns have been given different names to capture their polarity sensitivity properties. In addition to being referred to as negative polarity items, they are also called "existential polarity *wh*-phrases" (Lin 1996, 1998) or simply "polarity items" (Cheng 1991, 1994).

(2) a. *Wo mei you shenme youpiao, zhi   you yixie   hen   lao de youpiao*

      I   Neg have what   stamp   only have some very old De stamps

      'I hardly have any stamps, only some old ones.'

   b. **Wo mei you renhe youpiao, zhi   you   yixie hen lao de youpiao*

      I   Neg have any   stamp   only have some very old De stamps

      'I don't have any stamps, only some old ones.'

<div align="right">(Li, W.H.1992: 148)</div>

The focus operator *zhi you* 'only have' in the second conjunct of (2a) draws attention to the existence of some entities (old stamps) that are in the speaker's possession, thereby ruling out the 'none' reading (Li, W.H.1992: 140-149; Hsiao 2002: 126-127). The same continuation with the focus operator *zhi you* is deviant in combination with the NPI *renhe,* as in (2b). Negative sentences with *renhe* exclusively generate the 'none' reading.

The insignificance reading is common in daily conversation in Mandarin Chinese, as is widely acknowledged in traditional Chinese grammars (Li 1924; Wang 1943; Ding et al 1961; Chao 1968; Zhu 1982; Lü 1985) and in general Chinese textbooks for foreigners (Hole 2004: 204). However, this reading seems to have been glossed over by Chinese linguists in recent analyses of *wh*-pronouns; most Chinese linguists have focused on the 'none' reading, treating *wh*-pronouns as negative polarity items. The present study was designed to investigate the range of interpretations that can be assigned to *shenme* in negative statements in Mandarin. We also investigated how Mandarin-speaking children acquire the range of interpretations, including the insignificance reading. We compared children's comprehension of negative statements containing *shenme* with negative statements containing *renhe*. The present study was designed to determine when Mandarin-speaking children are able to distinguish the differences in meaning between these two sentence structures, i.e., allowing the insignificance for the *shenme* sentences but not for the *renhe* sentences.

There are a number of possible acquisition scenarios. One possibility is that both readings are acquired in tandem early in the course of language development. Another possibility is that one of the two readings is acquired before the other. In this case, we are invited to ask why the observed sequential ordering of these readings occurs. Here, learnability consideration in the the absence of negative evidence may be involved, as we discuss in section 4. In any event, since the insignificance reading has not previously been

investigated in research on child language, the findings of the present experimental study documenting when Mandarin-speaking children obtain this reading is independently motivated.

From a theoretical perspective, there were two additional motivations for the present study. First, it is pertinent to note that pragmatic factors are required to license the insignificance reading. These pragmatic factors have implications for the course of language development because, in the acquisition literature, pragmatic inferences have often been found to be beyond the reach of young children. However, the study of the children's pragmatic inferencing has been largely confined to the acquisition of scalar terms such as *some* (implying *not all*), *or* (implying *not and*) and cardinal numbers (Chierchia et al. 2001; Gualmini et al. 2001; Noveck 2001; Papafragou & Musolino 2003; Musolino 2004, 2009; Guasti et al. 2005; Papafragou 2006; Pouscoulous et al. 2007; Huang & Snedeker 2009; Barner & Bachrach 2010; Barner, Brooks & Bale 2011). The present study opens the door to a wider range of cases that reside at the semantics/pragmatics interface.

A second motivation for the present study is the fact that pragmatic inferences are also involved in the licensing and interpretation of negative polarity items (e.g., Fauconnier 1975; Krifka 1995; Chierchia 2004). However, there are relatively few previous investigations of children's pragmatic knowledge that pertains to the interpretation of negative polarity items. Research has focused, instead, on children's awareness of syntactic and semantic constraints that govern the distribution of negative polarity items (O'Leary 1994; O'Leary & Crain 1994; van der Wal 1996; Song 2003; Tieu 2010a, b). This study is among the first to investigate the pragmatic factors that influence the interpretation of *shenme,* as compared to the NPI *renhe*.

The remainder of the paper is organized as follows. Section 2 discusses how the insignificance reading is elicited in negative sentences with *shenme*. In section 3, we analyze the 'none' reading associated with negative sentences with *shenme* and ones with *renhe*.[3] Sections 4 and 5 expand on the proposed analysis by investigating Mandarin-speaking adults' and children's comprehension of *shenme* and *renhe* in negative statements. Section 6 concludes the paper.

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[3] Sections 2-3 summarize the theoretical analysis presented in another paper by the author (2013).

2. The insignificance reading

This section highlights the most important features of the insignificance reading associated with negative sentences with *shenme*, in order to pave the way for the experimental study of child language. First, the insignificance reading is felicitous when a contrast set is on offer. To illustrate, consider the story in (3), where both Mr. Dog and Mr. Pig are hoping to eat lots of food. Mr. Dog gets his wish, but Mr. Pig is only able to eat a small prawn.

(3) *Mr. Dog and Mr. Pig went to Mickey Mouse's house for a birthday party. Mr. Pig was eating a hard walnut before they started off to the party, and unfortunately he broke one of his teeth. At the party, Mr. Dog ate a big pizza, a big hamburger and a vegetable noodle dish; Mr. Pig also wanted to eat all of these kinds of the food, but he was only able to eat a small soft prawn taken from a big seafood noodle dish, because he was suffering from a toothache. In the end, Mr. Dog was full and happy and went to sleep, but Mr. Pig was still hungry, and regretted eating the hard walnut.*

With this story as backdrop, consider how sentence (4) is interpreted, with *shenme* in the second conjunct.

(4) *Xiaogou chi le   henduo dongxi, keshi xiaozhu mei chi shenme dongxi*
      Mr. Dog eat Asp a lot   food   but Mr. Pig Neg eat what   food
      'Mr. Dog ate a lot, but Mr. Pig hardly ate anything.'

The first conjunct in (4) explains that Mr. Dog ate lots of food (a pizza, a hamburger and a vegetable noodle dish). This sets the standard of comparison for Mr. Pig, who is the protagonist mentioned in the second conjunct, with *shenme*. The food eaten by Mr. Dog is 'significant', as underscored by the fact that Mr. Dog became full and was happy to lie down after the meal. As weighed against these criteria, the small prawn eaten by Mr. Pig was insignificant (i.e., close to nothing). In these respects, a contrast between significant versus insignificant kinds of food is established in the story. By inference, what Mr. Pig managed to eat was insignificant, as compared to what Mr. Dog ate. Strictly speaking, this inference (i.e., the insignificance reading) is not the literal meaning of the sentence. The

formation of the insignificance reading can be derived from a series of pragmatic inferences:[4]

(5)

Step 1: *Shenme* is combined with negation. The literal 'none' meaning is derived.

Mr. Pig did not eat any food. This reading makes the sentence (4) false.

Step 2: Assuming that the speaker is attempting to say something that is true[5], the hearer seeks an alternative to the literal meaning.

Step 3: This is accomplished by partitioning the entities in the domain of discourse into significant kinds versus insignificant kinds.

Step 4: The *wh*-pronoun *shenme* is anaphorically linked to the <u>significant</u> kinds of entities in the discourse context.

Step 5: When *shenme* is combined with negation, it yields the <u>insignificance</u> reading

Mr. Pig did not eat significant kinds of food → *Mr. Pig ate some insignificant kind of food.[6]*

The construction of the insignificance reading requires knowledge of both semantic and pragmatic properties of the *wh*-pronoun *shenme* (Step 4 in (5)). Semantically, *shenme* functions as a placeholder for modifiers. When *shenme* combines with an NP, such as *shenme pingguo* 'what apple', it partitions the denotation of the NP into kinds. To illustrate,

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[4] The derivation of the insignificance reading is represented more formally in the logical form in (i). Suppose that the domain of discourse contains four types of food, i.e., *p*(izzas), *h*(amburgers) and *n*(oodles) and *pr*(awns). Suppose, further, that *p*, *h*, and *n* are contextually 'significant,' whereas *pr* is 'insignificant'. Applying one of de Morgan's Laws (A ∨ B) ⇒ ¬ A ∧ ¬ B (where '∨' and '∧' correspond to Boolean disjunction and conjunction, respectively), we derive the entailment that Mr. Pig did not eat any significant kinds of food. By implicature (represented as '→'), the inferred meaning is that Mr. Pig may have eaten some insignificant kind of food.

(i) ¬ ∃x[**Eat'**(Pig, x) & **Food'**(x) & x ∈ {*p, h, n,* }]
= ¬ [**Eat'** (Pig, *p*) ∨ **Eat'** (Pig, *h*) ∨ **Eat'** (Pig, *n*)]
= ¬ **Eat'** (Pig, *p*) ∧ ¬ **Eat'** (Pig, *h*) ∧ ¬ **Eat'** (Pig, *n*)]
→ Mr. Pig may have eaten a prawn.

[5] The insignificance reading is highly frequent in Mandarin Chinese. It seems unreasonable to suppose that children will be content to observe adults producing abundant false statements with the same lexical item, in violation of the norms of conversation, which entreat speakers to say what they believe to be true (cf. Grice, 1989).

[6] The pragmatic inferences involved in the construction of the insignificance reading are not the same as those that pertain to scalar terms like *some* (implying *not all*). In the case of *some*, a set of expressions form a Horn scale < *some, many, most, all* >, with *some* representing the informationally weakest term on the scale, and *all* the informationally strongest term (Horn 1972). In the present case of the insignificance reading, *shenme* does not form a Horn scale with another term, and no entailment relation is involved. Rather, an opposition is created between significant versus insignificant kinds in the construction of the insignificance reading. The insignificance reading is inferred by the denying of the existence of the significant kinds. Therefore, the kind of pragmatic inferences involved in the insignificance reading are not scalar inferences (see Levinson 2000, 79-80, and Matsumoto 1995).

consider example (6). The example sentence asserts that Zhangsan bought an apple but, in asserting that, the speaker is not committed to knowing the specific kind of apple that Zhangsan bought. So, for example, Zhangsan might have bought a Pink Lady apple, or a Granny Smith apple, or another kind of apple. This underspecification in kind is due to the existence of *shenme*.

(6) *Zhangsan haoxiang mai le   ge shenme pingguo*

   Zhangsan seem   buy Asp CL what   apple

   'It appears that Zhangsan bought an apple of some kind.'

From the perspective of anaphoric reference (indexicality), the appearance of *shenme* in (6) functions as a 'free' pronominal, i.e., it is not anaphorically linked to particular entities (cf. Recanati 2005). This is the default semantic value of *shenme*. However, in special contexts, *shenme* exhibits context-dependent features. This happens when the hearer is able to infer from the context the particular entities are salient to the conversation. The licensing context of the insignificance reading represents such a case, wherein the denotation of *shenme* NP is restricted to some significant kinds of entities that have been made salient in the discourse context. When the existence of the significant kinds has been denied, as in example (4), the insignificance reading arises.[7]

The present study made the insignificance reading explicit in the experimental setting. In everyday conversations, the relevant contrast sets may be implicitly assumed, due to social conventions, thereby giving rise to the insignificance reading. For example, if you are thanking me for doing you a favor, then I am likely to respond by saying *Wo mei bang shenme mang* 'I-Neg-help-what-favor', or simply *mei shenme* 'Neg-what', to express the meaning that I hardly did anything to help you, as compared to what I would have been willing to do (as with the English colloquial expression - 'It was nothing').

3. The 'none' reading

We have seen that the insignificance reading requires contextual support. To derive this reading, the context must establish a contrast between significant versus insignificant kinds of entities. When this contextual information is not provided in the discourse context, the

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[7] *Wh*-pronouns in Mandarin Chinese, including *shenme*, can pick up a specific semantic value from their preceding linguistic context. Bare conditionals with *wh*-pronouns represent such a context-dependent feature of *wh*-pronouns in Mandarin Chinese (see Tai, 1994; Huang and Cheng, 1996; Lin, 1996; Chierchia, 2000; Pan and Jiang, to appear).

insignificance reading is not invoked in processing negative sentences with *shenme*. Instead, the alternative 'none' reading is the only available reading. An example is the context in (7).

(7) *Mr. Pig is always careless, and his friend Mr. Dog enjoys making fun of him. One day, Mr. Dog invited Mr. Pig to play a seek-the-treasure game with him. Mr. Dog promises Mr. Pig that if Mr. Pig finds any of the treasures he is going to hide, he would give Mr. Pig his favorite toy - a Thomas engine. Mr. Dog then hides a lot of small pearls and a big diamond. Mr. Pig eventually stumbles upon a pearl and the diamond by accident, and Mr. Dog gives the Thomas engine to Mr. Pig as he promises.*

In the story, Mr. Dog sets the condition for a prize: as long as Mr. Pig finds some of the treasure (whatever treasure it is), he will get the Thomas engine. Mr. Pig ends up finding a small pearl and the big diamond, and he gets the Thomas engine from Mr. Dog. Consider how the sentence in (8) would be interpreted, following the story in (7).

(8) *Xiaozhu zhaodao le baoshi,   keshi ta   mei   zhaodao shenme zhenzhu*
    Mr. Pig find   Asp diamond but   he Neg   find   what   pearl
    'Mr. Pig found the diamond, but he did not find any of the pearls.'

The first conjunct asserts that Mr. Pig found the diamond. This constitutes a correct description of one event that took place in the story. The second conjunct is a negative statement with the *wh*-phrase *shenme zhenzhu* 'what pearl'. The question is whether or not the small pearl that Mr. Pig found suffices for Mr. Pig to have found any of the pearls. In the present context, it does, because the pearl is just as significant as the big diamond - both are categorized as 'treasure' in the story. It doesn't matter what kind of pearl Mr. Pig finds, small or large. Any kind of pearl will suffice for Mr. Pig to receive the prize he was promised. This means that the semantic value *shenme* remains underspecified (see section 2). When the underspecified *shenme* NP in (8) is negated, therefore, the 'none' reading is generated, to the effect that Mr. Pig did not find any kind of pearl. Clearly, this is an inaccurate description of the story.[8] Our analysis is supported with some empirical data. As

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[8] The derivation of the 'none' reading is represented in (i). Suppose that the discourse contains four types of pearls: *p, q, r* and *s*. The context is one in which Mr. Pig did not find any of the pearls, i.e., the 'none' reading.

reported in a previous study, ten Mandarin-speaking adults were found to reject (8) as a description of the story (7) 100% of the time, on the grounds that Mr. Pig did find a pearl (Author (2013)).[9]

A different explanation is needed to understand why the insignificance reading is not possible for negative statements with the NPI *renhe*. As mentioned in Section 1, only the 'none' reading can be assigned to negative statements with *renhe*, such as (9) (formerly example (1b)).

(9) *Zhangsan mei   chi renhe dongxi*

    Zhangsan Neg eat any thing

    'Zhangsan did not eat anything'

We contend that the absence of the insignificance reading in (9) is due to the semantic properties of the NPI *renhe*. Basically, *renhe* has the same semantics as its English counterpart *any*. NPIs like *renhe* and *any* are used to extend the domain of quantification, so as to encompass entities that are not typically associated with the accompanying common noun, i.e., atypical entities of the same class. This semantic property is called 'domain widening', as advanced by Kadmon and Landman (1993).[10] (For further details on the syntax and semantics of *renhe,* see Wang & Hsieh 1996; Hua 1997; Hsiao 2002; Kuo 2003; Hua & Zeng 2009; Cheng & Giannakidou (to appear); Zhang 2010.)

(i) ¬ ∃x[**Found'**(Pig, x) & **Pearl'**(x) & x ∈ {*p, q, r, s*}]

  = ¬ [**Found'** (Pig, *p*) ∨ **Found'** (Pig, *q*) ∨ **Found'** (Pig, *r*) ∨ **Found'** (Pig, *s*)]

  = ¬ **Found'** (Pig, *p*) ∧ ¬ **Found'** (Pig, *q*) ∧ ¬ **Found'** (Pig, *r*) ∧ ¬ **Found'** (Pig, *s*)}

[9] The same ten adults were also tested with the story (3) and the negated *shenme* sentence (4). They accepted the test sentence 100% of the time, showing they assigned the insignificance reading to (4) in the context in (3). The fact that the same Mandarin-speaking adults accepted (8) but rejected (4) supports our proposal that the interpretation of *shenme* depends on discourse context.

[10] Kadmon and Landman (1993) discuss the domain widening of *any* in English by comparing the interpretative difference between (i) and (ii) below.

(i) I don't have potatoes.
(ii) I don't have any potatoes.

It is argued that (i) may be true if I have some rotten potatoes in the back yard. This is because, in a context of utterance, the domain of quantification that is associated with a common noun (i.e., potatoes) includes just typical kinds of entities (i.e., cooking potatoes), and leaves out atypical kinds of potatoes (i.e., rotten potatoes, decorative potatoes). However, when *any* is attached to a common noun, as in (ii), the sentence implies that the speaker lacks potatoes of all kinds, both typical and atypical. As one of the reviewers points out, there is sometimes a 'nothing significant' reading for English *any*. Nevertheless, in Mandarin Chinese, *renhe* does not allow the same insignificance reading. A speaker who wants to convey this reading must use *shenme*.

To recap, *shenme* partitions the denotation of the NP into kinds of entities. By default, *shenme* introduces an open set of kinds of entities. However, as a pronominal element, *shenme* exhibits context-dependent features. This pronominal property of *shenme* allows it to pick out a subset of entities made salient in the discourse. By contrast, the NPI *renhe* encodes domain widening, so the entire domain of entities is exhausted. This distinction between *shenme* and *renhe* explains why the insignificance reading is possible with negated *shenme* sentences, but not with negated *renhe* sentences. On the present analysis, when negated *shenme* sentences receive the 'none' reading, they have the same semantic representation as that of negated *renhe* sentences. In short, the present analysis highlights the discourse properties of *shenme*, and such properties are missing in sentences containing *renhe*. The analysis not only captures the relevant semantic similarities between *shenme* and *renhe* that have been discussed in the literature (e.g., Huang 1982; Li, A. 1992), but it also accounts for the differences in meaning between these two polarity items.

4. Predictions

The availability of the insignificance reading associated with *shenme* in Mandarin Chinese has implications for child language development. First, the requirement of extra contextual support that is involved in the establishing of the insignificance reading will impact upon Mandarin-speaking children's acquisition of this reading. Presumably, interpretations that require contextual support (i.e., a pragmatic inference) should be acquired later in the course of language development, as compared to interpretations that simply depend on the literal meanings of the words they contain. More specifically, in order to add the insignificance reading to their grammars, children have to recognize that the entities that are present in the domain of discourse are atypical or undervalued. Put differently, the 'none' interpretation is the literal meaning of negative sentences with *shenme*. This reading is therefore expected to be effortless for children. Children should assign this interpretation unless information in the context indicates that the 'none' reading is false, and an alternative interpretation is intended by the speaker. This summarizes one reason for predicting that the insignificance reading will be delayed, as compared to the 'none' reading.

There is a second reason for predicting a delay in the acquisition of the insignificance reading. There is a logical relationship between the insignificance reading and the 'none' reading. This logical relationship, too, invites the prediction that Mandarin-speaking children will initially hypothesize the 'none' reading, and add the insignificance

reading at a later stage of language development. In particular, the 'none' reading entails the insignificance reading, but not vice versa. That is, if there are no entities of the relevant kind in the circumstance (the 'none' reading), then there are no significant entities of this kind (the insignificance reading). The opposite is not true. The circumstance could lack significant entities of the relevant kind without lacking any entities at all. As formulated, the 'none' reading and the insignificance reading of negative sentences with *shenme* fall into a subset-superset relationship: the 'none' reading is true in a narrower set of circumstances in which the insignificance reading is true. Bearing in mind the logical relationship between the two interpretations, we can ask how a child would learn that a negative sentence with *shenme* has more than one interpretation.

One option is that the child starts with the 'none' reading. If so, the child may experience a negative sentence with *shenme* being uttered in a situation in which entities exist, but not ones that are considered to be significant, at least by adults. On this scenario, the assumption that the adult speaker is being cooperative would lead the child to infer that a reading other than the 'none' reading must be intended by the speaker. By a series of inferences, the child would be led to assign the insignificance reading (see (5)).

Alternatively, the child might start with the insignificance reading. A 'subset problem' arises on this scenario, however (see Crain, Ni & Conway 1994). As formulated above, the 'none' reading and the insignificance reading fall into a subset-superset relationship. If the child guesses the superset interpretation – that no significant entities exist – then this interpretation is verified whenever adult speakers intend the 'none' reading-that no entities of the relevant kind exists. If the local language lacks the insignificance interpretation altogether, it is difficult to see how a child who initially assigned the insignificance reading would be able to converge on a grammar that is equivalent to that of adults in the absence of negative evidence (see e.g., Pinker 1984; Crain 1991; Marcus 1993; Crain & Pietroski 2001, 2002). Taken together, considerations of learnability also lead us to expect the insignificance reading to emerge later than the 'none' reading in the course of language development. (Cf. Musolino 2006; Gualmini & Schwarz 2009).

To recap, there are two reasons to anticipate the 'none' reading of negated sentences with *shenme* should be the initial interpretation assigned by Mandarin-speaking children. If so, children should initially fail to distinguish between *shenme* and *renhe* in negative statements. We will now turn to the child language laboratory to investigate this experimental hypothesis.

5. Experiment

This experiment investigated Mandarin-speaking children's interpretation of negative statements with *shenme* and negative statements with *renhe*. Representative examples of the two types of sentences are (10) and (11).

(10)   *Xiaozhu mei chi shenme dongxi.*
          Mr. Pig Neg eat what   food
          (i) 'Mr. Pig hardly ate any food.'   Insignificance reading
          (ii) 'Mr. Pig did not eat any food.'   'None' reading

(11)   *Xiaozhu mei chi renhe dongxi.*
          Mr. Pig Neg eat any   food
          'Mr. Pig did not eat any food.'   'None' reading

5.1. Subjects

We recruited 45 Mandarin-speaking children from a kindergarten affiliated with Beijing Language and Culture University. Using a between-subject design, we tested the *shenme* sentences on one group of 24 of the children and tested the *renhe* sentences on the remaining 21 children. The *shenme* group ranged in age from 5;0 to 6;3, with a mean age of 5;5. The *renhe* group ranged in age from 5;0 to 6;3, with a mean age of 5;6. We refer to these children, combined, as '5-year-old children'. Notice that the *renhe* group had previously been found to understand the meaning of *renhe* using three other experimental conditions: in sentences with the negative quantifier *meiyouren* 'nobody', in ones with the modal *neng* 'can', and in sentences with *zai...zhiqian* 'before'.[11]

Following the study with the 5-year-old children, we tested two groups of older children using the *shenme* sentences alone. These children were recruited from students at No. 2 Primary School, Haidian District, Beijing. The first group included twenty 7-year-old children (range 6;7-7;6; mean 7;1), and the second group included sixteen 8-year-old

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[11] We used a between-subject design in order to avoid carry-over effects between trials. In pilot testing, the *renhe* sentences and the *shenme* sentences were presented to the same subjects. In this study, some children fluctuated between the 'none' reading and the insignificance reading in their interpretation of the *shenme* sentences. It was unclear whether this fluctuation was due to carry-over effects, or represented children's multiple interpretations for the *shenme* sentences. The present study used a between-subject design to avoid such effects.

children (range 8;1-9;0; mean 8;6). We refer to these two groups of children as '7-year-old children' and '8-year-old children' respectively.

We also included a control group of 42 Mandarin-speaking adults, who were graduate students from Beijing Language and Culture University. Adults, too, were divided into groups, with 20 adult subjects tested on the *shenme* sentences, and 22 on the *renhe* sentences.

5.2. *Procedures and materials*

The experiment used a Truth Value Judgment Task (Crain & Thornton 1998). The task involves two experimenters. One experimenter narrates the stories using toys and props. The other experimenter plays the role of a puppet, who watches the story alongside the child. At the end of each story, the puppet is invited to explain to the child what happened in the story. The child's task is to judge whether the puppet said the right thing or not. If the child informs the puppet that he is wrong, then s/he is asked to explain ''what really happened?'' When the puppet accurately described what had happened in the story, the child was instructed to reward him with a strawberry. Sometimes the puppet doesn't pay close attention, however, and says the wrong thing. In that case, the child is instructed to give the puppet something to remind him to pay closer attention, a pepper.

The child participants were introduced to the task and tested individually, following a brief warm-up session. In addition, each child was given two practical trials, one that was obviously true, and one that was obviously false. There were three test stories for each participant. These stories exhibited the same overall pattern of events. A typical trial was described earlier, as in (3). In this trial, Mr. Pig and Mr. Dog went to a party. At the end of the party, Mr. Dog had eaten a lot of food and was very full and happy, whereas Mr. Pig had eaten only a tiny prawn and was still hungry (see Appendix 1 for a full description of the story). At the end of the story, the toy characters and props were arranged as depicted in Figure 1. The final arrangement of the toys provided a record of the events that had taken place. The event corresponding to the insignificance reading (i.e., Mr. Pig ate the little prawn) was acted out last in the story, so if the insignificance reading is available to children, they should favor this reading.

Figure 1. The last scene of the sample story

After the story, the puppet produced either a *shenme* sentence (12), or a *renhe* sentence (13). These two sentences constitute a minimal pair, with *shenme* versus *renhe* appearing in the second clause of each sentence type.

Test sentences

Type 1 (*shenme*)

(12) *Xiaogou chi le   henduo dongxi, keshi xiaozhu mei chi shenme dongxi.*

　　 Mr. Dog eat Asp a lot   food   but   Mr. Pig Neg eat what   food

　　(i) 'Mr. Dog ate a lot of food, but Mr. Pig hardly ate any food.'

　　(ii) 'Mr. Dog ate a lot of food, but Mr. Pig did not eat any food.'

Type 2 (*renhe*)

(13) *Xiaogou chi le   henduo dongxi, keshi xiaozhu mei chi renhe dongxi.*

　　Mr. Dog eat Asp a lot   food   but   Mr. Pig Neg eat any   food

　　'Mr. Dog ate a lot of food, but Mr. Pig did not eat any food.'

The *renhe* sentence (13) is a false description of the story. By contrast, the *shenme* sentence is a true description of the story on the insignificance reading, but it is a false description if it is assigned the 'none' reading. Note that the same positive lead-in sentence

Xiaogou chi le henduo dongxi 'Mr. Dog ate a lot of food' was included in both types of test sentences. The function of the lead-in sentence was twofold. First, it helps set up a contrast set for eliciting the 'insignificance' interpretation of the *shenme* sentences (cf. section 2). Second, it was used to satisfy the felicity conditions associated with the use of negation (cf. Gualmini 2005; Musolino & Lidz 2006). Negative statements are typically used to point out a discrepancy between what is expected to happen and what actually happens (see, e.g., Russel, 1948; Wason, 1965; De Villiers & Tager-Flusberg 1975; Givon 1978). In this regard, the 'none' reading associated with sentence (12) and sentence (13) is felicitous in a context in which both Mr. Dog and Mr. Pig were expected to eat a lot of food but, in the end, Mr. Pig only ate a small prawn, thus failing to meet expectations.

Another feature of experimental design is known as the Condition of Plausible Dissent (Crain & Thornton 1998). This condition is based on Russell's (1948) observation that a negative judgment is appropriate only when the correlative positive judgment has already been made or is under consideration. In this regard, for the 'none' reading to be felicitous, it must be clear to a child that if events had taken a slightly different turn, the response to the sentence would have been "Yes", rather than "No". In the sample story, the "Yes" response would have been appropriate if Mr. Pig did not eat the small prawn during the story. Nevertheless, the fact that Mr. Pig ate the small prawn means that sentences (12) and (13) are false on the 'none' reading.

In addition to the test sentences, one filler sentence was presented as part of each story. The filler sentences were obviously true or false. The choice of making the filler true of false depended on whether the child participant accepted or rejected the test sentence. If the child accepted the test sentence, the puppet produced (14), a false statement; if the child rejected the test sentence, the puppet produced (15), a true statement.

(14) *Xiaogou chi de shi haixianmian*

    Mr. Dog eat De Aux Seafood-noodle

    'The noodle that Mr. Dog ate is the seafood noodle.

(15) *Xiaogou chi de shi shucaimian*

    Mr. Dog eat De Aux vegetable-noodle

    'The noodle that Mr. Dog ate is the vegetable noodle.

The filler trials served to obscure the purpose of the study, and to ensure that children remained aware of the task. In total, each child received three test sentences and three filler sentences. The number of "Yes" and "No" responses were counterbalanced. The entire testing session, including the warm-ups, the practical trials and the test trials and fillers, lasted about 15-20 minutes. English translations of the test materials are given in Appendix 1. The adult controls were tested on the same stories, using pictures. As we did with the child subjects, the adult subjects were asked to give a justification if they judged the puppet to be wrong.

5.3. *Results*

All of the child and adult participants responded correctly to the practical trials and the fillers 100% of the time, so their data were included in the final analysis. The dependent measure in the study was the proportion of "Yes" responses to the puppet's statements, for both the *shenme* sentences and the *renhe* sentences.

Let us look first at the adult data. The adult group who received the *shenme* sentences predominantly accepted the test sentences against the test stories, at 80% of the time (48/60 trials). On the other hand, the other adult group who received the *renhe* sentences accepted the test sentences only at 6% of the time (4/66 trials) in the same stories. A Mann-Whitney test revealed this difference to be significant ($Z = 4.953$, $p < .001$).

Now we can turn to the child data, beginning with the performance of the 5-year-old children. The group of 5-year-old children that received the negative *shenme* sentences rejected them 75% of the time (54/72 trials). The group that received the negative *renhe* sentences rejected the test sentences 90% of the time (56/63 trials). A Mann-Whitney test also revealed that the two groups of five-year-old children did not exhibit a significant difference in the proportion of acceptance of the two types of test sentences (25% vs. 10%, $Z = 1.787$, $p = .086$). In short, the two groups of 5-year-old children did not make a statistically significant distinction between negative sentences with *shenme* and negative sentences with *renhe*. In justifying their rejections of the puppet's statements, both groups of children consistently pointed out the existence of the 'insignificant' entity in the domain of discourse. For instance, the different groups of children explained that (12) and (13) were not accurate descriptions of what had happened in the story, because Mr. Pig did eat a small prawn. Based on these children's negative judgments and their subsequent justifications, it is clear that the majority of 5-year-olds assigned the 'none' reading to both types of sentences. In short, the insignificance reading pertaining to negative statements

with *shenme* was not available to 5-year-old Mandarin children, even though this reading was salient in the experimental context.

Despite the failure to reach significance, it appears that some 5-year-old children assigned the insignificance reading in response to the negative sentences with *shenme*. An examination of the data for individual children condition revealed that four of the 24 children projected the insignificance reading on at least two out of the three test trials. These children accounted for the majority of the 25% acceptances by this group. Presumably, then, by 5-years-old, some children have begun to add the insignificant reading to their grammars, though this is by no means true of all children at this age.

Figure 2 gives a comparison of "Yes" responses to the two types of test sentences by the two groups of 5-year-old children, and by the adult controls. The individual child data is given in Appendix 2.

Figure 2. Proportion of "Yes" responses to the puppet's productions of *shenme* sentences and of *renhe* sentences in 5-year-old children and in adults
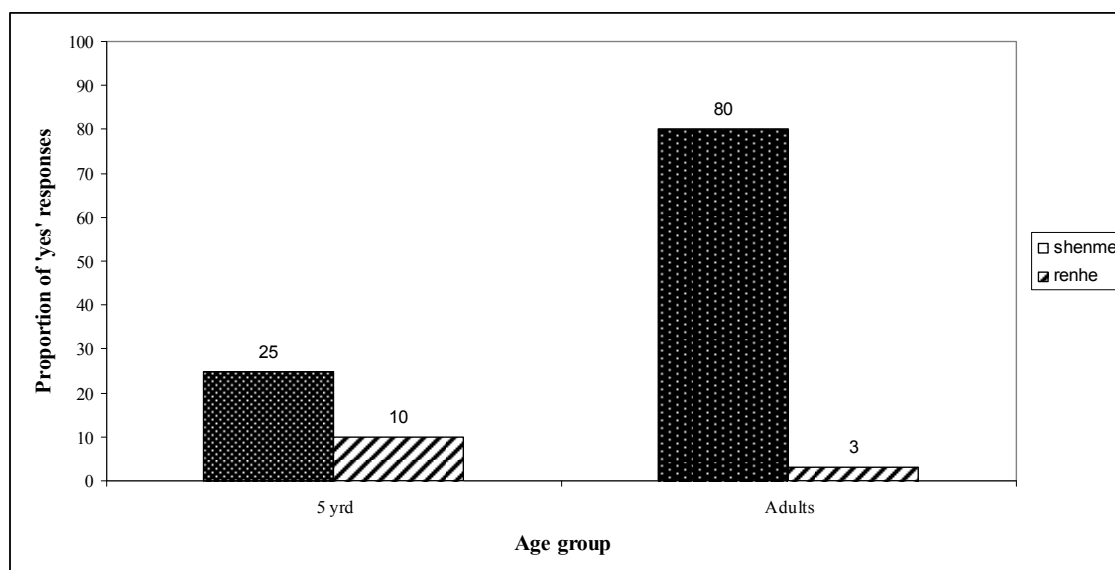
This brings us to the older groups of children. The data from older children reveal a clear developmental pattern in the proportion of acceptances of the insignificance reading. Specifically, the acceptance rate for negative sentences with *shenme* increased from 25% by 5-year-olds, to 68% (41/60 trials) by 7-year-olds, to 94% (44/48 trials) by 8-year-olds. Mandarin-speaking children gradually add the insignificance reading as they increase in age. A Mann-Whitney test revealed that, although adult controls accepted the *shenme* sentences significantly more often than the 5-year-old children (Z=3.874, p < .001.), adults

did not accept them significantly more often than either the group of 7-year-olds (Z = .808, p = .457) or the group of 8-year-olds (Z = .969, p = .327). Figure 3 summarizes the proportions of "Yes" responses to the *shenme* sentences across the four age groups.

Figure 3 Proportion of "YES" responses to the *shenme* sentences for the adult group and the child groups
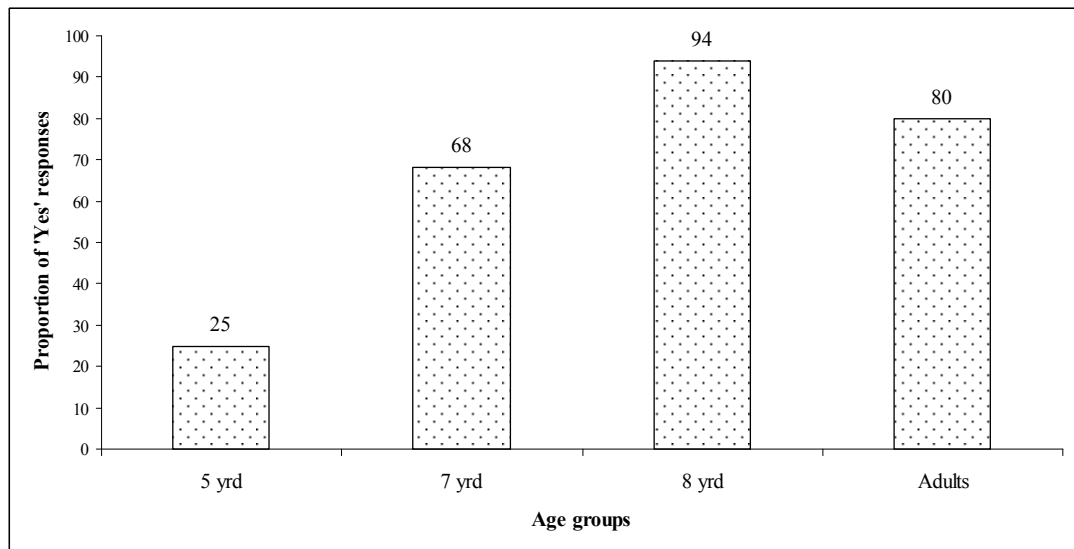
The findings summarized in Figure 3 invite us to conclude that a fundamental transition in the acquisition of the insignificance reading appears to take place by age 7 for Mandarin-speaking children. The findings are consistent with the experimental hypothesis – that the addition of the insignificance reading to children's grammars requires positive evidence and, hence, is delayed, as compared to the 'none' reading. As we noted, both pragmatic factors and the Semantic Subset Principle conspire to make the 'none' reading of the *shenme* sentences available to children earlier than the insignificance reading. As predicted, Mandarin-speaking children did not attain the insignificance reading until the age of 7, although children assigned only the 'none' reading to negative sentences with *shenme* by age 5.

6. Discussion

This study investigated how Mandarin-speaking children comprehend negative sentences with the *wh*-pronoun *shenme* 'what' and negative sentences with the NPI *renhe* 'any'. In the present experiment, 5-year-old children were found to predominantly assign the 'none' reading to negative sentences with *shenme*. Therefore, children distinctly differed from

adults, in that they did not make a distinction between negated *shenme* sentences and negated *renhe* sentences. As children advanced in age, they gradually added the insignificance reading, reaching at an adult-like level of performance by the time they were about 7 years old. We proposed two possible acquisition scenarios to explain children's non-adult behaviors, i.e., their lack of the insignificance reading. One possible scenario is that some pragmatic factor (i.e., a partitioning of entities into significant versus insignificant kinds) is required to elicit the insignificance reading. In the absence of pragmatic knowledge, negative sentences with *shenme* receive the 'none' reading. The second possible acquisition scenario is that children adhere to a subset principle that initially favors the strongest possible semantic interpretation, which is the 'none' reading. In the absence of negative evidence, a subset problem would arise, presumably, unless children initially favor the (subset) 'none' reading for negative sentences with *shenme*. The findings of the present study do not suffice to adjudicate between these two accounts of the acquisition of the insignificance reading. However, the findings can be invoked to eliminate several alternative accounts.

First, the preponderance of the 'none' reading in 5-year-old children cannot be attributed to the conjecture that this younger group did not know the semantic meaning of the word *shenme*, and hence did not process the word. This is a concern for us, because the 'none' reading might otherwise be assigned to simple negative sentences without *shenme*, i.e., to negative sentences with bare plurals. Consider example (16).

(16) *Xiaozhu mei chi dongxi*

    Mr. Pig Neg eat food

    'Mr. Pig did not eat any food'   'None' reading

Without *shenme*, (16) means that Mr. Pig did not eat food. The insignificance reading is absent for this sentence, just as it is absent for negative sentences with *shenme*, for 5-year-old children. To address this concern, we offer the following independent evidence that, by 5-years-old, Mandarin-speaking children know the semantic meaning of *shenme*. The requisite evidence comes from previous literature.

First, there is data from production studies showing that Mandarin-speaking children start producing interrogative *shenme* as early as two years old (Li and Tang 1991; Fan 2012) and, more importantly, that they start producing non-interrogative *shenme* shortly after the emergence of interrogative *shenme*, at around two years and half (Fan

2012). To cite just a few examples, non-interrogative *shenme* was used by young Mandarin children in sentences with negation (17), in sentences with the adverb of quantification *dou* 'all' (18), in sentences with the combination of negation and *dou* (19), and in donkey sentences (20).

(17).   *Shenme ye mei you*   (ZTX 02;01;12 from Fan 2012)

     What   also Neg have

     'Nothing exits here.'

(18)   *Shenme dou xihuan chi*   (Li & Tang 1991)

    what   all   like   eat

    '(someone) likes to eat anything.'

(19)   *Wo shenme dou de bu zhao le*   (ZHZ 02 ;04 ;11 from Fan 2012)

    I   what   all   get Neg Asp Asp

    'I did not get anything.'

(20)   *Jiejie, ni xiang chi shenme wo jiu chi shenme*   (Li & Tang 1991).

    Sister you want eat what   I   then eat what

    'Sister, if you want to eat x, I will eat x.'

Comprehension studies have also found that Mandarin-speaking children command the semantic meaning of *shenme* at a young age. Lee (1989) reports that his subject XM responded to adults' *shenme* questions appropriately well before XM's second birthday. A recent acquisition study of the comprehension of *shenme* in negative statements is directly relevant to the present study. Zhou, et al (in press) tested Mandarin-speaking children's comprehension of *shenme* in negative sentences like (21). This sentence can be used to pose a question, as indicated by the reading (21i): 'what type of furniture didn't the pandas buy?' Alternatively, the same sequence of words can be used to make a statement, as shown in (21ii): the pandas didn't buy any furniture.

(21) *Xiongmao meiyou mai shenme jiaju*

  Panda   Neg   buy what   furniture

  (i). 'What type of furniture didn't the pandas buy?'   (Rising intonation)

(ii) 'The pandas didn't buy any furniture.'   (Level intonation)

Although the Zhou et al. study did not investigate the insignificance reading, these researchers found that children were aware that the two semantic meanings of the same sequence of words in (21) were associated with different intonation patterns. In particular, when a rising intonation was place on *shenme jiaju*, children took (21) to be a question, but when the same phrase was produced with level intonation, children took (21) to be a negative statement, equivalent in meaning to its Mandarin counterpart with *renhe*.

Taken together, both the findings from previous production and comprehension studies reveal that Mandarin-speaking children have command of the semantic meaning of *shenme* by the age of 4. Without acquiring the semantic meaning of *shenme*, it would not have been possible for Mandarin-speaking children to exhibit adult-like performance when *shenme* appeared alongside other linguistic operators. In short, the present findings render it unlikely that the 5-year-old Mandarin-speaking children were ignoring the word *shenme*. A more reasonable scenario is that the 5-year-olds know the semantics of *shenme*, but cannot access to the discourse-bound meaning of *shenme* and, hence, fail to assign the insignificance reading.

Second, the delay of the insignificance reading cannot be explained by invoking frequency. As noted in section 1, the insignificance reading is common in daily conversations in Mandarin Chinese. It is widely acknowledged in traditional descriptive Chinese grammars and in general Chinese textbooks for foreigners. In fact, some of adults we have consulted pointed out that the insignificance reading is their favored interpretation to negated *shenme* statements; if they want to express the 'none' reading, they prefer to use other linguistic structures such as (i) negative statements with *renhe*; (ii) negative statements with bare nouns (22); (iii) negative statements containing *shenme…dou* 'what…all', with the universal adverb of quantification *dou* 'all' (23). The insignificance reading is not possible using these structures.[12]

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[12] It seems that there exists individual variation in the interpretation of negative statements containing *shenme*. Particularly, some Mandarin speakers take the insignificance reading as the preferred reading of this linguistic structure, as the alternative 'none' reading can be more explicitly expressed by other linguistic forms such as *renhe* 'any' and *shenme…dou* 'what…all'. However, this preference can be overridden. As shown in section 5, when a partition between significant entities versus insignificant entities is prohibited in the domain of quantification, the insignificance reading is not possible for negative statements containing *shenme*. This is attested in all the informants we interviewed. The possibility of overriding the preference of the insignificance reading suggests that the insignificance reading is not the unique reading that is associated with negative sentences with *shenme*; to facilitate the insignificance reading, a divide between significant entities versus insignificant entities in the domain of quantification has to be in offer. Otherwise, the

(22) *Xiaozhu mei chi dongxi*

    Mr. Pig Neg eat thing

    'Mr. Pig did not eat anything.'

(23). *Zhangsan shenme dongxi dou mei chi*

    Zhangsan what   thing   all   Neg eat

    'Zhangsan did not eat anything.'

The robustness of the insignificance reading is verified in our experiment using adult subjects. As the experimental results show, Mandarin adults preferred the insignificance reading of negative statements containing *shenme*, when the felicity conditions were met. Moreover, the insignificance reading is often made explicit in ordinary language use, by following *shenme* by a focus structure such as *zhi you* 'only have', as in (24) (formerly 2a). This is further evidence that *shenme* is used in contexts in which entities are being referred to.

(24) *Wo mei you shenme youpiao, zhi   you yixie hen lao de (youpiao)*

    I   Neg have what   stamp   only have some very old De stamps

    'I hardly have any stamps, only have some old ones.'

    Finally, the developmental pattern of the insignificance reading cannot be due to performance factors. In particular, the predominant rejection of the negated *shenme* sentences in 5-year-old children cannot be ascribed to a simple *no*-bias, and the 7-to-8-year-old children's acceptance of the negated *shenme* sentences is not simply due to a *yes*-bias. Recall that we asked children to justify their rejections of the test sentences in the experiment. As described in section 5, when children were asked to explain why they thought the puppet had said the wrong thing, children consistently pointed out the existence of the 'insignificant' entities in the domain of discourse. Moreover, if children's responses were simply due to their response biases, they would have presumably exhibited the similar developmental pattern (i.e., the *no*-bias followed by the *yes*-bias) across the board. However, this is not the case. For instance, an opposite developmental pattern is attested in children's acquisition of the scalar terms such as *some*. In particular, it has been

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alternative 'none' reading would arise. In this regard, the construction of the insignificance reading does need contextual support.

widely reported that, children younger than 7-year-old age tend to **accept** the sentences like *some of the books are red*, in the situation in which all of the books are red. When children become pragmatically sophisticated at around 7 years old, they behave just like adults and tend to **reject** the *some* sentence above, on the grounds that a more informative statement *All of the books are red* should have been used. (See Barner, Brooks & Bale 2011 for a review of the acquisition of scalar terms). Taken together, it is unlikely that the observed developmental pattern of the insignificance reading can be explained as a change in children's response biases, i.e., from the general *no*-bias to the general *yes*-bias. Instead, it is more reasonable to suppose that the growth of pragmatic knowledge in Mandarin-speaking children contributes to the attainment of the insignificance reading.

This section has ruled out several alternative accounts of the delay of the insignificance reading in 5-year-olds. It appears likely therefore that the delay in pragmatic knowledge, coupled with the Semantic Subset Principle, provides the most plausible account of the delayed acquisition of the insignificance reading. In this respect, our findings are consistent with previous findings that, at around 7 years old, children start becoming competent in making pragmatic inferences (e.g., Noveck 2001; Guasti et al 2005). A series of such pragmatic inferences, as listed in (5), are involved in the construction of the insignificance reading. Admittedly, the experimental findings cannot be used to specify exactly which of these pragmatic inferences are delayed.

The present study attempts to advocate that Mandarin-speaking children go through a stage during which the insignificance reading is absent in their interpretation of negated *shenme* sentences. This brings us to a broader picture of language development, pertaining to the competence/performance issue as associated with the acquisition of ambiguous sentences containing quantified NPs and negation. Particularly, in interpreting the ambiguous negative sentences like (25) *Every horse did not jump over the fence*, children, unlike adults, are found to have more difficulty to access the non-isomorphic reading 'not all the horses jumped over the fence' than the isomorphic reading 'none of the horses jumped over the fence.'

(25) Every horse did not jump over the fence

    (a) None of the horses jumped over the fence.   (every > not)

    (b) Not all the horses jumped over the fence.   (not > every)

This phenomenon is named as the Observation of Isomorphism (OI) (Musolino,1998, 2011). Various proposals have been put forward to explain the interpretive discrepancy between children and adults. Roughly, views can be divided into two contrastive accounts: the grammatical account versus the performance account (cf. Musolino & Lidz, 2006). On the grammatical account, the non-isomorphic meaning in sentences like (25) is absent in the early course of language development, due to some learnability problem (Musolino, 1998; Musolino, Crain and Thornton, 2000). On the performance account, the competence of non-isomorphic reading does exist as part of the linguistic competence of children; the apparent preference of the isomorphic reading is ascribed to some performance factors, performance factors such as the manipulation of certain contextual features and the function of semantic priming (Gualmini, 2004; Musolino & Lidz, 2006; Viau, Lidz & Musolino, 2010).

The present study did not directly address the competence versus performance issue. However, it seems that the competence account fares better. First, various felicity conditions, including the felicity conditions on negation and the insignificance reading, have been carefully considered in the experimental design (section 5). So it is unlikely that the absence of the insignificance reading in the 5-year-old children was due to the failure of meeting relevant requisite felicity conditions in the experimental settings. Second, we have ruled out various performance factors that might affect the access of the insignificance reading, as discussed above. Nevertheless, we are open to further exploration on this research issue.

In discussing the interpretation and acquisition of the insignificance reading, we refer in several places to previous discussions of scalar terms such as *some*. So, before we conclude the paper, we wish to clarify a few things in the interpretation and acquisition of scalar terms and *shenme* in negative statements. Although both are pragmatic inferences, in the case of scalar terms, the relevant inferences give rise to the **strong** reading (e.g., 'some but not all') of scalar terms (e.g., Grice, 1989). That is, scalar terms take on their weaker, strictly logical meanings, when scalar implicatures are not enforced (e.g., 'some and possibly all'). In the case of *shenme*, by contrast, the relevant inferences trigger the **weak** reading (i.e., the insignificance reading). In the absence of pragmatic factors, *shenme* sentences generate the 'none' reading, which is informationally stronger than the insignificance reading (section 2).

In much previous research, young children have been found to experience difficulty computing scalar implicatures, so they have not been successfully in accessing the strong

reading of scalar terms (e.g., 'some but not all') (e.g., Noveck, 2001. cf. Katsos, & Bishop, 2011). By contrast, in the present study children have been found to lack the weak reading (i.e., the insignificance reading) of negated *shenme* sentences in the early stage of language development. In short, different pragmatic mechanisms are required to explain children's pragmatic difficulties.

Now we are ready to address the last issue in the paper, i.e., the source of evidence compelling children to add the insignificance reading to their grammars. We suggest two sources of evidence. The first source of evidence is the explicit spelling-out of the insignificance reading in sentences like (24) provides the evidence that Mandarin-speaking children require to converge on the adult grammar. Second, children may notice that adults use *shenme* in circumstances in which there is a contrast between significant kinds of entities versus insignificant kinds of entities, thereby encouraging Mandarin-speaking children to add the insignificance reading to their grammars.

Acknowledgements

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Story 1:

This is a story about Mr. Dog and Mr. Pig. They are going to Mickey Mouse's birthday party. Mr. Pig always likes eating. You see, he is eating a hard walnut. Mr. Dog says to him 'hurry up, Mr. Pig, we are getting late'. Mr. Pig answers 'give me one more minute, let me finish the last bite'. "Ouch!" Mr. Pig cries. His teeth are broken! Poor Mr. Pig! It is very painful, but Mr. Pig still goes to Mickey Mouse's place with Mr. Dog. When they arrive, Mickey Mouse announces: "I have prepared a lot of delicious food for you today!". Mr. Dog and Mr. Pig are very happy. Haha, we are going to have a lot of yummy food today! In the party, Mickey Mouse first presents two big pizzas. Mr. Dog is very hungry, and grabs one for him. Yummy! Mr. Dog eats the whole pizza. Mr. Pig also wants to eat the other pizza, and goes to take it. But, his teeth are painful, so he has to give the pizza back to Mickey Mouse. Next, Mickey Mouse presents two big hamburgers. Mr. Dog takes one and eats it up in one minute. This is the best hamburger I ever ate, Mr. Dog announces. This makes Mr. Pig's mouth water, and then he cannot help to touch the other hamburger. But the hamburger is too hard for his broken teeth. He has to give it up, again. In the end, Mickey Mouse offers a vegetable noodle and a seafood noodle. Mr. Dog chooses the vegetable noodle. Mr. Pig is still suffering from his toothache, and shakes his head to Mickey Mouse. But Mickey suggests that: "look, there is a soft fresh prawn in this noodle. Why not try this one?" Mr. Pig has never eaten seafood before, he is hesitating. In the end, he cannot resist the attraction of the little prawn, and swallows it without biting it! Now the birthday party ends. Mr. Dog is very full and happy and goes to sleep on a couch. But Mr. Pig is very hungry, regretting: "I should not have eaten the hard walnut."

Test sentences:

Shenme sentence:

    Xiaogou chi le   henduo dongxi, keshi xiaozhu mei   chi shenme dongxi

    Mr. Dog eat Asp a lot food   but   Mr. Pig Neg eat what food

    (i) 'Mr. Dog ate a lot of food, but Mr. Pig hardly ate any food.'

    (ii) 'Mr. Dog ate a lot of food, but Mr. Pig did not eat any food.'

Renhe sentence:

> *Xiaogou chi le   henduo dongxi, keshi xiaozhu mei   chi renhe dongxi*
>
> Mr. Dog eat Asp a lot   food   but   Mr. Pig Neg eat any food
>
> 'Mr. Dog ate a lot of food, but Mr. Pig did not eat any food.'

Story 2

This is a story about Fat Hippo and Mother Kangaroo. Fat Hippo is a new neighbor of Mother Kangaroo. One day, Mother Kangaroo is preparing for dinner when Fat Hippo is running. Baby Kangaroo tells his mother: "look at the big belly of Uncle Hippo. I think he can eat a lot of food.' Kangaroo takes out some corns and say to Fat Hippo: "Hello Mr. Hippo, please join us for the dinner. We have very sweet corns here". Fat Hippo answers, without stopping running: "No, thanks, I am on a diet. I have to run to lose some weight." Mother Kangaroo then eats up one corn. Then she takes out some grapes, invites Fat Hippo again: "Hi, Mr. Hippo, I have some sweet grapes here. They do not contain many calories. They are fruit. They are good for you. " "No, thanks, Mother Kangaroo," said Fat Hippo, "I am too fat. I am keeping away from any sweet food." Fat Hippo keeps running. Then Mother Kangaroo finishes the grapes herself. In the end, it is dessert time! Mother Kangaroo takes out two icecreams. She tells Fat Hippo: "Do you want to try some ice-cream? You see you are sweating with the running!" "Ice-cream!" Fat Hippo stops running for a while, "it is my favorite food!" In a minute, he resumes running again. He says to himself: "No, No, No, I have to stick to the diet." Mother Kangaroo says: "look, I have a strawberry ice-cream, and a milk ice-cream. Have you ever eaten these kinds of ice-cream?" Fat Hippo answers: "I do eat milk ice-cream before, but I never eat strawberry ice-cream. Is it good?" "It is very good, why not try a little bit? I will get a spoon for you." Mother Kangaroo says and goes to fetch a tiny spoon for Fat Hippo. Fat Hippo has a small spoonful of strawberry ice-cream, and goes to run again. That night, Mother Kangaroo has a nice dinner and she is very full. But Fat Hippo is very hungry and cannot fall to sleep.

Test sentences:

Shenme sentence:

> *Daishu mama   chi le   henduo dongxi, keshi pang hema mei   chi shenme dongxi*
>
> Mother Kangaroo eat Asp a lot   food   but   Fat Hippo Neg eat what   food

(i) 'Mother Kangaroo ate a lot of food, but Fat Hippo hardly ate any food.'

(ii) 'Mother Kangaroo ate a lot of food, but Fat Hippo did not eat any food.'

Renhe sentence:

Daishu mama   chi le   henduo dongxi, keshi pang hema mei   chi renhe dongxi
Mother Kangaroo eat Asp a lot   food   but   Fat Hippo Neg eat any   food
'Mother Kangaroo ate a lot of food, but Fat Hippo did not eat any food.'

Story 3

This is a story about Mr. Mouse and Mr. Monkey. One day, they go to a farmer's garden. There are a lot of vegetables in the garden. You see, there are cucumbers, Chinese cabbages, and Peppers. When they arrive, the farmer is lying in a couch. She seems to get tired from working in the garden. Mr. Mouse and Mr. Monkey are very happy. They say: "The farmer is sleeping. We are going to have a lot of food for lunch today!" You see, they are going to steal the farmer's vegetables! They first go to the cabbages. Mr. Monkey says: "I don't like cabbages. Mummy bought a lot of cabbages before. I would like to try something new." So he moves on. But Mr. Mouse takes one big cabbages. He likes all kinds of vegetables. Then they go to the peppers. Mr. Mouse takes one pepper. He even loves spicy food! But Mr. Monkey is still picky about the food. He thinks the pepper is too spicy for him. Finally, they go to the cucumbers. Mr. Mouse takes one big cucumber for him. It is very fresh, and the smell is so good! Mr. Monkey likes the cucumbers as well. But when he goes to pick one cucumber, they hear the farmer cough once at the other end of the garden. The farmer is awake! They are very scared, and run away as quick as possible. Mr. Money grads a small piece of cabbage when he escapes from the garden. Both successfully leave behind the farmer. That noon, Mr. Mouse has the big cabbage, the big cucumber and a pepper. He is very full and happy. But Mr. Monkey has only a small piece of cabbage. Of course, he is very hungry! He says to himself: "I should not have been picky about food."

Test sentences:

Shenme sentence:

Xiaolaoshi chi le   henduo shucai,   keshi xiaohouzi   mei   chi shenme shucai

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Mr. Mouse eat Asp a lot vegetable   but   Mr. Monkey Neg eat what vegetable

(i) 'Mr. Mouse ate a lot of vegetables, but Mr. Monkey hardly ate any vegetables.'

(ii) 'Mr. Mouse ate a lot of vegetables, but Mr. Monkey did not eat any vegetables.'

Renhe sentence:

Xiaolaoshi chi le   henduo shucai,   keshi xiaohouzi   mei   chi renhe shucai

Mr. Mouse eat Asp a lot vegetable   but   Mr. Monkey Neg eat any   vegetable

'Mr. Mouse ate a lot of vegetables, but Mr. Monkey did not eat any vegetables.'

Appendix 2

Individual child data of 5-year-old children

	Shenme group				*Renhe* group		
Subject code	Age	Yes response	No response	Subject code	Age	Yes response	No response
1	5;0	0	3	1	6;3	1	2
2	5;4	0	3	2	6;3	3	0
3	5;4	1	2	3	6;0	0	3
4	5;4	1	2	4	6;0	0	3
5	5;3	0	3	5	6;2	0	3
6	5;4	0	3	6	5;0	0	3
7	5;0	0	3	7	5;4	0	3
8	5;1	2	1	8	5;8	0	3
9	5;1	3	0	9	5;4	2	1
10	5;1	0	3	10	5;3	0	3
11	6;0	0	3	11	5;4	0	3
12	6;3	1	2	12	5;6	0	3
13	6;3	0	3	13	5;3	1	2
14	6;0	3	0	14	5;5	0	3
15	6;0	1	2	15	5;11	0	3
16	5;6	0	3	16	6;0	0	3
17	5;2	1	2	17	5;0	0	3
18	5;11	0	3	18	5;2	0	3
19	5;6	3	0	19	5;4	0	3
20	5;10	0	3	20	5;6	0	3
21	5;8	0	3	21	5;10	0	3
22	5;5	1	2				
23	5;7	0	3				
24	5;4	1	2				

CHAPTER 5

Acquisition of the *wh*-pronoun *ji* 'how many' in Mandarin Chinese

This chapter is based on the following paper which has been submitted for publication.

Huang, Aijun and Stephen Crain (Submitted). Acquisition of the *wh*-pronoun *ji* 'how many' in Mandarin Chinese. *Lingua*.

Abstract

In Mandarin Chinese indefinite *wh*-pronouns are often analyzed as (negative) polarity items. The present study shows that Chinese *wh*-pronouns are not homogeneous. We focus on the interpretation of *ji-ge* in simple negative statements, where a peculiar 'small-amount' reading arises. To explain the 'small-amount' reading, we propose that *ji-ge* can be used as both a simple existential quantifier and a plural existential quantifier. When *ji-ge* is singular, it receives an 'at least 1' reading; when *ji-ge* is used as a plural existential quantifier, it receives an 'at least 2' reading and an 'a few' reading. In simple negative statements, *ji-ge* is assigned the 'at least 2' reading, and the 'small-amount' reading is inferred through a conversational implicature. We report the findings of an experimental study investigating Mandarin-speaking children's comprehension of *ji-ge* in simple negative statements. Children are found to proceed through three developmental stages, where each stage corresponds to one of the meanings of *ji-ge*. Specifically, the simple existential reading ('at least 1') is acquired earlier than either of the plural readings ('at least 2' and 'a few'). This study contributes new data on the acquisition of polarity items and sheds new light on linguistic theory of *wh*-pronouns in Mandarin Chinese.

Key words:

wh-pronouns; Mandarin Chinese; *ji* 'how many'; first language acquisition; 'small-amount' reading

1. Introduction

Wh-pronouns in Mandarin Chinese exhibit quantification variability. Apart from an interrogative reading, as in (1), *wh*-pronouns such as *shenme* 'what' and *shei* 'who' can receive an indefinite reading, as in (2), or a universal reading, as in (3).

(1)*Zhangsan chi le* **shenme** *ne*?　　　　　　　　　Interrogative

　　Zhangsan eat Asp what　Q_{wh}

　　'What did Zhangsan eat?'

(2) *Zhangsan chi le* **shenme** *ma*?　　　　　　　　Indefinite

　　Zhangsan eat Asp what　　$Q_{yes\text{-}no}$

　　'Did Zhangsan eat anything?'

(3) *Zhangsan* **shenme** *pingguo dou chi*　　　　　　Universal

　　Zhangsan what　apple　　all　eat

　　'Zhangsan eats any kind of apples.'

The variation in quantificational force in sentences with *wh*-pronouns, as illustrated in (1)-(3), has generated a heated debate about whether *wh*-pronouns in Mandarin Chinese function as existential quantifiers or as variables (Huang 1982; Cheng 1991, 1994; Li 1992; Aoun and Li 1993; Tsai 1994; Shi 1994; Hua 2000; Liao 2011).

Another observation about *wh*-pronouns in Mandarin Chinese is that indefinite *wh*-pronouns are licensed in contexts that typically license negative polarity items, e.g., *any* in English or *renhe* 'any' in Mandarin Chinese. These contexts include negation, the antecedent of conditionals, *yes-no* questions, negative predicates, the restriction of the universal quantifier, and so on (Huang 1982; Li 1992; Cheng 1991, 1992; Lin 1996, 1998. cf. Klima 1964; Baker 1970; Ladusaw 1980; Giannakidou 1998). In these contexts, *wh*-pronouns are semantically equivalent to English *any* or Mandarin *renhe*. Due to the similar distribution and semantic interpretation between indefinite *wh*-pronouns and *any/renhe*, indefinite *wh*-pronouns are often analyzed as negative polarity items (Huang 1982; Li 1992; Cheng 1991, 1994; Lin 1996, 1998). As expected on this account, *wh*-pronouns receive a 'none' reading in simple negative statements, on a par with the similar meaning assigned to the negative polarity item *renhe* 'any' in the same contexts. Examples are given in (4) and (5).

(4) *Yuehan mei   jian **shei***

   John   Neg meet who

   'John did not meet anyone.'

(5) *Yuehan mei   jian   **renhe** pengyou*

    John   Neg meet any   friend

   'John did not meet any friends.'

The present study shows that *wh*-pronouns in Mandarin Chinese are not homogeneous (cf. Tsai 1994; Hua 2000; Cheng and Giannakidou (to appear)). An outlier is the numerical *wh*-pronoun *ji-ge* 'how many-Classifier'.[1]

We focus in particular on the interpretation of *ji-ge* in simple negative statements such as (6).

(6) *Yuehan mei jian   **ji   ge** pengyou.*

   John   Neg meet   how-many CL friend

   'John did not meet many friends.'

Sentence (6) expresses the meaning that John did not meet many friends, with an implicature that John did meet a small-number of friends. We call this the 'small-amount' reading. Crucially, (6) cannot be used to mean John did not meet any friends. So the 'none' reading which is available for negative sentences containing the *wh*-pronoun *shei* 'who' in (4), is not available for negative sentences containing *ji-ge*, such as (6). The lack of the 'none' reading in (6) thus represents a case showing *ji-ge* departs from other Chinese *wh*-pronouns in their semantic interpretation.

In traditional Chinese grammar, the interpretation of *ji-ge* is partitioned into two readings. One is the 'how-many' reading observed in questions such as (7). The other is the 'a few' reading observed in statements like (8). On the 'a few' reading, as in (8), *ji-ge* denotes quantities with cardinality between 2 to 9. This meaning is roughly equivalent to the English expression *a few* (Lü 1980/1999: 290; Lü 1985).

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[1] In Mandarin Chinese, a full-fledged numeral quantified expression consists of a number word, a classifier and a NP (e.g., *yi ge pingguo* 'one-CL-apple'). Being a proform of number words, *ji* is followed by a classifier and a NP (e.g., *ji ge pingguo* 'how many-CL-apple'). *Ji* can attach to any classifier. For the sake of simplicity, we use the combination of *ji* and the general classifier *ge*, namely, *ji-ge*, to refer to this numerical *wh*-pronoun.

(7) *Yuehan chi le **ji** **ge** pingguo?*   Question

    John   eat Asp how-many CL   apple

    'How many apples did John eat?'

(8) *Zhangsan mai le **ji** **ge** pingguo.*   Statement

    Zhangsan buy Asp how-many CL apple

    'Zhangsan bought a few apples.'

Given the characterization of the semantic meanings of *ji*-ge in the current literature, it is unclear how the 'small-amount' reading can be derived.[2] To explain the derivation of the 'small-amount' reading, we propose that *ji-ge* can be used both as a simple existential quantifier and as a plural existential quantifier. When *ji-ge* is used as a simple existential quantifier, it receives an 'at least 1' reading; the interrogative 'how many' reading is one case of the 'at least 1' reading. On the other hand, when *ji-ge* is used as a plural existential quantifier, it can receive two additional non-interrogative meanings. One is the plural reading 'a few', previously identified in the literature (Tsai 2002). The other plural reading is 'at least 2'. On our analysis, these two plural readings are semantically related. The 'at least 2' reading is the basic meaning, and the 'a few' reading is the derived meaning, which is computed via a scalar implicature. On the proposed analysis, moreover, *ji-ge* in simple negative statements receives the 'at least 2' reading, and the 'small-amount' reading is implicated through a conversational implicature.

The acquisition of the various meanings associated with the *wh*-pronoun *ji-ge* is of considerable interest in view of its departure in meanings as compared to other *wh*-pronouns. As noted above, *ji-ge* has two distinct semantic denotations (as a simple existential quantifier and as a plural existential quantifier). This invites us to ask when the simple existential quantifier meaning ('at least 1') and the two plural existential readings of

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[2] Notice that *ji-ge* does not convey either a 'large-amount' or a 'small-amount' reading when it means 'a few' in statements. The 'large-amount' and 'small-amount' readings arise when there is an external operator. For instance, when *ji-ge* is modified by the intensifier *hao,* as in (i), the 'large-amount' reading emerges. On the other hand, when *ji-ge* is modified by the focus operator *zhi,* as in (ii), the 'small-amount' reading emerges.

(i) *Yuehan jian le hao ji   ge pengyou*
   John   meet Asp Int   how-many CL friend
   'John met quite a few friends.'

(ii) *Yuehan zhi   jian le ji   ge pengyou*
   John   only meet Asp how-many CL friend
   'John only met a few friends.'

ji-ge ('at least 2' and 'a few') emerge in child language. If not at the same time, which reading is expected to emerge first? The study of the acquisition of *ji-ge* is also motivated by previous findings on the acquisition of *wh*-pronouns. It has been reported that young Mandarin-speaking children distinguish among the various quantificational patterns that are associated with *wh*-pronouns such as *shenme* 'what' and *shei* 'who'. Children have been found to assign the interrogative reading, the indefinite reading and the universal reading to these *wh*-pronouns, depending on the nature of the linguistic environment (Lee 1989; Zhou 2011; Zhou and Crain 2011; Su, Zhou and Crain 2011; Zhou, Su, Crain, Gao & Zhan 2012. See Li and Tang 1991, Fan 2012 on early production of *wh*-pronouns). Children's early awareness of the variations in the interpretation of *wh*-pronouns has been attributed to children's innate knowledge of several complex semantic mechanisms, including operator-variable binding (Zhou 2011; cf. Fodor 1980; Chomsky 1993, 2007; Guo et al. 1996; Lee 2002; Foley, et al 2003;). In light of the previous findings on the acquisition of Chinese *wh*-pronouns, the present study asks whether Mandarin-speaking children have early access to the range of meanings associated with the *wh*-pronoun *ji-ge*. Particularly, the findings of the previous literature on child language bring us to think whether the meaning of *ji-ge* that is shared with other *wh*-pronouns will be the first to appear in child language. So, we wonder whether the first meaning of *ji-ge* children exhibit is the simple existential quantifier reading ('at least 1'), bringing *ji-ge* pattern in line with other *wh*-pronouns. As noted, however, the *wh*-pronoun *ji-ge* has several interpretations that are not shared with other *wh*-pronouns. These appear mainly in negative sentences, so the present study investigated Mandarin-speaking children's comprehension of *ji-ge* in negative statements.

The paper is organized as follows. In section 2, we examine the semantic interpretation of *ji-ge*. Next, in section 3 we apply the semantic analysis of *ji-ge* to explain how the 'small-amount' reading arises in simple negative statements containing *ji-ge*. In section 4, we review previous literature on the acquisition of *wh*-pronouns in Mandarin Chinese. In section 5, we report an experiment investigating Mandarin-speaking children's comprehension of simple negative sentences containing *ji-ge*. Section 6 discusses the experimental findings and concludes the paper.

2. Interpretations of *ji-ge*

Traditional Chinese grammar identifies two readings of *ji-ge*. One is the 'how-many' reading that is assigned in questions, and the other is the 'a few' reading that is

assigned in statements. In this section, we will argue that *ji-ge* has other non-interrogative meanings, apart from the 'a few' reading mentioned by traditional Chinese grammarians. One meaning of *ji-ge* is 'at least 2'. We propose, more specifically, that the 'a few' reading is derived from the 'at least 2' reading through a scalar implicature. Yet another meaning of *ji-ge* is 'at least 1'. We will discuss this reading first.

2.1 The 'at least 1' reading

The first observation we wish to make is that *ji-ge* receives the 'at least 1' reading when it patterns with other *wh*-pronouns in certain sentence structures. One structure in which *ji-ge* patterns alongside other *wh*-pronouns is the so-called donkey sentences (cf. Cheng and Huang 1996). A typical donkey sentence with the *wh*-pronoun *shei* is given in (9). Example (9) states that 'if someone comes first, that same person eats first.'

(9) ***Shei*** *xian lai,* ***shei*** *xian chi*

who first come who first eat

'If x first comes, then x eats first.'

Similar donkey sentences are formed using *ji-ge*, as illustrated in (10). Example (10) expresses the idea that, if John eats some number of apples, then Mary will eat the same number of apples.' The pair of *ji-ge's* are thus inter-connected, as we saw for the *wh*-pronoun *shei* in (9).

(10) *Yuehan chi* ***ji*** ***ge*** *pingguo, Mali jiu chi* ***ji*** ***ge*** *pingguo*

John eat how-many CL apple Mary then eat how-many CL apple

(lit.) 'If John eats *n* apple(s), then Mary will eat *n* apple(s).'

The parallel between *ji-ge* and *wh*-pronouns is also witnessed in (11) and (12), where the same 'none' reading ('I don't believe John ate any apple') is assigned to the example with *ji-ge* (11) and to the example with *shenme* (12).

(11) *Wo bu xiangxin* [CP/IP *Yuehan chi le* ***ji*** ***ge*** *pingguo*]

I Neg believe John eat Asp how-many CL apple

'I don't believe John ate any apple.'

(12) *Wo bu xiangxin* [CP/IP *Yuehan chi le   **shenme** pingguo*]

    I Neg believe   John   eat Asp what apple

    'I don't believe John ate any apple.'

    Recall that it is subject to debate whether *wh*-pronouns like *shenme* and *shei* function as existential quantifiers or variables (Huang 1982; Cheng 1991, 1994; Li 1992; Aoun and Li 1993; Tsai 1994; Shi 1994; Hua 2000; Liao 2011). For present purposes, it is not important to distinguish between the variable account and the quantifier account for the characterization of *wh*-pronouns in Mandarin Chinese. We favor the more current quantifier account (Liao 2011), but this issue is not the focus of the present research. Regardless, in view of the parallel between *ji-ge* and other *wh*-pronouns in some linguistic contexts, we contend that *ji-ge* is interpreted in the same way as other *wh*-pronouns in these linguistic contexts. For ease of exposition, we analyze *ji-ge* as a simple existential quantifier when it receives the 'at least 1' reading.

    The present paper is mainly concerned with the non-interrogative meanings associated with the *wh*-pronoun *ji-ge*. It is important to note, however, that the interrogative 'how many' reading of *ji-ge* in questions receives the 'at least 1' reading. When someone asks the question in (13) *Yuehan chi le ji ge pingguo?* 'how many apples did John eat', the speaker presupposes that Yuehan has eaten at least one apple, possibly 1,000 or more. Likewise, *ji-ge* in indirect questions, as in (14), conveys the 'at least 1' reading. Example (14) conveys the idea that I don't know how many apple(s) Zhangsan ate; it could be 1, or 100.

(13) *Yuehan chi le **ji**   **ge**   pingguo?*

     John   eat Asp how-many CL apple

     'How many apples did John eat?'

(14) *Wo bu zhidao Zhangsan chi le **ji**   **ge** pingguo.*

     I Neg know Zhangsan eat Asp how-many CL apple

     'I don't know how many apple(s) Zhangsan ate.'

2.2 *Ji-ge* as a plural existential quantifier

    In addition to its use as a simple existential quantifier, *ji-ge* sometimes unambiguously conveys plural quantification (cf. Tsai 2002). This brings us to the other

two non-interrogative readings of *ji-ge*, i.e., the 'at least 2' reading and the 'a few' reading of *ji-ge*. Consider first the 'at least 2' reading. This reading is the logical meaning of *ji-ge* when it is used as a plural existential quantifier. The 'at least 2' reading is available, for instance, when *ji-ge* occurs in downward entailing contexts, such as in the antecedent of conditional, as in (15), and in the restriction of the universal quantifier, as in (16).[3]

(15) *Ruguo Zhangsan chi le   **ji**   **ge** bingjiling,   ta jiu   hui sheng bin*

    If   Zhangsan eat Asp how-many CL ice-cream   he then will get   sick

    'If Zhangsan eats some ice-cream cones, he will get sick.'

(16) *Mei   ge sheng   le **ji**   **ge** haizi de ren   dou keyi dedao*

    every CL give-birth Asp how-many CL child De person   all   can   get

    zhengfu   butie

    government   benefit

    'Every person who gives birth to two or more children can have government benefits.'

In (15), *ji-ge* appears in the antecedent of a *ruguo*-conditional and functions like any plural noun phrase, e.g., *two ice-cream cones*. So (15) can be paraphrased as 'If Zhangsan eats two or more ice cream cones, he will get sick'. Therefore, (15) expresses a generalization that is true if Zhangsan eats two ice-cream cones and gets sick, if Zhangsan eats 3 ice-cream cones and gets sick, if Zhangsan eats 4 ice-cream cones and gets sick, and so on. Likewise, with *ji-ge* in the restriction of the universal quantifier *mei* 'every', as in (16), this sentence conveys a plural reading of *ji-ge*: every person who gives birth to two or more children can have government benefits.

    Now we turn to the 'a few' reading. On this reading, *ji* functions as an approximate expression, denoting quantities with a cardinality roughly between 2 and 9 (Lü 1980/1999, 1985). So the 'a few' reading also conveys a plural quantification (Tsai 2002). An example is (17).

(17) *Zhangsan mai le   ji   ge pingguo*.

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[3] Downward entailing (DE) contexts license inference from generic terms (e.g., *animal*) to specific terms (e.g., *monkey*) (Ladusaw 1980). To illustrate, if the statement *If John sees an animal, he will be happy* is true, it necessarily follows that the statement *If John sees a monkey, he will be happy* is also true. In this regard, the antecedent of conditionals is a DE context. By the same token, some other linguistic contexts like the restriction of universal quantifiers and negation are DE contexts.

Zhangsan buy Asp how-many CL apple

'Zhangsan bought a few apples.'

On the 'a few' reading, *ji-ge* is one term in an ordered sequence of terms referring to numbers. The (potentially infinite) sequence of number expressions is illustrated in (18).

(18) {1, *ji* (2-9), 10, *shi ji* (11-19), *ji shi* (20-99), 100, *ji bai* (200-999), 1000, *ji qian* (2000-9999), …}

As (18) indicates, *ji* combines with other numerical expressions, such as *shi* 'ten', *bai* 'hundred', *qian* 'thousand', to form higher numerical expressions on the sequence. So, *shi ji* 'ten how-many' is an expression referring to the numbers between 11 and 19, and *ji shi* 'how-many ten' refers to the numbers between 20 and 99, and *ji bai* 'how-many hundred' refers to the numbers between 200 and 999, and so on. The fact that *ji* appears on a scale with other number words leads us to speculate that *ji* is a scalar term. This is the basis for our analysis of the derivation of the 'a few' reading.

Here is our proposal. The 'a few' reading is derived from the 'at least 2' reading. We contend that the upper bound of the 'a few' reading, 9, is derived through a scalar implicature. In particular, *ji* forms a scale with a higher numerical expression, i.e., *shi ji* 'ten how-many', which logically covers numbers between 11 and infinite (∞)) (cf. footnote 4). On this scale, *shi ji* asymmetrically entails *ji*, as shown in (19). So, if Zhangsan bought *shi ji ge* (11-∞) apples, it follows that he bought *ji ge* (2-∞) apples. In terms of information strength, *shi ji* is more informative, or, informationally stronger than *ji* (cf. Horn 1972).

(19) < *ji* 'how-many', *shi ji* 'ten-how-many'>

    2 - ∞ 11- ∞

Grice's (1989) Principle of Cooperation states that speakers are obliged to convey the strongest information they can. Since *ji* is the weaker term on the scale (19), the Principle of Cooperation invokes an implicature of exclusivity. Upon hearing someone use the less informative term *ji*, listeners assume that the speaker is being cooperative, so they infer that the speaker is not in a position to use the more informative term *shi ji*. Therefore, the speaker's use of *ji* in the simple statement (17) *Zhangsan mai le ji ge pingguo* 'Zhangsan

bought a few apples' is taken to implicate the negation of *shi ji* on the scale (19), such that the use of *ji* in this case implies *no more than 9*.[4] Coupled with the lower bound 2, we have the derived meaning of *ji-ge*, i.e., *at least two, but not more than 9*. This concludes the derivation of the 'a few' reading.

Since the 'a few' reading is derived by a scalar implicature, this reading is cancellable (Grice 1989; Horn 1989; Levinson 2000; Chierchia 2004). This is illustrated by (20). In this sentence, the derived upper bound of *ji-ge* is cancelled by the continuation of a clause containing the interjection *shijishang* 'in fact'. This second clause *shijishang ta chi le shi ji ge* 'in fact he ate more than ten' is in conflict with the derived 'a few' reading of *ji-ge* in the first clause. Therefore, the upper bound of *ji-ge* is cancelled, and *ji-ge* receives the 'at least 2' reading.

(20) *Zhangsan chi le   ji   ge pingguo,shijishang ta chi le   shi   ji   ge*

    Zhangsan eat Asp how-many CL apple   in-fact   he eat Asp ten how-many CL

    'Zhangsan ate a few apples, in fact he ate more than ten.'

The cancellability of the 'a few' reading corroborates our contention that this reading is derived by a scalar implicature. More supportive evidence comes from the observation that the 'a few' meaning of *ji-ge* is reinforceable (cf. Horn 1972, 1989; Grice 1989; Levinson 2000; Chierchia 2004). Reinforceability is indicated by (21) and (22). In both sentences, the derived 'a few' reading of *ji-ge* in the first clause is explicitly spelled out in the second clause; no redundancy is observed.

(21) *Zhangsan chi le   ji   ge pingguo, dan mei you shi ji   ge*

    Zhangsan eat Asp how-many CL apple   but Neg have ten how-many CL

    'Zhangsan ate a few apples, but no more than ten.'

(22) *Zhangsan chi le   ji   ge pingguo, zhi you ji   ge*

---

[4] Notice that *shi ji* 'ten how-many' has a derived upper bound, which is 19 (cf. (18)). This upper bound is derived via a scalar implicature. In particular, *shi ji* forms a scale with another numerical expression that contains *ji*, namely *ji shi* (lit. 'how-many ten'). *Ji shi* designates numbers between 20 and infinite (∞). Applying the scalar implicature depicted above, *shi ji* implicates the negation of *ji shi*, and obtains the derived meaning, i.e., covering numbers between 11 and 19. In a similar way, the derived meaning *ji bai* is 'between 200 and 999', etc. Consequently, we have a derived scalar meaning for all expressions containing *ji* (cf. (18)).

Zhangsan eat Asp how-many CL apple   only have how-many CL

'Zhangsan ate a few apples, only a few apples.'

To wrap up, *ji-ge* conveys three non-interrogative readings, i.e., 'at least 1', 'at least 2' and 'a few', depending on the specific linguistic context. The 'a few' reading is derived from the 'at least 2' reading via a scalar implicature. The 'at least 2' reading has escaped the attention of Chinese linguists. However, this reading is crucial for an understanding of the derivation of the 'small-amount' reading that *ji-ge* is assigned in negative statements. This brings us to the next topic, which is the derivation of the 'small-amount' reading in negative statements containing *ji-ge*.

3. The 'small-amount' reading

Now we are positioned to discuss how the 'small-amount' reading arises when *ji-ge* occurs in simple negative statements, as in (23) (formally (6)).

(23) *Yuehan mei jian ji   ge pengyou.*

   John   Neg meet how-many CL friend

   'John did not meet many friends.'

Here is our proposal. Negation is a downward entailing context. We assume *ji-ge* receives its basic plural meaning, i.e., the 'at least 2' reading, when it appears in the scope of negation. This assumption is consistent with the observation that *ji-ge* receives the 'at least 2' reading in other downward entailing contexts, such as in the antecedent of conditionals and in the restriction of universal quantifiers (cf. (15) and (16)). The critical point is that entailments are reversed in this negative context, such that all numbers larger than or equal to 2 are negated. In this circumstance, numbers from 2 to infinity (∞), which represents a large-number, are negated. In this case, the 'small-amount' reading is implicated through a conversational implicature: if John did not meet a large number of friends, he may only have met a small number of friends, or no friends at all. However, if the speaker was in a position to know that John did not meet any of his friends, she should have said this. The fact that the speaker did not say this, invites the inference that the speaker was not in a position to assert this strong claim. Therefore, the hearer infers that John did meet some friends, just not many. An alternative account can also be proposed. This account follows

from the more general observation that, when a number word occurs under negation, a positive sentence containing the immediately lower numeral is implicated. This positive implication is inferred via an indirect implicature in the sense of Chierchia (2004). To illustrate, if one says *John isn't twenty one years old*, as in (24), we expect that John is of an age pretty close to twenty.

(24) John isn't twenty one years old.

$\rightarrow$ John is close to twenty years old.　　　　　(Chierchia's (2004) example 66)

In the case of (23), 1 is the immediate lower number of 2, which is targeted by negation. So if someone says John did not meet 2 friends, the positive implicature licenses the inferences that John met one friend, which is a relatively small amount. Moreover, since the operation of indirect implicature implies the existence of one entity, the 'none' reading is unlikely to be a reading for simple negative statements with *ji-ge*, as in (23).

The proposed analysis on the 'small-amount' reading is empirically supported. In particular, the 'small-amount' reading is available when the numeral–classifier *liang ge* 'two-CL' is embedded in similar negative statements, an observation due to Tsai (2002).[5] This is illustrated in (25).

(25) *Yuehan mei jian　　liang　　ge pengyou*.

　　John　　Neg meet　　two　　CL friend

　　'John did not meet many friends.'

The fact that no obvious difference in meaning is observed between (23) (with *ji-ge*) and (25) (with *liang-ge*) lends support to the claim that *ji-ge* in (23) takes the 'at least 2' reading.

A caveat is in order. The 'small-amount' reading is an outcome of a series of pragmatic inferences, so *ji-ge/ liang-ge* do not necessarily take their absolute value 'at least

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[5] Tsai's (2002) examples are as follows.

(i) *Ta mei he liang/ji　　bei jiu jiu zui　le*
　　He Neg drink two/how-many CL wine then drunk Asp
　　'He drank little wine then got drunk.'

Tsai emphasizes that no other numerals in Mandarin can generate the similar 'small-amount' reading.

two'. That is, it is not necessary that John can only meet one friend, to make the sentences (23) and (25) true. If the speaker expects John to meet, say, 100 friends, but John ends up meeting just 5 friends, it is also felicitous to use these two sentences to express the opinion that John did not meet many friends. Therefore, we wish to emphasize that the concept of 'small-amount' is a relative concept, defined by the context of utterance, particularly by the speaker's expectation.

To wrap up, we have presented so far that *ji-ge* can be used as a simple existential quantifier (receiving the 'at least 1' reading) or as a plural existential quantifier (receiving the 'at least 2' reading and the 'a few' reading). Moreover, *ji-ge* in simple negative statements receives the 'at least 2' reading, and the 'small-amount' reading is implicated through a conversational implicature. From the perspective of language development, we are interested to know whether Mandarin-speaking children have access to the full range of meanings of *ji-ge*. Moreover, we wonder when the simple existential quantifier reading ('at least 1') and the two plural existential readings of *ji-ge* emerge in child language. Would these alternative readings of *ji-ge* be acquired in tandem in the initial stage of language development, or would some reading take precedence over the other ones? To address these questions, we conducted an experiment investigating Mandarin-speaking children's interpretation of *ji-ge* in simple negative statements. Before reporting on the acquisition of *ji-ge*, it is worthwhile to review first how other *wh*-pronouns like *shenme* 'what' and *shei* 'who' are acquired by Mandarin-speaking children. This is the main task for the next section.

4. The acquisition of *wh*-pronouns: A literature review

Previous studies show that Mandarin-speaking children exhibit early mastery of adult-like interpretation of *wh*-pronouns like *shenme* 'what' and *shei* 'who'. They are able to access various interpretations of these *wh*-pronouns (i.e., the interrogative reading, the indefinite reading and the universal reading) (Lee 1989; Zhou 2011; Zhou and Crain 2011; Su, Zhou and Crain 2012; Zhou, Su, Crain, Gao and Zhan 2012).

To begin with, the interrogative reading of *wh*-pronouns is found in place early in the course of language development. Based on a longitudinal study of his subject XM, Lee (1989) reports that XM was able to discriminate questions from other forms of utterances before XM reached 2 years old. XM was observed to respond appropriately well to adults' questions containing *wh*-pronouns like *shenme* 'what', *nali* 'where' and *shei* 'who'. More recently, researchers are interested to know whether Mandarin-speaking children are

sensitive to linguistic contexts, and assign the proper interpretation of *wh*-pronouns based on the linguistic environments these *wh*-pronouns appear. Su, Zhou and Crain (2012) contribute such an experimental study on this (see also Zhou 2011 on the details of the experiment). This study investigated Mandarin-speaking children's comprehension of the *wh*-pronoun *shenme* in two distinct linguistic contexts, as shown in (26) and (27).

(26) *Meiyou   xiongmao chi shenme shuiguo*

    Neg-have panda   eat what   fruit

    'No panda ate any fruit.'

(27) *Mei-zhi xiongmao dou chi le shenme shuiguo*?

    every-CL panda   all   eat Asp what   fruit

    'What kind of fruit did every panda eat?'

In (26), the *wh*-pronoun phrase *shenme shuiguo* 'what fruit' appears in the predicate phrase of the negative quantificational expression *meiyou xiongmao* 'no panda'. In this downward entailing context, *shenme* is interpreted as a negative polarity item with the indefinite reading equivalent to English *any*. So (26) states that 'No panda ate any fruit'. On the other hand, in (27), the same *wh*-pronoun phrase *shenme shuiguo* 'what fruit' appears in the predicate phrase of the universal quantificational expression *mei-zhi xiongmao* 'every-CL-panda'. In this non-downward entailing context, the *shenme* phrase is interpreted as an interrogative phrase. Example (27) conveys the meaning 'what kind of fruit did every panda eat?'[6]

    Using the Question-Statement Task, Su, Zhou and Crain (2012) investigated whether 3-to-4-year-old Mandarin-speaking children are sensitive to the two distinct linguistic environments and assign the indefinite reading to *shenme shuiguo* in (26) but the interrogative reading to *shenme shuiguo* in (27). On a typical trial, three pandas went to have breakfast. They had four choices, including three kinds of fruit (lemons, pears and strawberries) and eggs. Eventually, each of the pandas had an egg and a strawberry, and one of the pandas had a pear; none of the pandas had a lemon. When the story concluded, the puppet produced either (26) or (27). A group of 14 children heard test sentence (26), and another group of 14 children heard test sentence (27).

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[6] The same intonation (the level intonation) was employed in Su, Zhou and Crain (2012), in order to control for the effect of the intonation on subjects' judgement.

It is found that children, like adults, assigned the indefinite reading to *shenme* in the *meiyouren* 'nobody' sentences, whereas they assigned the interrogative reading to *shenme* in the *meigeren* 'everyone' sentences. In particular, when responding to test sentences with the *wh*-pronoun *shenme* in the predicate phrase of *meiyouren* 'nobody', children rejected the puppet's statements 100% of the time. They justified their rejections by pointing out that every panda ate some fruit. On the other hand, children provided an answer to test sentences with the *wh*-pronoun in the predicate phrases of *meigeren* 'everyone' 100% of the time, indicating that they took these sentences as a question.

In another study, Zhou and Crain (2011) investigated Mandarin-speaking children's knowledge of the universal reading of *wh*-pronouns. This experiment contrasted minimal pairs of sentences, namely sentences with the universal quantifier *dou* and ones without *dou*, as illustrated in (28) and (29).

(28) *Shei dou meiyou pa-shang da shu*

　　Who all　Neg　climb-up big tree

　　'Everyone didn't climb up the big tree.'

(29) *Shei meiyou pa-shang da shu*

　　who Neg　climb-up　big tree

　　'Who didn't climb up the big tree?'

With *shenme* followed by the universal quantifier *dou*, (28) conveys a universal reading: 'everyone didn't climb up the big tree.' By contrast, the same sequence of words, but without *dou* 'all', as shown in (29), receives an interrogative reading: who didn't climb up the big tree?'

Using the Question-Statement Task, Zhou and Crain (2011) examined whether 3-to-4-year-old Mandarin-speaking children can assign the universal reading to *shei* in (28), but the interrogative reading to *shei* in (29). On a typical trial, a black dog, a white dog and a brown dog were having a tree-climbing competition. All of them climbed up a small tree. However, only the black dog reached the top of a big tree; the other two dogs got caught in the branches. At the end of the story, the puppet first produced a positive lead-in: *San zhi gou dou pa-shang le xiao shu* 'All the three dogs climbed up the small tree.' Following the positive lead-in, the puppet either produced the test sentence (28) or (29). Adopting the between-subject design, this experiment tested two groups. One group (15 children and 15

adults) heard test sentence (28). The other group (15 children and 15 adults) heard test sentence (29).

The experimental results show that children responded to the test sentence with *dou* by rejecting the puppet's statements 96% of the time. They justified their rejections by making reference to the fact one of the animal characters did perform the action mentioned in the test sentence. In the example story, children pointed out that the black dog did climb up the big tree. On the other hand, children assigned the interrogative reading to the test sentences with a *wh*-pronoun alone 95% of the time. They responded to this type of test sentences by providing an answer to the puppet's question. In the given story, they mentioned that the white dog and the brown dog did not climb up the big tree.

In short, previous comprehension studies on Chinese *wh*-pronouns suggest that Mandarin-speaking children as young as 4 years old are able to access the proper interpretation of *wh*-pronouns like *shenme* 'what' and *shei* 'who'. When *wh*-pronouns occur in questions, they assign the question reading to *wh*-pronouns. When *wh*-pronouns occur in downward entailing contexts like the predicate case of the negative quantificational expression *meiyouren* 'nobody', they assign the indefinite reading to *wh*-pronouns. Finally, when *wh*-pronouns co-occur with the universal quantifier *dou* 'all', they assign the universal reading to *wh*-pronouns.[7] In view of the early awareness of the quantification variability of *wh*-pronouns in young Mandarin-speaking children and the lack of sufficient positive evidence of these complex structures, Zhou (2011) contends that an innate mechanism enables children to access the proper interpretation. Assuming the variable account of *wh*-pronouns, Zhou argues that, once children acquire the semantic properties of these different linguistic environments, they can draw on these innate mechanisms to access the proper semantic interpretation of *wh*-pronouns.

Zhou's innateness account of the acquisition of *wh*-pronouns is in line with the general consensus that linguistic knowledge of complex semantic computations are likely candidates for inclusion in Universal Grammar (Fodor 1980; Chomsky 1993, 2007; Guo et al. 1996; Foley, et al 2003; Lee 2002; Crain 2012). The acquisition of complex semantic computations requires not only the knowledge on the lexical meaning of relevant

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[7] These comprehension studies of Chinese *wh*-pronouns are consistent with the findings on the early speech of Chinese *wh*-pronouns. It is reported that Mandarin-speaking children start producing interrogative *wh*-pronouns as early as two years old (Li and Tang 1991; Fan 2012). It is also reported that Mandarin-speaking children start producing non-interrogative *wh*-pronouns shortly after the emergence of interrogative *shenme*, at around two years and half (Fan 2012). The main productions of non-interrogative *wh*-pronouns are *wh*-pronouns in negation (indefinite *wh*-pronouns) and *wh*-pronouns co-occurring with *dou* 'all' (universal *wh*-pronouns).

expressions, but also knowledge about how they interact when they appear together in sentences. In view of the abstractness and complexity of semantic structures with combinations of logical expressions, it is unlikely that positive data alone suffice for the acquisition of these structures.

Now we turn back to the *wh*-pronoun *ji-ge*. We are interested to know whether the simple existential quantifier reading ('at least 1') of *ji-ge* is the first reading acquired by Mandarin-speaking children, bringing *ji-ge* pattern in line with other *wh*-pronouns. Furthermore, we are also interested to know the order of acquisition among the 'at least 2' reading and the 'a few' reading. Recall that, there is a semantic relation between these two readings. That is, the 'at least 2' reading is the basic semantic reading of *ji-ge* when it is used as a plural quantifier, and the 'a few' reading is derived from the 'at least 2' reading through a scalar implicature. Given the semantic relation between the 'at least 2' reading and the 'a few' reading, it is worthwhile to examine the ordering of occurrence of these two readings in Mandarin-speaking children. Bearing in mind these research issues, we now turn to the language acquisition laboratory to find an answer.

5. Experiment

This experiment investigated Mandarin-speaking children's interpretation of *ji-ge* in simple negative statements.

5.1. *Subjects*

We tested four groups of Mandarin-speaking children, including the 5-year-old group, the 7-year-old group, the 8-year-old group and the 9-year-old group. The 5-year-old group was recruited from a kindergarten affiliated with Beijing Language and Culture University. There were 16 children in this group, ranged in age from 4;7 to 5;10 (Mean age 5;2). Most of the children in the other three groups were recruited from No. 2 Primary School, Haidian District, Beijing.[8] There were 21 children in the 7-year-old group (Age range: 6;0-7;9; Mean age: 7;0), 10 children in the 8-year-old group (Age range: 8;0-8;9; Mean age: 8;4), and 14 children in the 9-year-old group (Age range: 9;0-9;11; Mean age: 9;5). We also included a control group of 15 Mandarin-speaking adults, who were graduate students from Beijing Language and Culture University.

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[8] Four of the children from the 7-year-old group were recruited from the kindergarten, and these four children's age were between 6;0 and 6;3. The rest of the children in the three older groups were taken from the primary school.

5.2. *Procedures and materials*

The experiment used a Truth Value Judgment Task (see e.g., Crain & Thornton 1998). This task is designed to assess whether or not children assigned more than one meaning to a target sentence. The task involves two experimenters. One experimenter narrates the stories using toys and props. The other experimenter plays the role of a puppet, who watches the story alongside the child. At the end of each story, the puppet is invited to explain to the child what happened in the story. The child's task is to judge whether the puppet said the right thing or not. In this way, the interpretation assigned by the child is revealed, but the child does not feel as though s/he is being tested. If the child informs the puppet that he was wrong, then s/he is asked to explain ''What really happened?'' When the puppet accurately described what had happened in the story, the child was instructed to reward him with a strawberry. Sometimes the puppet doesn't pay close attention, however, and says the wrong thing. In that case, the child is instructed to give the puppet something to remind him to pay closer attention, a pepper.

The child participants were introduced to the task individually and were tested individually. There was a brief warm-up at the very beginning of the test session to ensure that the child could perform the task. In addition, each child was given two practice trials before the formal test session. On each of the practice trials, the puppet produced one sentence that was obviously true, and one that was obviously false, to show the child that the puppet might say both wrong and right descriptions of the test trials.

There were two test conditions in the formal testing of the experiment. One is called the 'small-amount' condition, and the other the 'large-amount' condition. Let us take them in turn.

The 'small-amount' condition

The 'small-amount' condition was designed as follows. On a typical trial, there were three animal characters, Mr. Rabbit, Mr. Mouse and Mr. Pig participating in a vegetable-eating competition. Each of them was given six vegetables. Mr. Mouse ate up all the vegetables and he was rewarded with a gold medal. Mr. Pig finished five out of the six vegetables, and he was rewarded with a silver medal. Both Mr. Mouse and Mr. Pig were very full, and they were taken as the ones eating a large-amount of vegetables. However, Mr. Rabbit only ate two small carrots and was given a cross dark (a symbol of failure in Chinese culture). He was still hungry when the competition was finished. The story is summarized in (30).

(30) *This is a story about Mr. Rabbit, Mr. Mouse and Mr. Pig. They are going to have a vegetable-eating competition. You see, there are a lot of vegetables here, including carrots, peppers, cabbages, cucumbers, and eggplants. These vegetables look nice, and all of the animals feel like they will have a big and nice meal today. The judge Mr. Owl announces the rule: the first-place winner will get a gold medal, and the second-place winner will get a silver medal. If an animal gets the last place, he will get a dark cross instead.*

Now the competition starts. Each of the animals is given two small carrots, a big pepper, a big cabbage, a big cucumber, and a big eggplant. Mr. Mouse likes eating, and he eats up all the vegetables in a few minutes. Mr. Pig likes eating too, and he finishes eating all the vegetables, except the pepper. The pepper is too spicy for him. Both Mr. Mouse and Mr. Pig are full and happy. However, Mr. Rabbit is very picky about food, and he ends up eating only the two small carrots, which are his favorite food. He is still hungry.

Now the competition is finished. Mr. Owl comments that both Mr. Mouse and Mr. Pig has eaten a lot of vegetables, and have a good performance in the competition. So he gives the gold medal to Mr. Mouse, who finished all of the six vegetables, and gives the silver medal to Mr. Pig, who ate five out of the six vegetables. Mr. Owl gives Mr. Rabbit the dark cross, as Mr. Rabbit has only finished the two carrots.

At the end of the story, the toys were arranged as depicted in Figure 1.

Figure 1. The last scene of the example story

After the story, the main experimenter asked the puppet, which was played by another experimenter, to comment on the performance of Mr. Mouse (the gold-medal winner) and Mr. Rabbit (the dark cross holder). The puppet produced the test sentence (31).

(31) *Xiaolaoshu chi le henduo shucai,   keshi xiaotuzi   mei chi   ji   ge*
     Mr.Mouse eat Asp a-lot   vegetable but   Mr. Rabbit Neg eat how-many CL
     shucai
     vegetable
     'Mr. Mouse ate a lot of vegetables, but Mr. Rabbit did not eat many vegetables.'

Ji-ge is in the second clause of the sentence (31). The referent of the subject of the second clause *Xiaotuzi* 'Mr. Rabbit' only ate a small-amount of vegetables. This is why we call this condition as 'small-amount' condition. Clearly, this *ji-ge* sentence is a true description of the story, if the sentence is assigned the 'small-amount' reading. However, this sentence is a false description of the story if it is interpreted as Mr. Rabbit did not eat any vegetables, i.e., the 'none' reading.

The first clause *Xiaolaoshu chi le henduo shucai* 'Mr. Mouse ate a lot of vegetables' functions as a positive lead-in sentence, and this sentence describes the performance of the gold medallist (Mr. Mouse). The positive lead-in was used to satisfy the felicity conditions pertaining to the use of negation (cf. Gualmini 2005; Musolino and Lidz 2006). Negative statements are typically used to point out a discrepancy between what is expected to happen and what actually happens (see, e.g., Wason, 1965; De Villiers and Tager-Flusberg 1975; Givon 1978). In this case, an expectation was set up in the beginning of the story: the three main characters were expected to eat a lot of vegetables, because all of the vegetables looked fresh and tasty. But what really happened in the story did not conform to this expectation: only Mr. Mouse and Mr. Pig ate a lot of vegetables, and Mr. Rabbit, which corresponds to the referent of the subject of the *ji-ge* sentence, ate only two small carrots (which is a small amount). Against the scenario, the 'small-amount' reading or the 'none' reading associated with sentence (31) is felicitous: what happened with Mr. Rabbit failed to meet the expectation. To ensure the similar intonation was used for the test sentences throughout the experiment, we used the same person to play the role of puppet for the whole experiment. Furthermore, the puppet role-player was told to be consistent with her intonation, but she was not informed with the purpose of the testing.

In addition, the puppet was invited to comment on the performance of the silver medal winner (Mr. Pig) which is not mentioned in the test sentence. This brings us a filler sentence in the story. The filler sentence is obviously true or false, depending on whether the participant accepted or rejected the test sentence. If the participant accepted the test sentence (31), the puppet picked up (32), which is a false statement. On the other hand, if the participant rejected the test sentence (31), the puppet then picked up (33), which is a true statement.

(32) *Xiaozhu chi de gen xiaolaoshu yiyangduo*

    Mr. Pig   eat De with Mr. Rabbit the-same-amount

    'Mr. Pig ate the same amount of food as Mr. Rabbit.'

(33) *Xiaozhu mei chi lajiao*

    Mr. Pig Neg eat pepper

    'Mr. Pig did not eat the pepper.'

The filler sentences served to obscure the purpose of the study, and to ensure that children remained aware of the task.

The 'large-amount' condition

The stories for the 'large-amount' condition exhibited the same overall pattern of events as designed for the 'small-amount' condition. On a typical trial, Mr. Horse, Mr. Dog and Mr. Cat participated in a fencing-jumping competition. In the end, Mr. Horse jumped over all of the six fences, and received the gold medal. Mr. Dog jumped over five out of the six fences and received the silver medal. By contrast, Mr. Cat only jumped over the two lowest fences, and received a dark cross. Mr. Horse and Mr. Dog were taken as the ones successfully jumping over 'many' fences, and Mr. Cat was taken as the one that jumped over 'few' fences. Against this story, the puppet produced the test sentence (34), which has the same structure as the test sentence (31) in the 'small-amount' condition. However, this time the sentence was used to compare the performance of the gold medallist (Mr. Horse) and the silver medallist (Mr. Dog), rather than the comparison of the gold medallist and the dark cross holder in the 'small-amount' condition. With this design, the referent of the subject of the *ji-ge* sentence (Mr. Dog) jumped over a large-number of fences. That explains why we call this test condition as 'large-amount' condition.

(34) *Xiaoma   tiao guo le   henduo lan'gan, keshi xiaogou   mei tiao guo*

      Mr. Horse jump over ASP a lot   fence   but   Mr. Dog Neg jump over

      ji   ge lan'gan

      how-many CL fence

         'Mr. Horse jumped over a lot of fences, but Mr. Dog did not jump over many

         fences.'

The sentence (34) is a false description of the story in two situations: (i) if the *ji-ge* sentence is assigned the 'none' reading; (ii) if the *ji-ge* sentence is assigned the 'small-amount' reading but not the 'large-amount' reading. However, this sentence is a true statement if the participant admits of the 'large-amount' reading for the negated *ji-ge* sentence. Notice that if the *ji-ge* sentence is assigned the adult-like 'small-amount' reading, the three-character design of the test story allows the subject to point out that it is the dark-cross holder (Mr. Cat) who did not jump over many fences, not the silver medallist (Mr. Dog). That is, this three-character design allows the subject to identify the correct animal character whose performance matches the description of the test sentence. As we did in the 'small-amount' condition, the test sentence was preceded or followed with a simple filler sentence. The filler sentence was obviously true or obviously false, depending on the participant rejected or accepted the test sentence (34).

      There were three test stories in the 'small-amount' condition and another set of three test stories in the 'large-amount' condition. We adopted the within-subject design, testing the 'small-amount' condition and the 'large-amount' condition in the same subjects. So each participant in these two groups received 6 test stories, in which 6 test sentences and 6 filler sentences were presented. The number of "Yes" and "No" responses were counterbalanced. The two conditions were tested three days apart. Before the test trials started in the second testing session, we asked the child subject whether they remembered the 'rules' of the game, i.e., if the puppet gives the right answer, reward him with the strawberry; if he gives the wrong answer, give him a pepper. Almost all of the children remembered well the experimental procedure. If not, the experimenter briefly reminded the child subject of the procedure. Each testing session lasted about 15-20 minutes.

      The adult controls received the same practice trials and test trials, but not the warm-ups. The adults were tested on the same stories, using a questionnaire. All the stories were written out, and the adult subjects were asked to indicate, for each story, whether the puppet was right or wrong. As we did with the child subjects, the adult subjects were asked

to give a justification if they judged the puppet to be wrong. We also adopted the within-subject design for the adult control group, and the adult subjects were tested with the 'small-amount' condition and the 'large-amount' condition on different days.

5.3. *Results*

One child from the 5-year-old group took the *ji-ge* test sentences as questions, and this subject is excluded from analysis. The remaining children and all of the adults responded correctly to the practice trials and the fillers 100% of the time, so their data were included in the final analysis. The dependent measure in the study was the proportion of "Yes" responses to the puppet's statements, for both the 'small-amount' condition and the 'large-amount' condition.

Consider first the adult data. As expected, the adults accepted the test sentences 100% of the time (45/45 trials) in the 'small-amount' condition but rejected the test sentences 100% of the time (45/45 trials) in the 'large-amount' condition. The experimental findings clearly show that Mandarin adults exclusively assigned the 'small-amount' reading to negative statements with *ji-ge*. Based on the discussion in section 3, we assume that Mandarin adults assigned the 'at least 2' reading to *ji-ge* in this linguistic structure.

Now we proceed to the child data. Let us start with the 5-year-old group. In the 'small-amount' condition, children from this group accepted the test sentences 58% of the time (26/45 trials). A Mann-Whitney test shows a significant difference between the 5-year-old group and the adult group (100% vs. 58%, Z= 2.95, p <.01). In the 'large-amount' condition, the children accepted the test sentences 33% of the time (15/45 trials). They accepted the test sentences significantly more often than the adults (33% vs. 0%, Z = 2.41, p<.05). So the 5-year-old children behaved differently from adults in both the 'small-amount' condition and the 'large-amount' condition.

Examining the individual child data across the two test conditions, three patterns of response were attested in this 5-year-old group. First, a group of six children (43% of the children from this group) consistently **rejected** the *ji-ge* sentences in both the 'small-amount' condition and in the 'large-amount' condition.[9] In justifying their rejections of the puppet's statements, these children pointed out the existence of the entities in the domain

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[9] When a child rejected the test sentences on at least two out of the three test trials, we take it as one case that 'consistently reject' the test sentences. Likewise, when a child accepted the test sentences on at least two out of the three test trials, we take it as one case that 'consistently accept' the test sentences.

of discourse. For instance, they explained that (31) was not an accurate description of what had happened in the story, because Mr. Rabbit did eat two carrots. Similarly, in the 'large-amount' condition, these children pointed out that (34) was not a correct description of the story, because Mr. Dog jumped over 5 fences. Based on their negative judgments and subsequent justifications, it is clear that these children assigned the 'none' reading to the test sentences. For the ease of composition, we name these 6 children as Pattern I children. The second pattern of response in the 5-year-old group is that 4 of the children (29% of the children) consistently **accepted** the test sentences both in the 'small-amount' condition and in the 'large-amount' condition. So these children admitted of both the 'small-amount' reading and the 'large-amount' reading for negative statements with *ji-ge*. We name these four children as Pattern II children. The remaining 4 children (29% of the children) from the group behaved exactly like the adult subjects.[10] That is, they accepted the test sentences in the 'small-amount' condition, but rejected the test sentences in the 'large-amount' condition. Their justifications of rejections in the 'large-amount' condition further confirm that these four children assigned only the 'small-amount' reading to negative statements with *ji-ge*. For instance, in justifying his rejection of (34), a subject informed the puppet that Mr. Dog jumped over five fences, which is not a small-amount. He further pointed out that it is Mr. Cat (the dark-cross holder) who did not jump over many fences. We name these four children as Pattern III children.

Now we look at the 7-year-old group. In the 'small-amount' condition, the 7-year-old children accepted the test sentence 81% of the time (51/63 trials). No significant difference was observed between the 7-year-old group and the adult group (81% vs. 100%, Z= 2.0, p=.06). In the 'large-amount' condition, however, the 7-year-old children accepted the test sentences 38% of the time (24/63 trials). A Mann-Whitney test shows they accepted the test sentences significantly more often than the adults (38% vs. 0%, Z= 2.86, p < .01). So the 7-year-old children behaved like adults in the 'small-amount' condition, but not in the 'large-amount' condition.

Similar to the 5-year-old group, three patterns of response were observed in the 7-year-old group. First, 19% of the children (4 out of 21) rejected the negated *ji-ge* sentences in both the 'small-amount' condition and the 'large-amount' condition. These children assigned the 'none' reading to the negated *ji-ge* sentences. According to our classification, these children are Pattern I children. Second, 43% of the children (9 out of 21) accepted

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[10] One child (5;10) rejected all the *ji-ge* sentences in the 'small-amount' contexts but accepted all the test sentences in the 'large-amount' contexts. It is difficult to interpret the data of this child.

the negated *ji-ge* sentences in both the 'small-amount' condition and the 'large-amount' condition, and they are categorized as Pattern II children. Finally, 38% of the children (8 out of 21) accepted the negated *ji-ge* sentences in the 'small-amount' condition but rejected the sentences in the 'large-amount' condition. These are Pattern III children.

Next, we move on to the 8-year-old group. In the 'small-amount' condition, the 8-year-old children accepted the test sentences 83% of the time (25/30 trials). No significant difference was observed between the 8-year-old group and the adult group in this condition (83% vs. 100%, Z=1.768, p=.15). In the 'large-amount' condition, the 8-year-old children accepted the test sentences 43% of the time (13/30 trials). They accepted the *ji-ge* sentences in the 'large-amount' condition significantly more often than the adults (43% vs. 0%, Z=2.00, p< .01). Like the 7-year-old children, the 8-year-old children behaved like adults in the 'small-amount' condition, but not in the 'large-amount' condition. In this 8-year-old group, 20% of the children (2 out of 10) assigned the 'none' reading to the negated *ji-ge* sentences (Pattern I), 40% of the children (4 out of 10) admitted of both the 'small-amount' reading and the 'large-amount' reading (Pattern II), and 40% of the children (4 out of 10) assigned the adult-like 'small-amount' reading to the negated *ji-ge* sentences (Pattern III).

Finally, let us consider the 9-year-old group. In the 'small-amount' condition, the 9-year-old children accepted the test sentences 93% of the time (39/42 trials). No significant difference was observed between the 9-year-old group and the adult group in this condition (93% vs. 100%, Z=1.861, p=.100). In the 'large-amount' condition, the acceptance of the test sentences declined to 12% (5/42 trials). Again no significant difference existed between the 9-year-old children and the adults in the 'large-amount' condition (12% vs. 0%, Z=1.86, p=.1). In short, the 9-year-old children behaved like adults in both the 'small-amount' condition and the 'large-amount' condition. The adult-like performance of this child group is also revealed by the individual child data of this group. Among the 14 children in this group, 13 children (93% of the children) behaved like adults, assigning the 'small-amount' reading to the negated *ji-ge* sentences (Pattern III). The remaining one admitted of both the 'small-amount' reading and the 'large-amount' reading (Pattern II). No child assigned the 'none' reading to the negated *ji-ge* sentences, so there was no Pattern I children in this group.

The experimental findings above exhibit considerable individual difference. To examine whether there exists a developmental trend among the three patterns of response, we put together the children of the same pattern and calculate their mean age of each group.

It is found that the three patterns of response indeed correspond to three developmental stages. In particular, there are 12 Pattern I children, and their mean age is 6; 4. There are 18 Pattern II children, and their mean age is 6;9. Finally, there are 29 Pattern III children, and their mean age is 8;0. The ascending mean age of these three groups suggests that Mandarin-speaking children acquire negative *ji-ge* sentences in the sequential ordering of Pattern I (Stage I) → Pattern II (Stage II)→ Pattern III (Stage III). Therefore, children initially assigned the 'none' reading to negative statements with *ji-ge* (Stage I). Then they admitted of both the 'small-amount' reading and the 'large-amount' reading (Stage II). Finally, they discarded the 'large-amount' reading and allowed only the 'small-amount' reading (Stage III).

The observed developmental pattern is also reflected by the dynamic change of the percentage of Stage I/II/III children across the four child groups. Firstly, the percentage of Stage I children decreased with age. In particular, the percentage of Stage I children in the 5-year-olds is 43%, and the percentage decreased to 19% in the 7-year-olds, 20% in the 8-year-olds, and finally no Stage I children in the 9-year-olds. Secondly, the percentage of Stage II children in the 5-year-olds is 29%, and the percentage increased to 43% in the 7-year-olds, 40% in the 8-year-olds, and then declined to 7% in the 9-year-olds. Lastly, the percentage of Stage III children increased with age. That is, the percentage of Stage III children is 29% in the 5-year-olds, and the percentage increased to 38% in the 7-year-olds, 40% in the 8-year-olds, and finally reached up to 93% in the 9-year-olds. The statistics of the three developmental stages thus suggests the following things. First, Stage I is the initial stage, so the percentage of Stage I children decreased with age. Contrastively, Stage III is the final stage, so the percentage of Stage III children increased with age. Finally, as the transitional stage between Stage I and Stage III, Stage II progressed in a wax-and-wane way. So the percentage of Stage II children first increased and then decreased with age in the course of language development. Figure 2 displays the dynamic change of the percentage of Stage I/II/III children in the four child groups.

Figure 2: Percentage of Stage I/II/III children in the four child groups
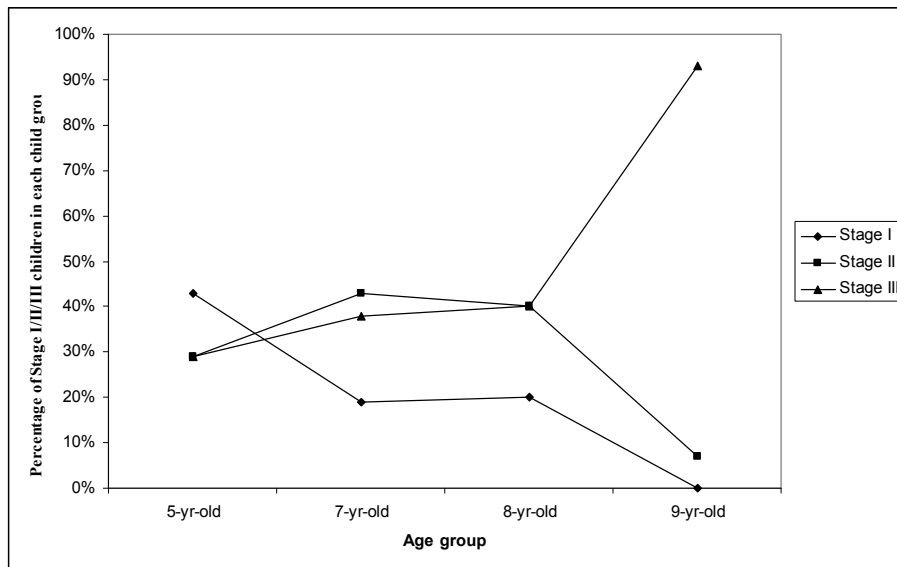
In addition to the identification of three developmental stages, the experimental data reveals another important finding. That is, while transition from Stage I to Stage II is abrupt, duration of Stage II is extended. This can be illustrated by the developmental trajectory of the two test conditions, as shown in Figure 3. In the 'small-amount' condition, the acceptance rate was only 58% in 5-year-olds, but reached up to the adult level in the remaining three older child groups (81% in 7-year-olds, 83% in 8-year-olds, and 93% in 9-year-olds). On the other hand, in the 'large-amount' condition, the acceptance rate of the test sentences remained around 30%-40% in the three younger groups (33% in 5-year-olds, 38% in 7-year-olds and 43% in 8-year-olds), and finally declined to the adult level at 9 years old (12%). Presumably, Stage I ends at an age when children stopped rejecting the test sentences in the 'small-amount' condition, and Stage II ends at an age when children overwhelmingly rejected the test sentence in the 'large-amount' condition. Accordingly, Stage I ended around 7 years old and Stage II ended at around 9 years old. That is, Stage I terminated two years earlier than Stage II.

Figure 3: Proportion of "Yes" responses to the puppet's statements
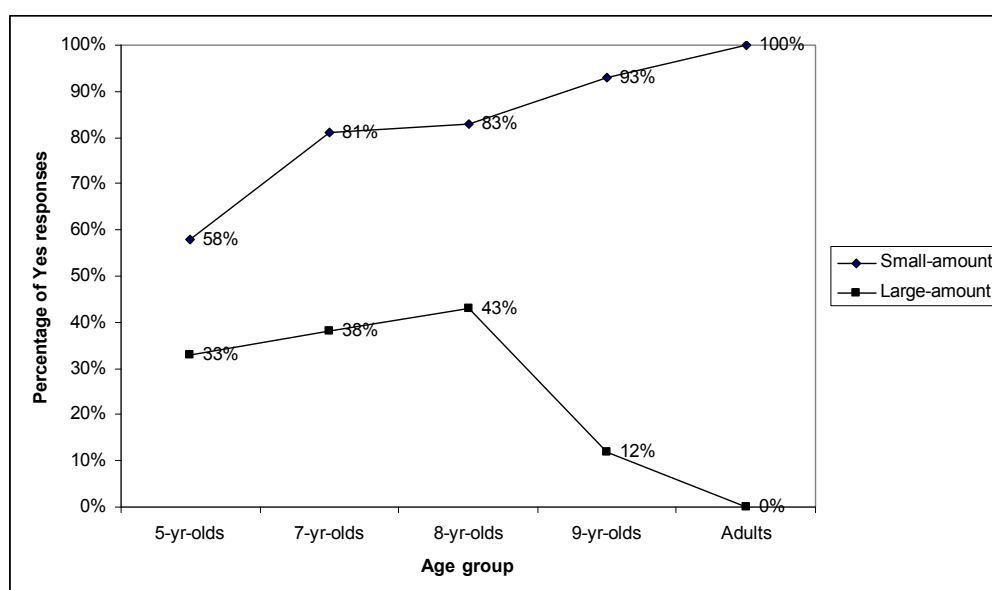
The prolonged Stage II is also manifested by the observation that no obvious change took place between the 7-year-old group and the 8-year-old group. These two child groups exhibited the similar acceptance of the test sentences in the two test conditions (about 80% of the time in the 'small-amount' condition, and about 40% of the time in the 'large-amount' condition) (Figure 3). Moreover, the distribution of the three patterns of response is also similar in the 7-year-old group and the 8-year-old group. In both groups, about 20% of children were in Stage I, 40% of children were in Stage II, and 40% of children were in Stage III (see Figure 2).

6. Discussion and conclusion

In the last section, we identified three developmental stages in the development of Mandarin-speaking children's comprehension of negative statements containing *ji-ge*. In this section we discuss what this developmental pattern tells us about Mandarin-speaking children's comprehension of *ji-ge* at various stages in the course of language development. We propose that, at each stage, Mandarin-speaking children employed a distinct meaning of *ji-ge*. So the developmental pattern in question is indicative of the emergence of the three readings of *ji-ge* in child language.

At Stage I, children rejected the negated *ji-ge* sentences in both the 'small-amount' condition and in the 'large-amount' condition, preferring to assign the 'none' reading to negative statements with *ji-ge*. Based on this reading, we assume that Stage I children

assign the 'at least 1' reading to *ji-ge*. This assumption is straightforward. For instance, in the example story for the 'small-amount' condition, If Mr. Rabbit did not eat any number of vegetables, it amounts to saying that Mr. Rabbit did not eat any vegetables, i.e., the 'none' reading.

At Stage II, children accepted the negated *ji-ge* sentences in both the 'small-amount' condition and in the 'large-amount' condition. We propose that Stage II children assigned the 'a few' reading to *ji-ge* in the negative test sentences. Our reasoning is as follows. When negation is associated with the numbers covering between 2 and 9, numbers lower than 2 and numbers beyond 9 are excluded. This gives rise to both the 'small-amount' reading and the 'large-amount' reading. The 'small-amount' reading corresponds to numbers beneath the lower bound 2, and the 'large-amount' reading corresponds to numbers higher than the upper bound 9.

At Stage III, children (like adults) accepted the negated *ji-ge* sentences in the 'small-amount' condition but rejected the same sentences in the 'large-amount' condition. According to our analysis, the 'small-amount' reading is derived using the plural 'at least 2' reading of *ji-ge* in negative statements. This is also the adult interpretation of *ji-ge* in negative statements.

The observed developmental pattern suggests that the 'at least 1' reading is the most accessible reading for Mandarin-speaking children. As noted earlier, the 'at least 1' reading is a reading of *ji-ge* showing a parallel between *ji-ge* and other *wh*-pronouns such as *shenme* 'what' and *shei* 'who' (cf. section 2.1). This brings the acquisition of *ji-ge* in line with the acquisition of other *wh*-pronouns. Recall that Mandarin-speaking children are found to have command the semantic interpretation of these *wh*-pronouns at an early age (cf. section 4). The early mastery of the 'at least 1' reading by Mandarin-speaking children thus suggests that they initially treat *ji-ge* on a par with other *wh*-pronouns.

The ordering of the second ('a few') and the third ('at least 2') reading by Mandarin-speaking children is of particular interest, because of the semantic connection between these two readings. Recall that, on our analysis, the 'a few' reading is derived from the 'at least 2' reading via a scalar implicature. In the adult grammar, we suggested, *ji-ge* is assigned the 'at least 2' reading in negative statements and other downward entailing contexts. The 'a few' reading cannot be assigned in such contexts. Contrastively, Mandarin-speaking children, more precisely, Stage II Mandarin-speaking children, applied the 'a few' reading across the board, even in downward entailing contexts like negation. The antithetical persistence of the 'a few' reading in Mandarin-speaking children requires

an explanation. A plausible account is that, Mandarin-speaking children initially take the 'a few' reading as an inherent lexical meaning of *ji-ge*, without knowing that this reading is derived from the 'at least 2' reading through a scalar implicature. When they become cognizant that *ji-ge* is a scalar term at some point later, they would automatically know that the 'a few' reading should be suspected when scalar implicature does not apply. In other words, they would know that in downward entailing contexts like negation, they should assign the 'at least 2' reading to *ji-ge*, rather than the 'a few' reading.

Notice that it is sensible to think Mandarin-speaking children initially take the 'a few' reading as an inherent lexical meaning of *ji-ge*. The 'a few' reading is the default reading of *ji-ge* in simple affirmative sentences, and this reading is common in daily use of *ji-ge* (section 2). So the 'a few' reading is salient to children such that they may pick up this reading from language input and apply it across the board at some stage of language development. Our experimental data has shown that children underwent a prolonged Stage II in their comprehension of negative statements containing *ji-ge*. Based on this observation, we assume that it takes a while for Mandarin-speaking children to reset their understanding of the 'a few' reading of *ji-ge*. Moreover, since Mandarin-speaking children initially assign the 'at least 1' reading to *ji-ge*, they cannot directly obtain the 'at least 2' reading from the 'at least 1' reading. This is because the 'at least 1' reading and the 'at least 2' reading fall into a superset-subset relation: while the 'at least 1' reading is the superset reading, the 'at least 2' reading is the subset reading. Children cannot learn a subset reading if he starts with a superset reading, due to the semantic learnability reason as proposed by Crain, Ni and Conway (1994). In this regard, Mandarin-speaking children need to go through a transitional stage in which the 'a few' reading is acquired, to acquire the 'at least 2' reading.

Both the 'at least 1' reading and the 'at least 2' reading are the basic semantic reading of *ji-ge*: 'at least 1' reading is the basic semantic reading of *ji-ge* when *ji-ge* is used as a simple existential quantifier, and the 'at least 2' reading is the basic semantic reading of *ji-ge* when *ji-ge* is used as a plural existential quantifier. However, the 'at least 2' reading is delayed as compared to the acquisition of the 'at least 1' reading. This leads us to conclude that Mandarin-speaking children will take some time to acquire the two plural quantifier readings (the 'at least 2' reading and the 'a few' reading).

Now we are in a position to discuss how children converge on the adult grammar in their comprehension of negative statements containing *ji-ge*. To transit from Stage I (the 'none' reading) to Stage II (the co-existence of the 'small-amount' reading and the 'large-

amount' reading), children learn the 'a few' reading as the lexical meaning of *ji-ge*. In this way, the initial 'none' reading is overridden, and Stage I comes to an end. Positive evidence showing the 'a few' reading of *ji-ge* is abundant in daily conversations, such as *ji-ge* in simple affirmative contexts, as shown in (35).

(35) *Zhangsan mai le   ji   ge pingguo.*

    Zhangsan buy Asp how-many CL apple

    'Zhangsan bought a few apples.'

    To transit from Stage II to Stage III, children may need to resort to positive evidence to discard the 'large-amount' reading. Sentences like (36) provide the kind of positive evidence that guides Mandarin-speaking children to converge on the adult grammar. In (36), as a continuation of the negated *ji-ge* sentence in the first clause, the second clause explicitly spells out the existence of small-amount entities.

(36). *Zhangsan mei chi ji   ge pingguo. Ta zhi chi le yi-dian-dian*

    Zhangsan Neg eat how-many CL apple   he only eat Asp a-little

    'Zhangsan did not eat many apples. He only ate a little bit.'

    To conclude, we propose that *ji-ge* receives three readings, including the 'at least 1' reading, the 'at least 2' reading and the 'a few' reading. An experimental study was conducted to investigate Mandarin-speaking children's comprehension of negative statements containing *ji-ge*. In this study, the three readings of *ji-ge* emerged in Mandarin-speaking children in three distinct developmental stages. The order of these stages was, first the 'at least 1' reading (Stage I), second the 'a few' reading (Stage II), and finally the 'at least 2' reading (Stage III). This developmental sequence suggests that Mandarin-speaking children initially treat *ji-ge* in the same way as other *wh*-pronouns; at some point later Mandarin-speaking children become cognizant that *ji-ge* can be used as a plural quantifier as well. Taken together, we hope that the present study contributes new data on the acquisition of polarity items and sheds new light on linguistic theory of *wh*-pronouns in Mandarin Chinese.

Acknowledgements

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CHAPTER 6

Polarity sensitivity decomposed:

Concluding remarks

This thesis has presented an investigation on the interpretation and acquisition of three polarity sensitive items in Mandarin Chinese, including *renhe* 'any', *shenme* 'what' and *ji-ge* 'how-many-Classifier'. In this final chapter, I summarize the major findings (sections 1-2), then proceed to discuss how lexical composition of *renhe*, *shenme* and *ji-ge* determines their semantic properties (section 3). This issue is particularly worth addressing in view of the theoretical strength of the compositional account of polarity sensitivity (Israel 1996; Lahiri 1998).

1. Acquisition of NPI *renhe* 'any' and FC *renhe* 'any' (Chapter 2)

Renhe 'any' in Mandarin Chinese is semantically equivalent to its English counterpart *any*. Like English *any*, *renhe* can be used as a negative polarity item (NPI), or as a free choice item (FC). The interpretation and distribution of NPI *renhe* and FC *renhe* is governed by syntactic and semantic constraints (Wang and Hsieh 1996; Hua 1997; Hsiao 2002; Kuo 2003; Hua and Zeng 2009; Zhang 2010; Cheng and Giannakidou (to appear)). However, unlike English *any*, *renhe* is very infrequent in spoken Chinese (Zhang 2010). Indeed, *wh*-pronouns are used in spoken Chinese to convey the intended polarity meanings (cf. Huang 1982; Li, A.1992; Cheng 1991, 1994; Lin 1996, 1998; Hsin 1999). In view of the linguistic complexity of *renhe* and the paucity of relevant adult input, we conducted two experiments to examine Mandarins-speaking children's semantic knowledge of NPI *renhe* and FC *renhe*.

In Experiment 1, we investigated 5-year-old Mandarin-speaking children's comprehension of FC *renhe* in sentences containing the ability modal word *neng* 'can'. This experiment contrasted minimal pairs of sentences, namely sentences with *renhe* and ones without *renhe*. A typical minimal pair of test sentences is given in (1)-(2).

(1) *Gongfuxiongmao   neng   tuidong renhe yi   ge chezi*
   Kung Fu Panda   be-able-to push   any   one CL car
   'Kung Fu Panda is able to push any one of the cars.'

(2) *Gongfuxiongmao neng   tuidong yi   ge chezi*
   Kung Fu Panda be-able-to push   one CL car
   'Kung Fu Panda is able to push one of the cars.'

In (1), *renhe* interacts with the ability modal word *neng*, and invokes a sense of free choice. Suppose there are three cars in the domain of discourse. (1) states that no matter which car you pick up, Kung Fu Panda is able to push the car in question. The sense of free choice invoked by *renhe* gives rise to a universal reading. By contrast, with the 'plain' indefinite (without *renhe*) *yi ge chezi* 'one-CL-car' in (2), this sentence is rendered with an existential reading, i.e., Kung Fu Panda is able to push one of the cars. Taking advantage of the meaning difference of the minimal pairs like (1) and (2), we examined whether Mandarin-speaking children are aware of the semantic contribution of FC *renhe*. It is found that most of the 5-year-old Mandarin-speaking children we tested behaved like adults. They correctly assigned the universal reading to sentences containing *renhe*, in contrast with the existential reading they assigned to sentences with plain indefinites. This concludes the summary of the findings on Mandarin-speaking children's semantic knowledge of FC *renhe*.

In Experiment 2 we tested Mandarin-speaking children's semantic knowledge of NPI *renhe*. The linguistic context we used is sentences containing the temporal conjunction *zai…zhiqian* 'before'. Consider (3).

(3) *Xiaoma   zai renhe yi   ge xiao dongwu zhiqian you   dao* le   *zhongdian*
    Mr. Horse   at any   one CL little animal   before   swim   to Asp finish line
     'Mr. Horse swam to the finish line before any of the other little animals.'

In (3), the nominal phrase *renhe yi ge xiao dongwu* 'any-one-CL-little-animal' is embedded in the scope of the temporal conjunction *zai…zhiqian* 'before'. This sentence states that Mr. Horse swam to the finish line before any of the other little animals. Two test conditions were designed. On one condition (adult-false condition), (3) was produced in the scenario in which Mr. Horse swam to the finish line before only one of the little animals. On the other condition (adult-true condition), (3) was produced in the scenario in which Mr. Horse was the first to swim to the finish line. It is found that Mandarin-speaking children accepted the *renhe* sentences on the adult-true condition, and rejected the *renhe* sentences on the adult-false condition. This adult-like performance suggests that Mandarin-speaking children were aware of the NPI meaning of *renhe*.

In short, both experiments showed that Mandarin-speaking children exhibited adult-like semantic knowledge of *renhe*, despite the paucity of relevant adult input. Our experimental findings are thus compatible with the previous findings on the early mastery

of the linguistic properties of *any* in English-speaking children (O'Leary 1994; O'Leary and Crain 1994; Thornton 1995; Song 2003; Tieu 2010a, b). We also discuss why Mandarin-speaking children, like adults, do not often produce *renhe* in ordinary conversations. It is suggested that the lack of production of *renhe* is plausibly due to the availability of alternative expressions (*wh*-pronouns) that convey the intended polarity meanings.

2 Un-uniformity of polarity sensitive items in Mandarin Chinese

Renhe 'any', *shenme* 'what' and *ji-ge* 'how-many-CL' in simple negative statements receive distinct interpretations. This observation is particularly interesting, considering the general view that *wh*-pronouns in Mandarin Chinese function as negative polarity items (Huang 1982; Li, A. 1992; Cheng 1991, 1994; Lin 1996, 1998; Hsin 1999). Consider the examples in (4)-(6):

(4) *Zhangsan mei   chi renhe pingguo*
     Zhangsan Neg eat any apple
      'Zhangsan did not eat any apples'   'None' reading

(5) *Zhangsan mei chi shenme pingguo.*
     Zhangsan Neg eat what apple
     (i) 'Zhangsan did not eat any apples.'   'None' reading
     (ii) 'Zhangsan hardly ate any apples.'   Insignificance reading

(6) *Zhangsan mei chi ji   ge pingguo*
     Zhangsan Neg eat how-many CL apple
     'Zhangsan did not eat many apples.'   'Small-amount' reading

In (4), the negative sentence with the negative polarity item *renhe* is interpreted as 'Zhangsan did not eat any apples', so this sentence receives the 'none' reading. By contrast, a negative sentence with *shenme*, as in (5), is ambiguous with two readings. One is the 'none' reading, as glossed in (5-i). This reading is the same as the 'none' reading in negated *renhe* sentence in (4). On the other hand, (5) can convey the reading 'John hardly ate any apples', as shown in (5-ii) (Li, W. H. 1924; Wang 1943; Ding et al 1961; Chao 1968; Zhu 1982; Lü 1985; Li, W.H.1992; Lin 1996, 1998, 2004; Hsiao 2002; Hole 2004;

Dong 2009; Zhang 2010; Cui 2012). We call this second reading the 'insignificance' reading, roughly equivalent to the meanings conveyed by sentences containing *hardly* in English. Finally, a negative statement containing the *wh*-pronoun *ji-ge* 'how many-CL', as shown in (6), receives the 'small amount' reading. Unlike (4) and (5), the 'none' reading is absent in this *ji-ge* sentence.

Examples (4)–(6) clearly show that the *wh*-pronouns *shenme* and *ji-ge* in negative statements receive different interpretations from that of *renhe* in the same linguistic context. This observation suggests variation exists among Chinese polarity items. This invites us to make a close examination of the semantic properties of each of the three polarity sensitive items. Moreover, the alternative meanings associated with *renhe*, *shenme* and *ji-ge* in negative statements provide a good testing ground to look into Mandarin-speaking children's semantic and pragmatic knowledge of polarity sensitive items. Now let us get into the details of the relevant findings.

2.1 Semantic interpretation of *shenme/renhe* and the acquisition of the insignificance reading (Chapters 3 and 4)

Shenme is a proform of NP modifiers, partitioning the denotation of the modified common noun into kinds of entities. Such a kind concept is absent in other *wh*-pronouns, such as *shei* 'who'. To illustrate, (7) expresses the idea that the speaker doesn't know what kind of person Zhangsan is. The kind concept in question is contributed by the NP modifier *shenme*. By contrast, with the *wh*-pronoun *shei* 'who', (8) states that the speaker has no knowledge on the identification of an individual person named Zhangsan (Zhu 1982).

(7) *Wo bu   zhidao Zhangsan shi shenme ren*

   I   Neg know Zhangsan be what person

   'I don't know what kind of person Zhangsan is.'

(8) *Wo bu zhidao Zhangsan shi shei*

   I   Neg know Zhangsan be who

   'I don't know who Zhangsan is.'

By default *shenme* introduces an open set of kinds of entities. To illustrate, (9) conveys the meaning that Zhangsan ate an apple, but the speaker does not know what kind

of apple it is. It could be a Granny Smith apple, a Pink Lady apple, or any other kind of apple.

(9) *Zhangsan chi le yi ge shenme pingguo*

    Zhangsan eat Asp one CL what apple

    'Zhangsan ate an apple of some kind.'

On the other hand, *shenme* can pick out a subset of entities which are made salient in the context of utterance, due to the pronominal feature of *shenme*. This brings us to the insignificance reading in negative statements containing *shenme*, as in (10) (previously (5)).

(10)   *Zhangsan mei chi shenme pingguo*

      Zhangsan Neg eat what apple

      (i) 'Zhangsan hardly ate any apples.'   Insignificance reading

      (ii) 'Zhangsan did not eat any apples.'   'None' reading

We propose that, when a partition between significant versus insignificant kinds is on offer in the context of utterance, *shenme* is anaphorically linked to the significant kinds of entities; in this circumstance, the insignificance reading is derived from a series of pragmatic inferences, as specified in (11). When relevant felicity conditions are not met, the 'none' reading is the default reading for negated *shenme* sentences.

(11) Step 1: *Shenme* is combined with negation. The literal 'none' meaning (*Zhangsan did not eat any apple*) is derived. This reading makes the sentence false in the situation where some apple exists.

    Step 2: Assuming that the speaker is attempting to say something that is true, the hearer seeks an alternative to the literal meaning.

    Step 3: This is accomplished by partitioning the entities in the domain of discourse into significant kinds versus insignificant kinds.

    Step 4: The *wh*-pronoun *shenme* is anaphorically linked to the <u>significant</u> kinds of entities in the discourse context.

    Step 5: When *shenme* is combined with negation, it yields the <u>insignificance</u> reading

        Zhangsan did not eat significant kinds of food

        → *Zhangsan ate some insignificant kind of food*

By contrast, *renhe* 'any' invokes a domain widening effect, on a par with its English equivalent *any* (cf. Kadmon and Landman 1993). The domain widening effect is illustrated with the interpretive difference between (12) (without *renhe*) and (13) (with *renhe*). Sentence (12) *Wo mei you tudou* 'I don't have potatoes' is true even if I have a few rotten potatoes in my back yard. This is because in a context of utterance, the domain of quantification associated with the common noun (i.e., *tudou* 'potato') includes typical potatoes (i.e., cooking potatoes), leaveing out atypical potatoes (i.e., rotten potatoes, or decorative potatoes). However, when *renhe* is added, as in (13) *Wo mei you renhe tudou* 'I don't have any potatoes', the sentence is no longer true if I have a few rotten potatoes. The denotation of *tudou*, when combined with *renhe*, is thus extended to include both typical and atypical potatoes.

(12)   *Wo mei you tudou*

    I   Neg have potato

    'I don't have potatoes.'

(13) *Wo mei you renhe tudou*

    I   Neg have any   potato

    'I don't have any potatoes.'

Due to the domain widening effect invoked by *renhe*, sentences containing *renhe* requires that the entire domain of entities must be exhausted. This semantic property of *renhe* makes it impossible to make a partition in the domain of discourse, thereby prohibiting the insignificance reading in negated *renhe* sentences.

The proposed analysis of the presence/absence of the insignificance reading associated with negated *shenme* and negated *renhe* sentences has implications for child language development. First, the requirement of extra contextual support involved in the establishing of the insignificance reading will impact upon Mandarin-speaking children's acquisition of this reading. Presumably, interpretations that require contextual support (i.e., a pragmatic inference) should be acquired later in the course of language development, as compared to interpretations that simply depend on the literal meanings of the words they contain (Noveck 2001). Second, there is a logical relationship between the insignificance reading and the 'none' reading. Namely, the 'none' reading makes the sentences true in a narrower set of circumstances than the insignificance reading does. In view of the subset-

superset relationship between the 'insignificance' reading and the 'none' reading, we predicted that the child should start with the 'none' reading, and add the insignificance reading at a later stage of language development in their comprehension of negative sentences with *shenme*. This prediction is based on the Semantic Subset Principle (Crain, Ni and Conway 1994), as specified in (14).

(14)

Semantic Subset Principle: If the interpretative component of UG makes two interpretations, A and B, available for a sentence, and if interpretation A makes S true in a narrower range of circumstances than interpretation B does, then interpretation A is hypothesized before B in the course of language development.

(Crain, Ni & Conway 1994:455)

In short, both the considerations of the pragmatic factors involved in the construction of the insignificance reading and of the logical relationship between the 'none' reading and the insignificance reading invite us to make the same prediction. Namely, Mandarin-speaking children are anticipated to initially treat negated *shenme* sentences in the same way as negated *renhe* sentences, and they add the insignificance reading for negated *shenme* sentences at a later stage of language development.

This experimental hypothesis was confirmed. It is found that 5-year-old Mandarin-speaking children assigned the 'none' reading to both negative statements containing *shenme* and ones containing *renhe*; children obtained the insignificance reading for negated *shenme* sentences when they reached 7 years old. The experimental data therefore lend support to the proposed analysis of the insignificance reading.

From the perspective of theoretical linguistics, this study of the insignificance reading sheds light on the linguistic theory of Chinese *wh*-pronouns in two aspects. First, unlike the negative polarity item *renhe*, *wh*-pronouns do not invoke the domain widening effect. Rather, *wh*-pronouns like *shenme* can pick up a subset of entities that have been made salient in the context of utterance. Second, a kind concept is involved in the semantic denotation of the *wh*-pronoun *shenme,* and such a kind concept is absent in other *wh*-pronouns.

2.2 Semantic interpretation of *ji-ge* and the acquisition of the 'small-amount' reading (Chapter 5)

In the Chinese literature, the *wh*-pronoun *ji-ge* 'how many-CL' is interpreted with two readings, including the 'at least 1' reading and the 'a few' reading (Lü 1980/1999, Lü 1985). The 'at least 1' reading is illustrated with (15). This sentence expresses the idea that, if John eats *n* apple(s), then Mary will eat *n* apple(s).' On this reading, *ji-ge* substitutes for any number words larger than or equal to 1. So it could be as low as 1, or as high as 1, 000 or more. As long as the number of the apple(s) eaten by John is identical to the number of the apple(s) eaten by Mary, the sentence holds true.

(15)   *Yuehan chi ji   ge pingguo, Mali jiu   chi   ji   ge pingguo*
         John   eat   how-many CL apple   Mary then eat   how-many CL apple
         (lit.) 'If John eats *n* apple(s), then Mary will eat *n* apple(s).'

On the other hand, the 'a few' reading is illustrated with (16). In (16), *ji-ge* denotes quantities whose cardinality is roughly between 2 and 9, so it is semantically equivalent to *a few* in English (Lü 1980/1999, 1985).

(16) *Zhangsan mai le   ji   ge   pingguo.*
        Zhangsan buy Asp how-many CL apple
        'Zhangsan bought a few apples.'

We propose that *ji-ge* can receive a third reading, i.e., 'at least 2' reading, in addition to the 'at least 1' reading and the 'a few' reading documented in the literature. The 'at least 2' reading is illustrated by (17).

(17) *Ruguo Zhangsan chi le   ji   ge bingjiling, ta jiu   hui sheng bin*
        If   Zhangsan eat Asp how-many CL ice-cream   he then will get   sick
        'If Zhangsan eats some ice-cream cones, he will get sick.'

Ji-ge in (17) functions like any other plural noun phrase such as *two ice-creams*. So this sentence conveys the meaning that, if Zhangsan eats two ice-cream cones, he will get sick; similarly, if Zhangsan eats as many as 100 ice-cream cones, he will also get sick.

Moreover, we propose that the 'a few' reading of *ji-ge* in (16) is derived from the 'at least 2' reading through a scalar implicature. In particular, *ji* forms a scale with a higher numerical expression, i.e., *shi ji* 'ten how-many', which logically covers numbers from 11 to infinite (∞)). On this scale, *shi ji* asymmetrically entails *ji*, as shown in (18). So, if it is the case that Zhangsan bought *shi ji ge* (11-∞) apples, it follows that he bought *ji ge* (2-∞) apples.

(18) < *ji* 'how-many', *shi ji* 'ten-how-many'>

   2 - ∞   11- ∞

            Entailment: ←

In view of the entailment relationship between *ji* and *shi-ji*, we assume that Grice (1989)'s Principle of Cooperation invokes an implicature of exclusivity, to the effect that the utterance of *ji* in (16) is taken to implicate the negation of *shi ji* on the scale (18). Therefore, a derived upper bound '*no more than 9*' is implicated for *ji-ge* in (16). Coupled with the lower bound 2, we have the derived meaning of *ji-ge*, i.e., *at least two, but not more than 9*. This is how the 'a few' reading of *ji-ge* is derived.

On the proposed analysis of the 'small-amount' reading, we contend that *ji-ge* in negative statements is assigned the 'at least 2' reading, and the 'small-amount' reading is derived through a conversational implicature. The critical point is that entailments are reversed in this negative context, such that all numbers larger than or equal to 2 are negated. In this circumstance, numbers from 2 to infinity (∞), which represents a large-number, are negated. So for the sentences like (19), the 'small-amount' reading is implicated through a conversational implicature: if John did not eat a large number of apples, he may only have eaten a small number of apples.

(19) *Zhangsan mei chi ji   ge pingguo*
    Zhangsan Neg eat how-many CL apple
    'Zhangsan did not eat many apples.'   'Small-amount' reading

The proposed analysis on the derivation of the 'small-amount' reading is empirically supported. In particular, the similar 'small-amount' reading is available in

negative statements containing the numeral–classifier *liang ge* 'two-CL' (Tsai 2002), as illustrated in (20).

(20) *Yuehan mei jian   liang   ge pengyou.*

    John   Neg meet   two   CL friend

    'John did not meet many friends.'

The fact that no obvious difference in meaning exists between (19) and (20) lends support to the claim that *ji-ge* in (19) takes the 'at least 2' reading.

We report an experiment investigating Mandarin-speaking children's compression of negative statements containing *ji-ge*. It is found that three developmental stages are identified; these three developmental stages are argued to manifest the emergence of the three readings of *ji-ge* in the course of language development. At Stage I, children acquired the 'at least 1' reading of *ji-ge*, and hence assigned the 'none' reading to negated *ji-ge* sentences. Next at Stage II, children acquired the 'a few' reading as the lexical meaning of *ji-ge*, and admitted of both the 'small-amount' reading and the 'large-amount' reading for negated *ji-ge* sentences. Finally, children at Stage III acquired the 'at least 2' reading of *ji-ge*, and assigned only the 'small-amount' reading to negative statements with *ji-ge*. Mandarin-speaking children acquired the 'small-amount' reading of negated *ji-ge* sentences when they reached 9 years old. Theoretical implications are discussed regarding to the three-stage developmental pattern.

To wrap up, we have identified the 'at least 2' reading as the third reading of *ji-ge*, in addition to the 'at least 1' reading and the 'a few' reading documented in the literature. The identification of the 'at least 2' reading provides an account for the derivation of the 'small-amount' reading in negative statements containing *ji-ge*. Moreover, the three readings of *ji-ge* emerge in Mandarin-speaking children in three distinct developmental stages. This study contributes new data on the acquisition of polarity items. Theoretically, this study highlights the concept of cardinality in the semantic interpretation of *ji-ge*, which makes *ji-ge* distinguished from other *wh*-pronouns in Mandarin Chinese.

3 Polarity sensitivity decomposed

It has been maintained that lexical semantics determines the distribution and interpretation of polarity items (Israel 1996; Lahiri 1998). Following this line of thought,

this section discusses how the lexical composition of *shenme*, *ji-ge* and *renhe* determines their distribution and interpretation.

Consider first *shenme* and *ji-ge*. Both are *wh*-pronouns, but they have different lexical composition. *Shenme* consists of one morpheme, and it is a proform of NP modifiers. By contrast, *ji-ge* consists of two morphemes, including the *wh*-element *ji* 'how-many' and the classifier *ge*.[1]

The lexical composition of *shenme* and *ji-ge* shapes their distribution and interpretation. An important aspect is the presence/absence of a classifier in the lexical composition of these two *wh*-pronouns. In Mandarin Chinese, classifiers can function as a negative polarity licensor (Lin 1996, 1998; Wu 2000). To illustrate, (21) is ungrammatical if the classifier *dian* is absent in this imperative sentence containing the *wh*-pronoun *shenme*.

(21) *Guo-lai chi *(dian) shenme ba*

    Come eat CL what Particle

    'Come over to eat something.   (Lin 1998: 226).

Considering the NPI licensing function of classifiers, we now look into the distribution of *ji-ge* and *shenme*. *Ji-ge* can occur in affirmative contexts, as shown in (22), without requiring a licensor (Tsai 2002). By contrast, without such a classifier in the lexical composition of *shenme*, *shenme* in (23) needs a licensor (the sentence-final inferential *–le*) to trigger its indefinite reading; otherwise, a question reading ('What apple did Zhangsan buy?') will arise in this sentence (Li, A. 1992; Lin 1996, 1998).

(22) *Zhangsan mai le ji ge pingguo*.

    Zhangsan buy Asp how-many CL apple

    'Zhangsan bought several apples.'

(23) *Zhangsan mai le shenme pingguo *(le)*.

    Zhangsan buy Asp what apple Inf

    'Zhangsan bought some apple(s).'

---

[1] Like a full-fledged numeral quantified expression in Mandarin Chinese, a classifier is obligatory for the numeral *wh*-pronoun *ji*.

The grammatical contrast between (22) and (23) thus shows that the *wh*-pronoun *ji-ge* is less restricted in distribution, due to the polarity licensing function of the accompanying classifier *ge*.

In addition to functioning as NPI licensers, classifiers in Mandarin Chinese encode quantificational force. This can be illustrated with the interpretative differences in nominal expressions with or without a classifier. In particular, bare nouns (i.e., nouns without attaching to a classifier) in Mandarin Chinese are underspecified in quantification. Rather, Chinese nominals resort to classifiers to single out a counting unit of referents denoted by the noun (Greenberg 1972/1990: 171; Krifka 1995; Chierchia 1998; Bore 2005; Au Yeung 2005; Huang 2009; Huang and Lee 2009). The numerical value of the counting unit is one by default. For instance, while the bare noun *pingguo* 'apple', as shown in (24a), could refer to one or more apples, the classifier-noun sequence *ge-pingguo* 'CL-apple', as in (24b), denotes one apple.

(24) a. *Zhangsan chi le   pingguo*
   Zhangsan eat Asp apple
   'Zhangsan ate one or more apples.'

  b. *Zhangsan chi le   ge pingguo*
   Zhangsan eat Asp CL apple
   'Zhangsan ate an apple.'

This brings us to the interpretative difference between *shenme* and *ji-ge*. First of all, due to the presence of the classifier *ge*, *ji-ge* unambiguously exhibits inherent quantification when *ji-ge* functions as a plural existential quantifier (Tsai 2002). The 'a few' reading and the 'at least 2' readings of *ji-ge* are two cases illustrating *ji-ge* encodes inherent plural quantificational force. Relevant examples are given in (25) and (26) (cf. section 2.2).

(25) *Zhangsan mai le   ji-   ge pingguo*.
  Zhangsan buy Asp how-many CL apple
  'Zhangsan bought a few apples.'

(26) *Ruguo Zhangsan chi le   ji   ge bingjiling, ta jiu   hui sheng bin*

    If   Zhangsan eat Asp how-many CL icecream   he then will get   sick

    'If Zhangsan eats some ice cream cones, he will get sick.'.

      By contrast, it is less clear whether inherent quantification is encoded in *shenme* or not. That is why it is controversial whether *wh*-pronouns like *shenme* and *shei* are existential quantifiers (Huang 1982; Liao 2011) or as a variable without any inherent quantification force (Cheng 1991, 1994; Li 1992; Aoun and Li 1993; Tsai 1994; Shi 1994; Hua 2000). Apparently, the quantification force of *shenme* is more tied to the linguistic environment it appears. To illustrate, *shenme* in questions receives an interrogative reading, as in shown in (27); in NPI-licensing contexts, as in (28), *shenme* is bound and licensed by NPI-licensing operators (e.g., *haoxiang* 'seem') and receives an existential reading; finally, when *shenme* co-occurs with the universal adverb of quantification *dou* 'all', as in (29), it exhibits a universal reading.

(27) *Zhangsan chi le shenme ne*?   Interrogative

    Zhangsan eat Asp what Q

    'What did Zhangsan eat?'

(28) *Zhangsan haoxiang chi le shenme le.*   Existential

    Zhangsan seem   eat Asp what Asp

    'Zhangsan seems to have eaten something.'

(29) *Zhangsan shenme pingguo dou chi*   Universal

    Zhangsan what apple   all eat

    'Zhangsan eats any kind of apples.'

      The difference in meaning between *shenme* and *ji-ge* is also revealed when they appear in negative statements, as discussed earlier. First, while negative statements containing *shenme* is ambiguous with two readings (i.e., the 'none' reading and the insignificance reading), negative statements containing *ji-ge* receives only one reading ('small-amount' reading).

      Moreover, negated *shenme* sentences, when interpreted with the insignificance reading, and negated *ji-ge* sentences convey different kinds of insignificance. Negated *ji-ge*

sentences suggest a sense of insignificance in quantity, i.e., the 'small-amount' reading; insignificance in quality is not possible for negative statements with *ji-ge*. By contrast, negated *shenme* sentences suggest a sense of insignificance in quality; quantity is not a crucial matter in this case. Attesting to this is the fact that, a negative sentence with *shenme* is felicitous in a context in which reference is being made to a large quantity of entities, as long as the kinds of these entities are insignificant as defined by the context. Consider (30). Suppose Zhangsan is planning to buy some clothes, to dress up for an important meeting. I expect Zhangsan to buy some formal and smart clothes, say, a suit. However, it turns out he buys a lot of cheap T-shirts and jeans, none of which I think is appropriate for such a formal situation. In this circumstance, I can use (30) to convey the opinion that the large quantity of clothes Zhangsan buys is not 'significant'.

(30) *Zhangsan jintian mei mai shenme yifu,   jiu   mai le   yi   da dui meiyong de yifu*
   Zhangsan today Neg buy what   clothes only buy Asp one big pile useless De clothes
   'Zhangsan hardly bought any useful clothes today. He only bought a lot of useless
    clothes.'

To wrap up, due to the quantificational force encoded in the classifier *ge*, the *wh*-pronoun *ji-ge* can function as an plural existential quantifier. For the same reason, negative statements containing *ji-ge* can only convey the sense of insignificance in quantity ('small-amount' reading). On the other hand, *shenme* is a proform of NP modifiers, partitioning the denotation of the modified common noun to kinds of entities. This determines that insignificance in quality/kind is the basic insignificance reading for negative statements containing *shenme*.

Finally, let us consider the lexical composition of *renhe*. *renhe* consists of two morphemes, including *ren* and *he*. The first element *ren* is an emphatic element, roughly meaning 'whatsoever'; the second element *he* is a general question word in classic Chinese, and can be translated as 'what' (Hua and Zeng 2009; Cheng and Giannakidou (to appear)). So, *renhe* has an additional emphatic element (*ren*), as compared to the lexical composition of other *wh*-pronouns. In this regard, *renhe* is named as an emphatic indefinite, whereas *wh*-pronouns such as *shenme* 'what' can be termed non-emphatic indefinites (Haspelmath 1997: 126).

Presumably, the presence of the emphatic element *ren* requires that the entire domain of quantification associated with the utterance of sentences containing *renhe* must

be exhausted (Giannakidou 2001; Cheng and Giannakidou (to appear). Therefore, the domain widening effect and freedom of choice invoked by *renhe*, as discussed in section 1 and 2.1, can be traced back to the lexical position of *renhe*.

To conclude this chapter, this thesis investigates the interpretation and acquisition of the polarity items *renhe* 'any', *shenme* 'what' and *ji-ge* 'how-many-CL' in Mandarin Chinese. Three generalizations can be made. First, the semantic knowledge of the polarity item *renhe* 'any' is in place early in Mandarin-speaking children. Second, different developmental patterns were observed in Mandarin-speaking children's comprehension of negated *shenme* sentences and negated *ji-ge* sentences, due to the distinct semantic properties of *shenme* and *ji-ge*. This gives empirical evidence showing *wh*-pronouns in Mandarin Chinese are not homogeneous. Third, lexical composition of *shenme*, *ji-ge* and *renhe* determines their interpretation and interpretation. Theoretically, this study shed new light on the un-uniformity of polarity items in Mandarin Chinese (cf. Tsai 1994; Hua 2000; Cheng and Giannakidou (to appear)), and lends support to the compositional account of polarity sensitive items (Israel 1996; Lahiri 1998).

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Appendix (Ethics Approval) of this thesis has been removed as it may contain sensitive/confidential content