國立臺灣師範大學文學院英語學系

碩士論文

Department of English, College of Liberal Arts
National Taiwan Normal University

Master's Thesis

中文 *Wh*-疑問詞之第一語言習得

L1 Acquisition of *Wh*-words in Mandarin Chinese

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中華民國 112 年 1 月

January 2023

ACKNOWLEDGEMENTS

Tik-Tok. Tik-tok. Time flies. The thesis writing is about to come to an end. It feels like a dream to complete a Master's degree program in the English Department of National Taiwan Normal University (NTNU). The completion of my studies and thesis would not have been possible without the support and inspiration from my beloved as well as respected people. Hence, I would like to thank them all respectively.

First and foremost, I would like to express my deepest gratitude to my thesis advisor, Dr. Chun-yin Doris Chen, for her supervision on academics and her guidance on life planning. She is not only an esteemed scholar but also an admirable role model to me. She has provided me with her constructive comments on the thesis. Also, I would like to extend my sincere gratitude to my thesis committee members, Dr. Jen-i Li and Dr. Yow-yu Brian Lin, for their detailed and invaluable feedback on my thesis. They have generously given their time and expertise to help me improve my work, and their comments made my research well-grounded. I am enormously grateful to the professors who had taught me during the course of my Master's degree. The knowledge I learned in linguistic courses have helped me equip the academic foundations and develop my thesis. My gratitude extends to the faculty at the Department of English, NTNU, for their assistance at every stage of administrative affairs.

Next, I deeply appreciate the administrators and teachers at the following schools for their assistance to my experiment: Taipei Municipal Gu Ting Elementary School, Taoyuan Municipal Da Tong Elementary School, Taoyuan Municipal Zhongli Elementary School, Chan-chan Preschool, and Affiliated Preschool of Taichung Municipal Tsau-Hu Elementary School. Many thanks go to those teachers who took time out of their schedules and helped me recruit the participants as well as schedule the experiment appointment. Besides, I am deeply grateful to all the children from these schools who voluntarily took part in the experiment for

their contribution to this study. I would like to offer my special thanks to my sister Yun-Ching Linda Wang, my best friend Wen-Chun Wang, my fellow Robin Lin, and my colleagues Chan-I Wu and Guo-Jing Wu particularly. Without them, the experiments would not have been conducted smoothly. I thank Yun-Ching Wang, Wen-Chun Wang, and Chan-I Wu for their great amount of assistance with school contact, and I thank Robin Lin and Guo-Jing Wu for their generous help with data processing and statistical analysis.

Finally, my appreciation also goes out to my family and people around me for their warm encouragement and persistent support all through my studies. I would like to express my heartfelt gratitude to my parents for their unconditional support and care. I also thank my sister and grandparents for their unwavering support and belief in me. A special thanks to my dog Harry who offers me great comfort during the writing process. What's more, I wish to thank my roommates Ni-Chen Hsieh, Sz-Chin Chen, Ya-Wen Chuang and Ying-Ling Shen by alphabetical order for listening to my worries when I felt frustrated and overwhelmed. I am, additionally, grateful for having supporters from my workplace and NTNU language course in alphabetical order: Shandy G. Gabina, Shih-Fen Han, Tim O'Brien, Wan-Rong Zhang, Ying-Yun Jasmine Chen and Yun-Hsin Claire Chou for their mental support and kind suggestions on thesis writing.

All of them played a crucial role at every stage of my graduate school journey. It is hard to get through the challenges and be on the track to continue the academic progress without their tremendous support and encouragement in the past few years. Without them, the goal of this thesis would not have been realized. Without them, the study of graduate school would not have drawn an end.

摘要

有鑑於日常提答問時所運用的構句策略，中文在疑問句句構上主要呈現三大類型－是非問句、選擇問句、wh-問句。然，就目前所知，尚未有關於完整的中文 wh-疑問詞研究（Li, Chen & Yang 2015），因此，此篇論文主要針對此議題探討六大常用的疑問詞（Fahn 2003），並依據其句法功能分為兩大類－主語 wh-疑問句與賓語 wh-疑問句。根據研究數據結果顯示，疑問詞的使用頻率由高至低按順序排列為：什麼、誰、什麼時後、哪裡、怎麼以及為什麼，此順序對應英文疑問字詞分別為 what、who、when、where、how、why。在此篇研究中，其他近義字詞也納入數據採計範圍內。因時間與學校等考量因素，此篇未能採錄三歲以下的幼童之口語表現，且僅採樣臺灣中部以北的地區學校。此研究一共收集並分析六十名中文為母語者的語料，從中發現符合文獻中所述孩童習得主語 wh-疑問句先於賓語 wh-疑問句（如 Erbaugh 1982，Bloom, Merkin & Wootten 1982）。此呈現出孩童的早期語言發展是由具象（約三歲）到抽象（約七歲）概念，然，疑問詞 why 因認知與語言上具複雜特性，鮮少出現在口語表達中。

關鍵詞：第一語言習得、中文、疑問句、wh-疑問詞

ABSTRACT

As people inquire about things, there are several strategies used to form questions in Chinese, such as by asking binary questions (also called yes-no questions), producing disjunction questions with *wh*-words or question particles, and forming content questions to search for information. On the other hand, if people want to raise questions, they have to know the process of making interrogative sentences. While forming sound interrogatives and recognizing when to use them play a vital role in human communication, only a few studies investigated the acquisitional aspect of Chinese interrogatives (Li, Chen & Yang 2015). Hence, in this study, the learning path of Chinese interrogatives is studied with the aim to fill the gap from previous research (Fahn 2003). From the statistical analysis, children produce *wh*-question in specific order from *shenme* '*what*', *shei* '*who*', *shenme shijian* '*when*', *nali* '*where*', *zenme* '*how*' to *weishenme* '*why*'. These *wh*-words are categorized into two classifications—*wh*-argument and *wh*-adjunct. Children acquire *wh*-argument earlier and perform better than with *wh*-adjunct (e.g., Erbaugh 1982, Bloom, Merkin & Wootten 1982), which reflects children's early language development from concrete (around age 3) to abstract description or inquiry (around age 7). The *wh*-word *weishenme* 'why' is the last one emerging in speech, no matter in Chinese or in English, due to cognitive complexity. The biggest limitation here is the recruitment of participants aged equal and below two years old. This study only included participants in northern Taiwan, so the future studies can include participants in other cities. Aside from the first language acquisition, the study on second or third language acquisition on interrogatives is suggested as compared to the performance of the bilingual participant in this study.

Keywords: first language acquisition, Mandarin Chinese, interrogatives, *wh*-questions

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LIST OF ABBREVIATIONS

L1	First language
L2	Second language
Asp	Aspect
Prf	Perfect aspect
Inc	Inchoative aspect
CL	Classifier
S	Subject
V	Verb
O	Object
Q(s)	Question(s)

LIST OF INTERROGATIVE DESCRIPTIONS[1]

shei	誰	who
shenme ren	什麼人	which person (who)
na (yi) ge ren	哪（一）個人	which person (who)
na wei	哪位	which person (who)
na ge	哪個	which
shei de	誰的	whose
shenme	什麼／甚麼[2]	what
shenme shijian	什麼時間	what time (when)
shenme shihou	什麼時候	what time (when)
jidian	幾點	what time (when)
nali	哪裡	where
na ge difang	哪個地方	which place (where)
shenme difang	什麼地方	where
weishenme	為什麼	why
zenme	怎麼	how; why
zenmeyang	怎麼樣	how

[1] The Hanyu Pinyin for Mandarin Chinese is adopted here for the Chinese-English descriptions for interrogatives, which is based on *Revised Mandarin Chinese Dictionary*.

[2] According to the semantic explanation in the online dictionary by the Ministry of Education, Taiwan (R.O.C.) and National Academy for Educational Research (NAER), the word *shenme* has two similar written forms: one is written as '什麼', and the other is written as '甚麼'.

ruhe	如何	how
shenme fangfa	什麼方法	how

CHAPTER ONE

INTRODUCTION

1.1 Motivation

People use interrogatives to seek answers to any questions they have in mind. These interrogatives can generally be classified into a three-way distinction of syntactically-formed questions (Ngai 2021). Each type of interrogative has different linguistic functions (Huddleston 1994, Akal 2020). The three classifications of interrogatives according to Ngai (2021:466) are:

(a) polar questions: 'closed questions' with limited yes-no replies;
(b) disjunctive questions: questions with *wh*-words or question particles; and
(c) content questions: questions used to seek possible answers in theories or studies.

These three types could even be divided into two question types, according to their truth value—confirmation-seeking questions and information-seeking questions (Huang, Kong & Her 2022). Polar questions belong to confirmation-seeking questions; information-seeking questions consist of the other two types—disjunctive questions and content questions. Therefore, people use the methods to inquire and to retrieve certain information.

When people puzzle over one thing, they inquire about it. They may have set some target questions in their mind to elicit wanted answers. The more precise the question is, the clearer the responsive answer will be. Therefore, interrogatives have become a central topic in the language research field. Researchers have investigated interrogatives in semantic, syntactic and other linguistic aspects (e.g., O'Grady, Dobrovolsky & Katamba 1997, Ginzburg & Sag 2000). Over the years, the acquisition of interrogatives has been studied (e.g., Erbaugh 1982, Bloom, Merkin & Wootten 1982, Lee 1989, Chang 1992, Lightbown & Spada 2006). These previous studies have found that native speakers (L1) acquire interrogatives in certain order. Likewise, second language learners (L2) also develop their acquisitional path in a similar way.

For instance, children start acquiring question words around one to two years old and develop their comprehension from simplicity to complexity of logic. The emergence of *wh*-question words can also reflect the cognitive development of language acquisition, concerning place, object, people, reason, and method and so on (e.g., Bloom et al. 1982, Jiang, Koffi & Kuehn 2019). To be more detailed, a mechanism of cognitive development is a mental process that improves children's ability to process information, including perceptual and linguistic processes, conceptual, reasoning, and problem-solving ones. The improvements in children's ability to process information that are of interest include large and small ones, long-term and short-term ones, qualitative and quantitative ones (Siegler 1989).

As compared with questions in English or other languages (e.g., Ervin-Tripp 1970, Tyack & Ingram 1977 in English), questions in Mandarin seem relatively simple. Many interrogative words in Mandarin and in English have similar uses and interpretations. For example, *shenme* has the interpretation of inquiring the matter like the English question word *what* (e.g., What does Linda do?), and *zenme* is analogous to the English question word *how* (e.g., How does Linda do?). In the aspect of etymology, research investigated the origin and possible combination of Chinese question words, and some of them slightly involved semantic and syntactic discussion (Xu 2004[1]). Apart from the mere studies of Chinese interrogatives in semantics and syntax, respectively (e.g., Li 1992, Lin 1992), there are some studies (e.g., Yoon 2008, Hsu 2010) investigating the asymmetry between *wh*-arguments (*who* and *what*) and *wh*-adjuncts (*when*, *where*, *why* and *how*). Also, an interesting study by Tsai (1999) focuses on Chinese *how-why* questions in the interface of semantics and syntax, and the *wh*-question words are *shenme* 'what,' *zhenme* 'how,' *zenmeyang* 'how,' *weishenme* 'why' and *weileshenme* 'why,' as shown in (1) to (3).

[1] Xu (2004) especially mentions that two *wh*-words *shenme* and *zenme* have been the central issue in the 1990s. He summarizes the previous research of *shenme* and *zenme"* in three aspects—the origin, the syntax, and the semantics.

(1) Akiu zenme hui zou?
Akiu how will leave
'Why would (# will) Akiu leave?' (Tsai 1999: 11)[2]

(2) Akiu shang-ci zenmeyang chang-ge?
Akiu last-time how-manner sing-song
'How did Akiu sing last time?' (Tsai 1999: 13)[3]

(3) Akiu weishenme/*wei(-le) shenme zou-le?
Akiu why/for(-Prf) what leave-Prf/Inc
'Why did Akiu leave?' (Tsai 1999: 18)[4]

Aside from Tsai's (1999) study on closer examination of Chinese *how-why* with English, such cross-language comparisons of questions have been studied in the linguistic field for years (e.g., Lin 1992). Decades ago, studies popped up to examine *wh*-questions in the aspect of language acquisition, and most of them were in the investigation of English. Till now, *wh*-questions are one of central interests in language acquisition for researchers to test whether their theories or assumptions are acceptable or not. For example, de Villiers (1995) provided an overview of studies on *wh*-questions in the domain of acquisition in three aspects—topic, methodology, and theory. The results sometimes provide converse perspectives as the studies attempt to draw possible presumptions like the Structural Distance Hypothesis of O'Grady (1997), which pointed out the acquisitional contrast of subject-object embedded position.

Though lots of studies on questions in different languages were widely discussed (de Villiers 1995), some issues are worth reexamining. To the best of my knowledge, little research

[2] In example (1), causal *zenme* scopes over a future modal verb. It is licensed by aspectuality, but it is not sensitive to the agenthood of its subject (Tsai 1999).
[3] The answers to the question with *zenmeyang* 'how' in (2) have two readings:
(i) *Yong houlong* 'With throat.'
(ii) *Hen dasheng* 'Very loudly.'
The *wh*-word *zenmeyang* can be construed either as method, as in (i), or as style of action, as in (ii).
[4] In (3), Tsai (1999) did not gloss and translate into English. Thus, the gloss here is provided for better understanding.

focuses on the acquisitional aspect of question words in Mandarin, either in the first language acquisition or in the second language acquisition. Moradlou, Zheng, Tian and Ginzburg (2021) recently investigated the sequence of comprehension of questions, but there is a lack of overall examination on question words.

Question words once move the positions in sentences, which may cause a trace effect. English is a *wh*-movement language, while Chinese is a *wh*-in situ language. The learnability of syntactic structure is affected by the position of question words in languages; for instance, English *wh*-words of subject or object position cause subject-object asymmetry in acquisition (Stromswold 1995, O'Grady 1997). That is, learners (L1 and L2) demonstrate different performances on different grammatical constructions of *wh*-questions. Take one English *wh*-question as an example. In the sentence 'Who will meet Barbara?', the wh-word *who* acts as the subject question, whereas 'Whom will Barbara meet', the wh-word *whom*[5] here acts as the object question (Stromswold 1995). The subject-object asymmetry can be described briefly with the SVO hypothesis, which provides a simple account of why the subject-object asymmetry occurs in child productions. SVO[6] Hypothesis is a basic form of a language or a communication system, and it is found that people have their preference to form sentences in SVO word order. In (4), children are inclined to avoid producing an object *wh*-question as in (4b) because its mechanisms for generating OSV[7] sentences are weakly established as compared to a subject *wh*-question as in (4a) (Philip, Coopmans, van Atteveldt & van der Meer 2001).

[5] In modern English, *who* and *whom* are used interchangeably in the subject position of sentences. Thus, the sentence provided by Stromswold (1995) can be written 'Who will Barbara meet?'; the sentence by Philip et al. (2001) can be 'Whom is the boy helping?'.

[6] These three capital letters SVO represent three words respectively—subject, verb and object.

[7] In deep structure, the *wh*-word *who* stays at the end of the sentence as an object of the predicate 'helping,' but in order to be in the interrogative form, *who* is moved to the beginning of the sentence and leave the trace after the verb 'helping.'

(4) a. Who is helping the boy?

S V O

b. Who is the boy helping?

O S V (Philip et al. 2001: 587)

According to the position of *wh*-words, English is a movement language such as Spanish and Italian because *wh*-words occur at the initial position of the sentence, involving several changes like *wh*-fronting, *do*-support, and subject-auxiliary inversion in one sentence. When asking about a person's activity, the position of *wh*-word '*what*' is in a different position of the sentence, as shown in (5).

(5) a. What is he doing?

b. He is doing what? (Zhang 2016: 1578)

In comparison to two English sentences in (5a) and (5b), *wh*-word *what* in (5b) remains its position at deep structure, whereas *what* in (5a) undergoes syntactic operations and moves its position to the front in the sentence at surface structure. On the contrary, Mandarin does not overt *wh*-movement, see an example of *shenme* 'what' in (6). As can be seen in (6a), the *wh*-word *shenme* does not move to the beginning of the sentence, but it stays in-situ instead and plays as the complement of the verb *zuo* 'doing' at surface structure. The gloss is interpreted in (6b), which also presents a similar deep structure in English as shown in (5b). That is, the structural asymmetry does not exist in Mandarin, so Mandarin is termed a *wh*-in-situ language.

(6) a. Li Ming zai zuo shenme?

b. Li Ming is doing what? (Zhang 2016: 1579)

In Mandarin, wh-words *shenme* 'what,' *shenme shijian* 'when,' *nali* 'where,' *shei* 'who,' *zenme* 'how' and *weishenme* 'why' have alterations[8] to express the same or close meaning. However, subject-object *wh*-questions in Mandarin may influence the acquisition difficulty (e.g., Fahn 2003). The *wh*-questions in Mandarin may not behave identically just as interrogatives in English and other languages (e.g., Cairns & Hsu 1978, Erreich 1984, Hanna & Wilhelm 1992, Seidl, Hollich & Jusczyk 2003). Sometimes the alterations can be interchangeable to replace the position in sentence structure, but sometimes the alterations have limitations like *weishenme* and *weileshenme* (Tsai 1999, 2000).

(7) Ni yao shenme?
you want what
'What do you want?'

(8) Ta kan shei?
s/he see who(m)
'Who(m) does s/he see?'

(9) Ta shenme shihou qule Nanjing?
s/he when go-Prf/Inc Nanjing
'When did s/he go to Nanjing?' (Erbaugh 1982: 475)[9]

(10) Qui zai nali?
ball be where
'Where is the ball?'

(11) Ta weishenme zuotian mei lai?
he why yesterday not come
'Why didn't he come yesterday?' (Lin 1992: 294)

(12) Ta zenmeyang chuli nei-jian shi?
he how handle that-Cl matter
'How did he deal with that matter?' (Lin 1992: 294)

[8] Take 'when' question for example. The phrase *shenme shijian* can be replaced with another phrase *shenme shihou*, or the other similar phrase *jidian*.
[9] The glosses are provided here, which Erbaugh (1982) did not provide in the study.

Therefore, this study intends to examine six types of *wh*-words in Mandarin, as illustrated in (7) to (12), and aims to conclude the full acquisitional path of *wh*-words, along with the remaining issues in the aspect of acquisition.

1.2 Research Questions

Studies on interrogatives in Mandarin Chinese have investigated in the syntax, semantics and applied linguistic fields (e.g., Lin 1992, Tsai 2000), while there is a gap in the acquisition aspect of interrogatives, especially of *wh*-questions to present the overall acquisitional sequence. For example, Fahn (2003) only examines three *wh*-words in her experiment design. Thus, the following research questions will be addressed:

1) At what stage do children mostly acquire the differences between *wh*-arguments and *wh*-adjuncts?
2) Among the six types of question words in Mandarin, what is the developmental sequence in use in child language?

1.3 Significance of the Study

Research has shown that what children acquire relate to their cognitive development and that it might be affected by their language learning experiences. Most of the linguistic tests are only a single dimension to examine or to infer the acquisition process (Bloom, Merkin & Wootten 1982). As to *wh*-questions, it is an interactive process to connect the inter-mind with the outside world. Children begin to step into the unknown by asking questions, and during their growth, they develop a learning path to comprehend and produce interrogatives (e.g., Lee 1989). However, they have difficulty in distinguishing different types of questions that appear in a child's language development, especially complex words with interpretations or structures. It is ambiguous for children to identify and apply inquiry correctly. Thus, this study builds on the previous work, specifically under the framework of Fahn (2003), but includes the common

six *wh*-question words[10] *shei* ‘who,’ *shenme* ‘what,’ *shenme shijian* ‘when,’ *nail* ‘where,’ *zenme* ‘how’ and *weishenme* ‘why’ in Mandarin for examining Chinese-speaking children’s acquisition of questions.

In reply to the research questions, the experiment will be in line with one of the two contradictory arguments on subject-object *wh*-question acquisition, either the argument of Stromswold (1995) or that of O’Grady (1997). Stromswold (1995) argues object *wh*-questions are the early acquired interrogatives, whereas O’Grady (1997) believes that subject *wh*-questions are acquired earlier. Some research takes possible factors like age and frequency into consideration (e.g., Lieven 2010); hence, in this study, factors like age, input and output will be examined to investigate the previous proposed statements that the *wh*-form *what* and *where* refer to less abstract as compared to the form *when* and *why*; therefore, it can refer to *what* and *where* can be acquired earlier before *when* and *why*.

1.4 Organization of the Thesis

The organization of this thesis is as follows. Chapter Two introduces some theoretical and empirical studies on interrogatives. Chapter Three elaborates the methodology of the experiment, including the information of participants, materials and methods, and the experimental procedure. Chapter Four reports the findings and addresses the research questions along with issues emerging from the data. Finally, Chapter Five concludes the overall research and provides the blueprint for further investigation on interrogatives in Mandarin.

[10] *Wh*-words are so called in that they involve the use of interrogation of *wh*-words at the beginning, and *how* is also classified as a *wh*-word because it behaves syntactically the same as other *wh*-words.

CHAPTER TWO

LITERATURE REVIEW

This chapter contains three sections. Section 2.1 introduces interrogatives and presents two distinctive languages—a *wh*-movement language like English and a *wh*-in-situ language like Chinese. Both empirical and theoretical studies of language acquisition on interrogatives and *wh*-questions are reviewed in Section 2.2. A summary of this chapter is given in Section 2.3.

2.1 The Introduction of Interrogatives

Interrogatives are used to raise questions or express inquiry in different situations. Based on the interrogative functions and the purpose of inquiring, interrogatives can be classified into three categories, which consist of 'closed' polar questions, disjunctive questions with multiple question formations like using *wh*-words or question particles, and 'open' content questions (Ngai 2021, Huang, Kong & Her 2022). Each type of interrogative has different linguistic functions. As to linguistic features of forming interrogatives with *wh*-words, there are two distinctive branches—a movement language and a *wh*-in-situ language. The terms come from the position of *wh*-question words in sentences. Here are eight *wh*-question words: *who, what, when, where, why, whose, which,* and *how*. These question words are nicknamed as the involvement of *wh*-interrogative words in the initial position of a sentence (Curme 1931). Although *how* does not begin with *wh*-, it has the similar syntactic function as other *wh*-words. Take English and Chinese for example, which will be illustrated in Section 2.1.1 and Section 2.1.2. Respectively, the former language is called a *wh*-movement language, and the latter is termed as a *wh*-in-situ language.

2.1.1 English

In English, *wh*- words *who*, *what*, *when*, *where*, *why*, *whose*, *which*, and *how* have their different grammatical functions, and these words can be further categorized into three types—pronoun, adverb, adjective (Zhang 2016, Jiang et al. 2019), as illustrated in Table 2-1.

Table 2- 1. Types of *wh*-words based on grammatical functions

Pronoun	Adverb	Adjective
who (subject pronoun) *what* (direct object) *which*[2]	*when* (temporal adverb) *where* (locative adverb) *why* (adverb) *how* (modality adverb)	*whose*[1] (possessive adjective) *which*

English is a movement language, which stands for the movement of *wh*-words is required. That is, *wh*-words are moved to the initial position of the sentence even if they are originally in the deep structure (Huang 1982). As the movement occurs, it brings about syntactic operations, subject-auxiliary inversion and *do*-support inversion (Jiang et al. 2019). The illustration is provided in Table 2-2 below based on the sentence 'When did you finish your project?'.

[1] In some sentences, *whose* functions as a relative pronoun.
[2] *Which* can also function as a relative pronoun.

Table 2- 2. Derivations of *wh*-movement in English (Jiang et al. 2019:42)

Derivations	English
Deep structure	You past finish your project when
Interrogation	Q You past finish your project when
Do- insertion	Q You past *DO* finish your project when
Subject-Aux Inversion	Q *Do* You past_ finish your project_
WH Fronting	Q When *Do* You past_ finish your project_
Affix Hopping	Q When *Do* past You _ _ finish your project_
Spell out rule	When did you finish your project?
Surface structure	When did you finish your project?

In view of syntax and language acquisition, two competing theories on English acquisition proposed by Stromswold (1995) and O'Grady (1997) are the closest to make the mystery of subject-object *wh*-questions clear. Stromswold (1995) firstly assumes that the object *wh*-questions are acquired much earlier than the subject *wh*-questions; this assumption is based on the principle-and-parameter framework (Chomsky 1981, Snyder & Lillo-Martin 2011). According to her, lexical government is less complicated but more direct than antecedent-government. So as to, an object *wh*-question is easier than a subject *wh*-question. However, O'Grady (1997) later argues against Stromswold (1955) and claims that an object *wh*-question has a longer distance than a subject *wh*-question in considering the distance between the *wh*-word and the associated gap, which is characterized as computational complexity. Thus, object *wh*-questions are more complex than subject *wh*-questions; object *wh*-questions are assumed to emerge late in the acquisition path as compared to subject *wh*-questions.

2.1.2 Chinese

Chinese is a *wh*-in-situ language, which means that *wh*-words stay in the position they are generated in the deep structure (Gao 2021); therefore, there is no need to move *wh*-words in the sentences, as illustrated in (1). In contrast to *wh*-words in English, the question words must move to the initial position, as shown in (2).

(a) Zhangsan renwei [Lisi mai-le ***shenme***]? (*wh* in-situ)
Zhangsan think [Lisi buy-Asp ***what***]
'What did Zhangsan think Lisi bought?'[3]
(b**)** ***What*** did John think [that Bill bought *e*]? (*wh* movement)

(Hsu 2010:209)

Wh-words of *wh*-in-situ languages like Chinese, Korean and Japanese can be divided into two syntactic categories—*wh*-arguments and *wh*-adjuncts, and w*h*-arguments are nominals and *wh*-adjuncts are adverbials (Yoon 2008). However, there is an asymmetry between *wh*-arguments and *wh*-adjuncts in Chinese based on their syntactic properties, such as the island sensitivity and intervention effects (Hsu 2010). *Wh*-arguments are bound by a Q binder with semantic features. Contrary to *wh*-arguments, *wh*-adjuncts are bound by the Q binder in narrow syntax and are considered to be operators, which must undergo movement; thus, they are subject to locality (Hsu 2010). Chang (1992) states that Mandarin interrogative sentences are simpler as compared to English interrogatives since the syntactic structure does not involve subject-verb agreement but only considers the absence of morphological changes related to verbs in questions. Yet, *wh*-words are closely related to verbs; conversely, *v*P positions would be related with the sensitivity of *wh*-phrases (Yoon 2008).

Tsai (1999, 2000) further examined the ambiguity of two *wh*-adjuncts *how* and *why* in

[3] The gloss which is not interpreted by Hsu (2010) is provided here for better understanding.

the interface between semantics and syntax in Mandarin Chinese. In Mandarin Chinese, there are several words or phrases used to pose *how* and *why* questions. The Chinese *wh*-words for *how* and *why* questions are *zenme*, *zenmeyang*, *weishenme* and *weileshenme*. The *how-why* words and its alternations are affected by a number of factors, such as the semantics of causal relations and the fundamental difference between nouns and adverbs. These *wh*-words interface with two aspects: manner and causality. *Wh*-words *zenme*, *zenmeyang*, *weishenme* and *weileshenme* are used explicitly to deliver the interrogative and non-interrogative readings. In a more specific way, *zenme* could be interpreted as casual reading or event when *zenme* is in the initial position of a sentence, or when *zenme* appears before an auxiliary verb. Furthermore, the *wh*-word *zenme* concerning an interrogative reading can be *zenmeyang* 'how' to ask for the method, manner or style of action especially when *zenme* or *zenmeyang* is in either postmodal or preverbal position. Also, the interpretation of *zenmeyang* could be the resultative or style of resultant state when the *wh*-questions apply postverbal *zenmeyang*. In addition, the *wh*-word *zenme* has the reading of *weishenme* 'why.' In some cases, *weishenme* also has the function as the form of *weileshenme*, but *weishenme* is cause-effect relationship, which is mainly asked for reasons, and *weileshenme* is mainly for purposes[4]. These two *wh*-words *weileshenme* and *zenmeyang* have similar syntactic structure[5].

There are four question-marking devices, including *wh*-words, in Mandarin questions in the study of Li and Thompson (1981:520-563):

(a) adding a sentence final particle like "ma" or "ne";
(b) using a specific question word; for example, if inquiring the location in a declarative sentence "John went to school", a locative question word will be applied and the sentence will be "Where did John go";

[4] In certain cases, *weileshenme* plays the same function as *weishenme* for asking reasons.
[5] Tsai (1999, 2000) mentions that two wh-words *weileshenme* and *zenmeyang* could be split into two phrases. For instance, *weileshenme* can be *weile* and *shenme*, and *zenmeyang* could be *zenme* and *yang*. Those two phrases are tied together to be a word with different functions or meanings.

(c) listing two alternatives by the question formation V-not-V question such as “you want-not-want come”;
(d) forming a tag question onto a declarative sentence, which is similar to V-not-V form, like “right not right” or “be not be.”

The sequence of interrogative development is related to these question-marking devices. The first emergent form is (a) the sentence-final particle (or the particle question) in the Mandarin question. Later on, (b) question words like *shenme* (translated as *what* in English) begin to appear occasionally in posing questions. At the same stage, (d) V-not-V disjunction question is applied and used correctly. The last emergent type of question is (c) the V-not-V formation. Overall, the order of development of different questions appears to be similar in Mandarin and English (Chang 1992). It is believed that this phenomenon could reflect universal cognitive processing concerning children’s comprehension of the order of development of the question across different languages. However, Chang’s findings contradicted the presentation of English data (Brown 1973, Ervin-Tripp 1970), and further stated its limitation in ways of concerning intonation. It is assumed that concerning intonation is not the necessity at the early stage of posing questions via a linguistic device.

2.1.3 Interim Summary

Chinese is regarded as a language with complex semantics in contrast to English. The semantic aspect is reviewed in the sequential study of Tsai (1999, 2000), which slightly involves the syntactic aspect. He revisited the central topic of question words, especially on *how* and *why* in Mandarin Chinese. Tsai compared questions in Mandarin with other languages like English and Russian, stated the different functions in these two words ‘how’ *zenme* and ‘why’ *shenme* as well as two alternatives *zenmeyang* and *weileshenme*, and found the similarity in pairs between question words. As mentioned to syntax, Chang (1992) proposed the concept of simple Chinese and complex English in interrogatives, and the linguistic categories of posing

questions. Additionally, based on the syntactic aspect, Stromswold (1995) and O'Grady (1997) proposed the opposite acquisition theories to figure out whether object *wh*-questions can be acquired early and easily or not.

2.2 Language Acquisition of Interrogatives

In this section, both empirical and theoretical studies on language acquisition of interrogatives are reviewed. Section 2.2.1 elaborates studies (Tyack & Ingram 1977, Cairns & Hsu 1978, Bloom et al. 1982) on types of questions and their hierarchy, each with different methodology and findings. While Tyack and Ingram (1977) discussed the findings of subject-object *wh*-questions, which emerged from Smith (1933) and Ervin-Tripp (1970) and did a complementary experiment, Cairns and Hsu (1978) examined questions with *wh*-forms which partially were used in previous experiments.

In Section 2.2.2, researchers examine questions in depth and study the interaction with different linguistic factors based on some theories or hypotheses. While Erreich (1984) considered the inversion occurred in questions with a hypothesis-testing modal, Valian and Casey (2003) discussed the learning speed of syntactic structure with auxiliary inversion. Fahn (2003) dealt with age and subject-object position in questions in Mandarin Chinese to clear the puzzle left behind. Rowland and Pine (2003) conducted revisited research of Brown (1973). While Bloom et al. (1982), an integrated modal was implemented to investigate the interaction among different linguistic factors, Newman, Rowe and Ratner (2016) addressed the factors affecting language acquisition; Moradlou et al. (2021) did cognitive research on semantics.

2.2.1 Acquisitional Sequence of Interrogatives

Two studies have some correspondence between each other—Smith (1933) and Ervin-Tripp (1970). Smith (1933) examined the developmental constitution of questions from the

children by ages 1;6 to 6;0, and she found that 13% in children's speech was constituted as questions across a five-age range. Regarding the order and frequency, *what* and *where*, aside from yes-no question type, were marked as the most frequent and the most used items, and *when* was marked as the most infrequent question word appeared in children's language. In contrast to Smith (1933), Ervin-Tripp (1970) observed a small group of children in the aspect of comprehensive ability by videotaping children's respondents to questions. She did a longitudinal study about a year on children around the age 2;0, and then she designed another one-year study based on the finding from the videotaping observation. She found out that yes-no question, *what* and *where* were marked for children to understand initially, and this finding favorably corresponded to Smith's (1933). However, the result of Ervin-Tripp (1970) was ambiguous with *who*-subject and *who*-object. Besides, there were two restrictions: one was that few verbs were used, and the other was that per *wh*-word was used once in each type of question in the experiments of Smith (1933) and Ervin-Tripp (1970).

Years later, Tyack and Ingram (1977) conducted a follow-up study of Smith (1933) and Ervin-Tripp (1970), which addressed the acquisitional order of questions with different *wh*-forms as well as the errors made and the context of question as well as its influence over the result. They examined the comprehension and production separately of two types of questions, yes-no and *wh*-questions. In the production study, twenty-two children of 9 boys and 13 girls were divided into four age groups, and all of them were from middle-class, English-speaking families. The parents of these children were engaged for the reasons: (a) inordinate questions, (b) better understanding of speech, and (c) more production on questions. This resulted in a positive outcome that a mean number of questions per child increased across all age groups. As age increased, children tended to produce more diverse types of questions. On the basis of the frequency in percentages of questions, more than 60% of the total questions were of yes-no questions, which was similar to the result of Smith (1933); the rate of what and where were

quite similar to Smith's result as well, and both *what* and *where* occurred more frequently than *how* and *when*. Besides, across age groups, the frequency of *why* was more frequent, and the use of several *wh*-words increased in frequency, which might suggest children acquire questions in sequence with their cognitive development and conceptual establishment like manner, time or cause.

In the comprehension study, one hundred children in an equal number of boys and girls were divided into five age groups, and all of them were from middle-class, English-speaking families. The materials used in the experiment were six scenes of photographs. There were the restrictions on the question word used, the verb and the syntactic structure. Hence, there were thirty-six questions with *wh*-words *where, why*; *how, when, who* and *what*; six different *wh*-questions were used for each photograph. The two syntactic structures were selected in control of syntactic complexity: (a) *wh*-word + is + the +boy/girl + verb + -ing? and (b) What/Who + is +verb + -ing + the + boy/girl? Besides, the use of verbs was also controlled and selected: *ride, touch, help* for the transitive verbs and *sleep, smile, sit* for the intransitive verbs. Each child was tested individually. According to the percentage of correct responses, the rate of six *wh*-words increased across all age groups. To be detailed, the highest percentage of correct responses to the lowest was ranked by five stages: (1) *where*-intransitive verb; (2) *why*-intransitive verb, *why*-transitive verb and *who*-subject; (3) *where*-transitive verb; (4) *what*-object, *who*-object, *when*-intransitive verb and *when*-transitive verb; and (5) *how*-transitive verb, *how*-intransitive verb and *what*-subject. This result reversed the findings of Ervin-Tripp (1970) in that *when* was easier than *how*. By observing children's use of questions, it also showed that cognition is related to question processing as well as the transitivity of verbs.

Then, Cairns and Hsu (1978) selected six questions with *wh*-forms, which were used in the previous two studies of Ervin-Tripp (1970) and Tyack and Ingram (1977). The six adopted questions were *who*-subject, *who*-object (in progressive aspect and with *do*-support), *why*,

when and *how*. The *wh*-form, *where,* was not examined in this study. The two syntactic types in *who*-object question were used to fill the gap in Ervin-Tripp's (1970) and Tyack and Ingram's (1977) studies, which only examined *who*-object in progressive form. Cairns and Hsu observed fifty children between the ages of 3;0 to 5;6 from middle-class families; these children were divided into five age groups with equal numbered genders in each group. In the experiment, all children tested individually and viewed five videotaped segments once in the same order under investigation; in the prevention of memory effects, the six questions were presented in a random order in each segment. As age increased, the children gave correct responses in all *wh*-questions. As to the result of correct responses for each age group and question type, the five age groups differed from one another significantly, with the only one exception between the age group of 4;0 - 4;6 and of 4;6 - 5;0. The accuracy from high to low was *who*-object using *do*-support, *who*-subject, *who*-object using progressive aspect, *why*, *when* and finally *how*. That result also presents the acquisitional sequence of *wh*-questions from the easiest to the hardest. This result is against the order proposed by Ervin-Tripp (1970), but it supports the order in Tyack and Ingram (1977), with a slightly different order of *why*.

The different rate of acquisition of *wh*-questions was related to the order of difficulty in answering correctly over six types of questions. As compared with *why*, *when* and *how*, the *who*-question types seem to be an adequate index by its increased accuracy for a child's performance, and it can be attributed to the increasing memory span. The finding that superior performance on *who*-subject and *who*-object with *do* indicated that the identity of the grammatical relation occurred before the *who*-object question in a progressive aspect. Also, it was suggested that the children start the memory search for the correct answer as the questions are processed. The easiest question type after three *who* questions was *why* question. From the result, *why* question was superior to *when* and *how* questions for all children across age groups; *why-how* was found stronger than *why-when,* and *when* was slightly over than *how*. For the

children, the ability to deal with the concept of causality seems to develop early and was perceived as an antecedent-consequence. As for the reason *why* occurring before *when*, causality was found easier than temporality for the children to encode the concept, and the ability to encode temporal concept relied on the ability to encode causal concept. Thus, they acquired *why* questions before *when* questions. Then, as mentioned *how* occurred later than *why* and *when*, there was no certain ability of the children like encoding causality or temporality for *how*. As age increased, the correct rate of answering *questions* increased as well. However, the reason for the difficulty of *how* questions seem to be attributed to the varied types of acceptable answers; there are three types of answering *how* questions: locative or instrumental responses, statements of the syntactic form *by*, and statements describing the event. Therefore, children need to gain the sentence production skill to cover the varied *how* sentences with cognitive demands.

2.2.2 Acquisition Hypothesis Models

2.2.2.1 Bloom et al. (1982)

Bloom, Merkin and Wooten (1982) adopted an integrated model combining semantics, syntax and pragmatics, and examined the linguistic factors with nonlinguistic conceptual factors together in order to understand how different aspects influence each other for the child in the progress of language acquisition. It was hypothesized that there is a difference between in early and in later as *wh*-forms are learned by the child from three aspects:

(a) the syntactic function related to the question;
(b) the verb usage that brings out simple or complex semantic meaning in *wh*-question;
(c) the use of *wh*-question in a different discourse environment.

(Bloom et al. 1982:1085)

Bloom et al. (1982) observed seven children of three girls and four boys from 22 months

to 36 months of age longitudinally. These subjects were the firstborn children, and their parents were college-educated; they were selected in the restriction of birth order, social and/or economic effects in order to minimize the possibilities in the experiment. During the experiment, seven children with their parents and/or an investigator were observed and recorded in audio separately for the text of the linguistic transcription and nonlinguistic description like an accompanying speech. Though the children were examined separately their similarity in both linguistic and/or nonlinguistic aspects to each other to build their pattern of language development. On this basis, the mean length of utterance (MLU) was computed for the texts from each child, and divided into four MLU periods: Period A (mean range = 2.14), Period B (mean range = 2.83), Period C (mean range = 3.45) and Period D (mean range = 4.55). These periods showed that increasing utterance length was a way to observe the change in acquisition of *wh*-questions.

The order of acquisition for the questions included verbs: *what* and *where* acquired firstly at the average age of 26 months before *who*, then *how*[6] acquired in third, and then *why* at an average age of 35 months. Three *wh*-forms *which, whose* and *when* occurred rarely even at the age of 36 months. Thus, the developmental sequence of *wh*-questions acquisition was inferred from the frequency counts of questions with *wh*-forms in relation to the age of emergence of children. Concerning syntactic categories, *wh*-pronominals, *what*, *where* and *who* emerged firstly with verbs; *wh*-pronominal ask for the major sentence constituents, such as the subject, the object and the phrase verb constituent that they replace. *Wh*-sententials *why*, *how* and *when* emerged later, which ask for semantic relations that specify a reason, a manner or the time among all the constituents in a sentence. *Which* and *whose* are adjective forms for an objective constituent, which were rarely used and produced in a child language. The acquired sequence reflected the syntactic complexity of *wh*-questions for children.

[6] The *wh*-word *how* emerged before *who* when it occurred without verbs.

Children used the great majority of pro-verbs in their *wh*-questions, as compared to the total frequent usage of descriptive verbs with *wh*-questions. Besides, *what*, *where* and *who* questions occurred the most frequently among all question types. The *wh*-forms *why* and *how* occurred more often with descriptive verbs than with pro-verbs, so it was inferred that *wh*-questions acquired later were more likely to occur with descriptive verbs than pro-verbs, except the infrequent *wh*-form *whose*. That is, there was a positive relation between syntactic function of questions and semantic complexity of verbs, and it pointed out the order of acquisition of *wh*-forms as well. As for the discourse result, *what, where* and *who* occurred with gradual increase in child utterance in all periods, but *how* and *why* emerged later and showed a decrease over time. *What* and *where* questions were the most frequent and had the highest rate of adjacency and contingency; to be specific, the rate of adjacency was higher than that of contingency over time. Concerning the proportion of linguistic contingency, *why* showed the highest proportion and *how* showed the lowest proportion. The rate increased over time of all *wh*-questions with descriptive verbs with the only exception of *how*. That is, *why* questions were more contingent than other *wh*-questions, and it also occurred most frequently with descriptive verbs; *why* questions might be more prior to adult utterances of questions.

2.2.2.2 Erreich (1984)

In the acquisitional process of question formation, children have to keep two things in mind about the syntactic knowledge of questions: one is subject-auxiliary inversion in question formation, and the other is inversion required differently in yes-no questions and *wh*-questions. Different from the child grammar, subject-inversion existed in adult grammar, which was reversed in the usual word order of a declarative sentence. Therefore, three stages occurred to acquire inversion patterns of questions, as elaborated as follows.

(a) Stages I and II: Auxiliaries were not in use, so inversion was not produced as well;

only intonation was changed into the rising tone to indicate the sentence as a question.

(b) Stage III: Auxiliaries appeared in declaratives and started to convert to yes-no questions, but they were absent from *wh*-questions. Inversion appeared in non-inverted form and in negative *wh*-questions at this stage.

(Erreich 1984:580)

Erreich (1984), based on the assumptions of non-inversion errors with *wh*-questions in that children performed yes-no questions before *wh*-questions, did a hypothesis-testing modal in order to figure out the subject-auxiliary inversion occurrence in yes-no questions as well as *wh*-questions and non-inversion errors found in *wh*-questions. Eighteen children, 7 girls and 11 boys from the age 2:5 to 3:0, participated in the experiment in their homes. The experiment was designed as an elicitation task consisting of yes-no questions and *wh*-questions. During the experiment, each child received three types of elicitation items, which were asked by their mothers and the experimenter. All respondents and speeches were tape-recorded within a week, and each session for the children did not last more than an hour. The result of Erreich (1984) presented that the most produced question types, as compared with inverted patterns of questions, was non-inverted pattern of both yes-no questions and *wh*-questions, with the percentages of 51% and 36% separately. This rate indicated that the non-inversion form of questions was more common for the children. As for the inverted form of questions, over eighty percent of children tended to produce inverted and non-inverted forms for yes-no questions and *wh*-questions, but about one-third of the children produced only the non-inverted form of *wh*-questions. It seemed that most children had acquired their inversion rules for these two question types, and most of them only produced these two patterns of questions—inverted and inverted. In addition, the children produced questions with auxiliaries much often, and auxiliaries were used in almost an equal percentage of yes-no questions, *wh*-questions and declaratives. To be detailed, auxiliaries in yes-no questions were slightly higher in use than auxiliaries in *wh*-

questions or declaratives. As mentioned to negative forms of questions, both yes-no questions and *wh*-questions were produced in a non-inverted pattern. Owing to no supportive data found in the experiment, the findings of Erreich contradicted the claim that children acquire inversion of yes-no questions earlier than that of *wh*-questions. According to the data, non-inversion errors would be a characteristic feature in acquisition of *wh*-questions.

2.2.2.3 Fahn (2003)

Fahn (2003) developed her experimental design of the language acquisition of Mandarin Chinese with fundamental theories and studies by researchers (e.g., Ervin-Tripp 1970, Cairns & Hsu 1978, Tyack & Ingram 1977). At that time, in contrast to languages like English, Cantonese, Korean and Japanese, studies on *wh*-questions were rarely found and done in Mandarin Chinese. Thus, the experiment was designed for the Chinese-speaking children to fill in the gap and to figure out the acquisitional process of *wh*-questions in two aspects: 1) Is there any difference between a subject *wh*-question and an object *wh*-question? and 2) Does age play an important role influencing the acquisition of simple *wh*-questions. Fahn focused on how Mandarin-speaking children develop their acquisition sequence on the mono-clausal wh-questions, which she called as simple *wh*-questions, including subject *wh*-questions and object *wh*-questions (elaborated examples listed below in (3)). In (3a), a subject *wh*-question stands for wh-word being the subject in *wh*-question, while in (3b), an object *wh*-question refers to wh-word functioning as the object in *wh*-question.

(3) a. Subject *wh*-question
Shui zai ti Xiaoming?
who Prog kick Xiaoming
'Who is kicking Xiaoming?'

b. Object *wh-question*

Xiaoming zai ti shui?

Xiaoming Prog kick who

'Who is Xiaoming kicking?'

(Fahn 2003: 82-83)

Mandarin Chinese does not have *wh*-movement but moves at Logical Form. Besides, there is no asymmetry between subject and object questions in Mandarin Chinese (Huang 1982, 1987)[7]. What if a subject and object asymmetry exists, the Empty Category Principle may be one factor to influence the permissibility of the extraction for *wh*-phrases in subject or object position. If *wh*-words move without overt *wh*-movement, then what is the implication in language acquisition? To figure out the answer to this question, Fahn designed a production task, which was partially reduplicated and modified Yoshinaga (1996)'s task design, to examine the acceptability of two proposals of Stromswold and O'Grady. Also, the study focused on whether the subject *wh*-question is easier than the object *wh*-question and on whether age is an influential factor in the acquisition process. The production task avoided the animacy bias and adopted the reversible verbs like pull and push. Then, in Fahn's experiment, eighty-five kindergarten children were involved in the production task to examine the target proposals. Through the production task, the children's language ability was examined, including their comprehensive ability, knowledge of morphemes, syntax, etc[8].

Due to statistical reasons, some data from younger children at the age of 4;5 or below were excluded in this experiment. During the process of experiment, only forty-two children were included and categorized into four age groups 4;6-4;12, 5;0-5;6, 5;6-5;12, and 6;0-6;6 in equal gender and number of age groups. Moreover, a puppet was set aside for the children to

[7] This proposal is opposed to Stromswold (1995). Fahn assumes that Huang's proposal supports the opinion of object *wh*-questions acquired later than subject *wh*-questions.

[8] Fahn considers that a production task could also be employed to examine the elements in a comprehension task.

create an environment to ask *wh*-questions. Before the main test, the training task was needed for the children to become familiar with the researchers, and for them to lead the children to know the task process. In the training task, all targeted *wh*-questions were included: subject *wh*-questions, object *wh*-questions, *which*, *what*, and *who* through the shown pictures with one or more participant(s) to children guiding them to ask the target questions without knowing. Otherwise, in the main task, positive reinforcement, including nodding and compliment phrases like "That's good!" was used for all responses to replace with guiding sentences, errors were not collected in this task. What's more, Mandarin Chinese is a pro-drop language so that the deletion in subject or object position is acceptable and included in the data as correct responses (the sentences of deletion were presented in (2)).

(4) a. Subject deletion
Zai tui na yi zhe?
Prog push which one Cl
'Which one is the pig pushing?'
b. Object deletion
Na yi zhe zai la?
which one CL Prog pull
'Which one is pulling the cow?'

(Fahn 2003: 107)

Here the result of Fahn (2003) presented in percentages to show the frequency of correct responses in different age groups and in general. Overall, subject *wh*-questions had a higher percentage in 97.21% than object *wh*-questions in 59.93%. The two different percentage existing a big gap indicated that subject *wh*-questions were easier than object *wh*-questions for the children to acknowledge questions to give correct responses; however, one possibility of a low percentage of object *wh*-question was that the children used subject *wh*-questions to replace object *wh*-questions, especially in the case of *which*-questions. This grammatical reversal

among three object *wh*-questions (*which one, who, what*) was found in a high percentage 90%; *which-one* question had a higher error rate at 49.66% than *what*- and *who*-questions at 21% and 16%, respectively. As mentioned to percentages in the age groups, both subject and object *wh*-questions increased their rates for correct responses, but a group at the age of 5;0 to 5;6 did not rise up in frequency of correct responses, but either maintained the percentage as the former age group or slightly lowered the rate for correct responses. The paired *t*-tests were used to examine the mean scores as well as deviation scores among across-age groups and to clarify the importance of age effect in accordance with a statistical significance. The mean scores were increased from 2.07 to 2.36, and the average was 2.17. Almost all the *p*-values were at the rate of 0.000, except for the age group of 4;6-5;0. So, the paired *t*-test was compatible with the percentage for the frequency counts of correct responses. It also showed that age did not play a significant role in acquisition.

Fahn's result corresponded with Yoshinaga's report that children gave correct responses in *which-one* object questions at the lowest rate among *wh*-questions. But this result was reversed from Cheung and Lee (1993) and Lee (1989), who found object *wh*-questions easier than subject *wh*-questions. The difference might be attributed to the task design; that is to say, the difficulty of a comprehension task was not compatible to that of a production task which involves using all abilities in a comprehension task in order to transform into an output as production. But any error in any process may cause an impact to the output. Besides, Cheung and Lee seemed to agree with the hypothesis of Stromswold in that lexical government is less complicated but more direct than antecedent government. In Mandarin Chinese, both subject and object positions are lexically governed. The outcome of Stromswold, and Cheung and Lee were not supported by that of Fahn, nor that of O'Grady, who argues that subject *wh*-questions are acquired earlier than object *wh*-questions, or that both of them are acquired at the same period. Overall, O'Grady proposal seemed to support Fahn's research.

From the perspective of syntactic movement theory, Huang (1982, 1987) also seemed to be a supportive statement to Fahn's research. Subject *wh*-questions move only once but object *wh*-questions move twice. Therefore, in consideration to the complexity of LF movement, Huang states that subject *wh*-questions are easier than object *wh*-questions. A slight clash exists in the difference of the case-marking system between Huang's research and the discovery of Yoshinaga's experimental results. Yoshinaga showed that there was no obvious difficulty between subject and object *wh*-questions in the acquisition process with the support of a case-marking system (nominative case *-ga* and accusative case *-o* in Japanese). But English-speaking children still provide supportive data to the statement that subject *wh*-question are easier than object *wh*-question.

2.2.2.4 Valian & Casey (2003)

Valian and Casey (2003) propose that the process of normal language acquisition is slow as mentioned to the rate of learning the syntactic structure, which is not found in previous studies. They also consider that both process and attention in language acquisition are the big impacts to affect the child's input. During the process of acquisition, *wh*-questions require knowledge in three aspects: one is that *wh*-word is at the front at most times compared to the rate appearing at the end of a sentence or a clause; another is that tense is placed on either the position of the main verb or that of auxiliary; the other is that equivalent class of elements (i.e. tense, agreement, modals, *have*, and *be*) are inverted followed by subjects. So, *wh*-questions are acquired later than yes-no questions due to the complex syntactic structure and knowledge, and the main difference between these two types of questions lies in the movement from the inflection node (INFL) to the position before the subject (COMP).

In the experiment, 29 monolingual English-speaking children from age 2;6 to 3;2 were recruited to examine their input in the acquisitional process of *wh*-questions. All sessions were

conducted in the same room of their preschools or homes, and were audiotaped and fully transcribed. In their experiment, environmental features and frequency of the input were assumed to be attempted factors to examine the significance for children to produce a successful parsing. Environmental features, they supposed, could be an enhancement for children to focus on the syntactic structure of *wh*-questions; frequency of the input could be an acceleration for children to be familiar with the syntactic structure. If the frequency of input is raised up for children having opportunity to focus and acquire the input, then the frequency of output is supposed to rise up in that children have collected a certain amount of data to integrate a parsing. If the input appears not much, then children might lose their attention on the input to parse. To clarify the role of input, intervention studies are used to provide children the input and to examine the acquisitional consequences. The intervention procedure was used in a systematic way and a statistical comparison was made for syntactic structure testing. Specifically for the procedure, four sessions (Session 1 to Session 4) were set for three conditions (Quasi-control, Modelling, and Implicit correction) for all the children. Sessions 1 and 4 belonged to pre- and post-intervention; the former was to test children's ability of using 4 auxiliaries and 2 *wh*-words to form *wh*-questions, and the latter for children was to demonstrate their ability to ask questions. Sessions 2 and 3 belonged to intervention; the difference between each other was on the treatment group the children were assigned to. Each session was one week apart. And its aim was to examine each child's performance on whether natural input is better than a feature of intervention studies or not. During all the sessions in three models, the children tried to repeat questions and hear Gabby bear answering as the experimenter asked questions. Besides, the process of Modelling was like parental-repetition; Implicit correction's process was like the customized variation of parental-repetition.

Children intimated different types of *wh*-questions in four sessions. Session 1, pre-intervention session, contained 4 practice sentences and 24 test sentences with *wh*-words *when*

and *where*, with auxiliaries like *do, will, can* and the main verb *be*. Sessions 2 and 3, intervention session, contained 16 test sentences with *wh*-words *when* and *where*, with the auxiliary *can* and the main verb *be*. Session 4, post-intervention session, contained 16 test sentences with *wh*-words *when* and *where*, with *do, will, can* and the main verb *be*. All test questions were in quasi-random order, and all *wh*-words and auxiliaries were presented in equal numbers in four sessions. An important point here is that only two auxiliaries *can* and *do* were used in Sessions 2 and 3, which might help to examine the influence of the untrained auxiliaries and the trained ones. Therefore, target auxiliary use and any auxiliary use were scored, and verb and agreement changes like *was/are/is* and *can/could* were considered acceptable in the experiment except semi-auxiliaries like *gonna* and *wanna*.

The results of Valian and Casey (2003) showed that their children somehow lacked knowledge of auxiliaries as they imitated questions. If they had a high production rate of auxiliaries, they might have known syntactic formation of questions. Another possible assumption for the outcome is the children's understanding of the experimental test '*ask* game'. Besides, the children tended to answer the questions instead of asking questions. They could acquire the acknowledgement of auxiliary after training with great improvement with constant hearing of questions, corresponding to the presumption of Valian and Casey. In overall, the children performed well on trained auxiliaries *can/do* as compared to untrained ones *will/do*. The results of Valian and Casey also showed frequency and variety were important factors for the input, as considering four influential factors - form, correction, frequency and variety. This coincides with previous research.

As children present their parsing ability during the input sessions, they are expected to have the ability of self-repetitions and implicit-correction-like replies through practice. Even the ability of self-repetitions and implicit-correction-like replies exist cross-culturally at the early stage of children interacting with parental speech. But the process is slow and long for

children to acquire the structure, although children do improve rapidly with minimal input received from the environment. Children take time to establish their knowledge of semantics, syntax, pragmatics and nonverbal interests in the learning process. Frequency of input can provide children with an opportunity to accelerate the learning process, and hearing a target question or syntactic sentence more times helps them generalize the usage of target forms. The environment is also an influential factor for children to retain attention in learning.

Here Valian and Casey mentioned three limitations in their experiment: limited measures under the practical consideration, the environment constraint on the influence of children's production, and insufficient data for spontaneous speech produced by children during or before experimental sessions.

2.2.2.5 Rowland and Pine (2003)

As van Valin (2002) proposes that the study of Rowland and Pine (2000) shows a lack in the explanation of input frequencies, he also suggests that Role and Reference Grammar can be more successful than input frequencies in the account for explaining the data of Adam's speech. Later on, Rowland and Pine (2003) reexamine the *wh*-question data of Adam's speech (Brown 1973) which they use in their previous study as their main test resource, and also argue that the syntactic perspective from Van Valin is appropriate but not necessary to devise a theory to explain a phenomenon.

Three studies mentioned above are practiced in different methods and provide different perspectives. First, Adam's speech is used as a big database to perform the calculation on various purposes; second, Rowland and Pine use the data to examine the *wh*-question in the pattern of inversion and un-inversion to figure out the role of input frequencies toward children; third, van Valin focuses on the shift of data and provides an explanation in terms of Role and Reference Grammar. As for Rowland and Pine's study in 2000, the data of Adm's speech

contains a large proportion of *wh*-word + auxiliary (*wh* + aux) combinations. The *wh* + aux combinations can be divided into two subtypes: inverted *wh*-questions (e.g. *what are you doing?*) and un-inverted *wh*-questions (e.g. *What you can do?*), and these *wh* + aux combinations are influenced by the frequency of Adam's input.

However, van Valin disagrees with the perspective of Rowland and Pine, and states his disagreement in three points. First, the pattern of inversion and un-inversion in *wh*-questions cannot be viewed as the factor of input frequencies in that this frequency-based explanation cannot provide a solid analysis to all statistics in data of Adam's speech on *wh* + aux combinations. Second, the acquisition sequence of *wh*-questions in inverted and inverted patterns cannot be explained clearly in Adam's data due to a shift at data points, which he observes *wh*-questions with auxiliaries tend to be produced in inverted pattern rather than un-inverted pattern. Third, the explanation of the acquisition sequence of *wh*-questions is limited in the *wh* + aux combinations, and it cannot be used to predict the acquisition sequence of yes-no questions.

In van Valin's study, Role and Reference Grammar is applied to explain the shift in data points. The possible factor is the tense of *wh*-questions. The illocutionary force (abbreviated as IF) carries the tense in English, so it may affect the acquisitional sequence of *wh*-questions for children. Apart from tenses, auxiliaries and modals are also the influential factors to IF because both of them also carry tense. Therefore, children have to know tenses in English first. Children acquire the knowledge of auxiliary earlier than modals and negatives. And according to Adam's data, tensed auxiliaries of *wh*-questions have larger numbers than un-inverted *wh* +aux combinations with modals and negatives. The explanation with IF in the acquisition sequence can also be adopted in yes-no question acquisition.

To this extent, Rowland and Pine agree with some of van Valin's perspectives toward their previous study, and acknowledge him provide a rule to fill the gap in explaining about

Adam's data shift. The previous study of Rowland and Pine may overestimate the importance of input frequency, but it does prove inverted pattern is more likely to appear than un-inverted pattern for children in percentages of frequency. Hence, the input-driven approach does provide a real effect account. Furthermore, Rowland and Pine provide another perspective on Adam's data for explaining the data shift after they re-examine the data of Adam's speech. They consider there are two factors causing the shift in data points. The first factor is more *wh*-word with auxiliaries involved in the data; another factor is the reduplicated use of *wh* + aux combinations in new examination of *wh*-question types; hence, it leads to the result with a high score on the performance of certain *wh*-question types.

The data of Adam's speech could not be explained by a certain approach or rule, but it does need the association between an approach and a rule to present a prediction on an issue. In this case, the rules of van Valin's theory need additional parameters to provide an overall explanation, not just for the shift in data points. The advantage of data-driven or so input-driven does not overestimate the possibility of data, without limiting in adult grammar. Also, the data-driven approach is consistent with the concept of acquisition that learning is a gradual process from generalization to specific characteristics.

2.2.2.6 Moradlou et al. (2021)

The cognitive aspect of question acquisition, especially on the semantic entity, remains unaddressed. Apart from that, the question theory so far has not addressed the mechanism by which questions are acquired. Moradlou, Zheng, Tian and Ginzburg (2021) conducted an experiment testing the emergence order of comprehension of *wh*-questions and polar questions to confirm the observation from the *Province* corpus by using elicitation studies. They also implement two theories-the partition theory and the propositional function in the experiment design.

With regard to the complexity of questions, the polar-question is tied only to two entities, and the *wh*-question depends on the predicate and wh-word meanwhile. Children possess the questions and utterances responses in four basic strategies proposed by Evrin-Tripp (1970), such as giving a correct reply, a causal explanation, or a relative response based on the verb usage in questions. In a series of studies by Moradlou and Ginzburg from 2013 to 2014, not only children's answering but also answering behavior for questions were investigated and considered as a response to questions; the most frequent non-verbal responses observed during the experiment, for example, were a shrug, a nod, a head shake, or an action. These non-verbal responses were all made to polar questions, and mostly to *where* and *which* questions. The experiment was conducted on 17 German and 27 Chinese-speaking children in German and China separately, with a shared picture book reading in the elicitative way of examining the finding of question emergence from the corpus study that children answered *wh*-questions ahead of polar questions. The female participants were 7 and 10 for German and Chinese-speaking children, respectively. The English corpus generalization was tested in this experiment for the applicability of assumptions in German and Chinese. It was hypothesized, based on children's cognitive ability, about the correlation between the order of understanding and questions whose answers were easier to understand. So that, children might answer polar questions later than *wh*-questions owing to the inference of propositions. In the study of Moradlou, Zheng, Tian and Ginzburg (2021), the limited number of tested questions, considering question type and the existence of wh-word, was generated through a python program and adopted to elicit the causal relevance on question answering. The sets of question type were included here: identity, location/existence, and animal sounds. The conditions of *wh*-word presences were considered here as well: *wh*, polar with a correct answer *yes*, and polar with a correct answer *no*. The responses from children were collected and given feedback if necessary.

The data were explained with the coding system, which took account of the answers truth/false, type correctness, and pragmatic congruity. Each answer made by children could be verbal, non-verbal, or a combination of both, and would be scored. As the generalization from corpus study, the elicitation study shows that polars were significantly harder for the children to answer compared to *wh*-questions. The answerability of question types presented in the following sequence for both languages German and Chinese: location > identity > sound-*post hoc* pairwise comparisons with statistical significance ($p \leqq 0.05$). The postulation of the answer complexity derives from the driving force and the learning interrogative meaning. The driving force was for the observed disparity in answerability of *wh*-questions and polars in two ways-verbally and non-verbally, such as making a gesture toward an object or labeling an object. The learning interrogative meaning was dependent on concreteness and perceptual grounding of the answer to the question. The results here contradicted the notion of Casillas et al. (2016), some factors of which distinguished this study. The differences were stated in the following: age, sampling, repetition as affirmation, non-informational polar-questions, and phonological effect. Aside from the above mentioned, whether routinization can be taken into account to explain the interrogative meanings learned from situated questions and answer pairs in an interactive learning view of Moradlou and Ginzburg (2014). Two considerations suggest that routinization should not be accounted for completely. One was the dearth of *wh*-questions in routine situations and no dearth of polar questions in routine situations; and the other was the onomatopoeia questions with the lowest scores in the elicitation experiments in considering the clear example used in a routine. Moradlou, Zheng, Tian and Ginzburg (2021) mentioned the other constraints on the experiments such as attention, on a second-by-second basis.

2.3 Summary of Chapter Two

Language acquisition is a complex process involving a variety of factors, such as

linguistic factors, psychological and non-psychological factors. Thus, in the light of some factors, the developmental sequence of English *wh*-questions has been investigated in previous studies, as shown in Table 2-3. However, there are still some limitations in the studies.

Table 2- 3. Summary of previous studies on *wh*-questions

Studies	Major Issues	Methods and Findings	Limitations
Ervin-Tripp (1970)	types of English *wh*-Q	Method • 24 children from 2;6 to 3;1 • 9-monthly interviews • 30 questions about a picture book Findings • subject *who*-Q appears earlier than object *who*-Q	Tested questions seemed to give clues to children about the syntactic function of *wh*-word.
Tyack & Ingram (1977)	children's comprehension of English *wh*-Q	Method • 100 children at the age of 3;0 to 5;5 • 6 photographed scenes Findings • *who*: subject Q is easier than object Q • *what*: object Q is easier than subject Q	Validity is questionable due to animacy factor and verb choice which did not control.

Table 2- 3. *(continued)*

Studies	Major Issues	Methods and Findings	Limitations
Cairns & Hsu (1978)	types of *wh*-Q English	<u>Method</u> • 50 children between 3;0 and 5;6 • 30 questions based on 5 videotaped episodes <u>Findings</u> • subject *who*-Q and object *who*-Q with *do* are easier than object *who*-Q with progressive aspect	Validity of the experiment is questionable because the auxiliary *do* did not include in the subject questions.

Note: The capital letter Q is used to represent the word 'question' in the table.

Through different dimensional examination, there seems to be a conclusive finding of cognitive development: *wh*-questions are acquired in a certain sequence regardless of a first-language or a second-language development (e.g., Ervin-Tripp 1970, Morafdlou et al. 2021), even though there are some factors remaining in the discussion, such as the number of test questions, the verbs used in the questions, production skills, age, parental influences, attention span. While Erbaugh (1982, 1992) introduced the interrogative order with productive strategies, Lee (1989) conversely investigated the emergent order with comprehensive strategies. Some research proposes opposing the learning path of *wh*-questions and other interrogatives, such as Stromswold (1995) and O'Grady (1997) with an argument over subject-object *wh*-questions. The findings of Fahn (2003) even contradicted Cheung and Lee's proposal that object *wh*-questions are easier than subject ones. Generally speaking, the common rule in language development is that a child or a language learner acquires his native or a new language from simple to complex concepts and from concrete to abstract ideas.

CHAPTER THREE

RESEARCH DESIGN

This chapter presents the research design, containing four sections, to explore the first language acquisition of question words. Section 3.1 reports the background information of the participants. Methods and materials are introduced in Section 3.2. Section 3.3 sets out the experimental procedures, along with formal study, and scoring and statistical analysis. Finally, a brief summary of research design is given in Section 3.4.

3.1 Participants

The present study aims to examine the production of Mandarin-speaking children on different question words in Chinese. In the previous chapter, literature shows that children manage to acquire the difference of *wh*-word meaning (e.g., Tyack & Ingram 1977). A total number of 60 participants engaged in this study. All participants were divided into three groups by age, as shown in Table 3-1. One group was the control group (i.e., adult group, abbreviated as AG), and the rest were the experimental groups (i.e., child group, abbreviated as CG). The child groups were divided into two groups by age. Each group had the same number of 20 participants. Except for the adult group, two child groups had an equal number of males and females, each of them had ten participants.

Table 3- 1. Participants of the experiment

Group			Age Range (Mean Age)	Gender		Number of Participants
				Male	Female	
Child	Preschoolers	G1	3-5 (4;40)	10	10	20
	Schoolers	G2	6-8 (7;15)	10	10	20
Adult	College students	G3	18-37 (21;08)	2	18	20
Total				22	38	60

All the child participants[1] were separately recruited from three public elementary schools, one public elementary school's affiliated preschool and one private preschool with government subsidies in Taipei City, Taoyuan City and Taichung City. Except for one schooler who lived in a bilingual family (his mother tongues are English and Chinese), the rest of the children all grew up predominantly in Chinese-speaking families. Few of the children's family members spoke the vernacular languages Hakka and Taiwanese dialect sometimes, but these children did not receive intensive or extensive exposure to the vernacular languages at school, at home and outside of home. Generally, they were considered monolingual and native Chinese speakers because they had been exposed to Mandarin Chinese as their first, family and community language from birth to schooling. Children' homeroom teachers were interviewed to assure whether children did have special needs as well as performance at school or not and to ensure that children tested did not meet the exclusion criteria[2].

[1] There were 101 participants recruited to engage in the production elicitation task. Twenty adults were between 18 and 37 years old; fifty-one schoolers were between 6 to 10 years old; thirty preschoolers were between 3 and 6 years old.

[2] The exclusion criteria include some missing part of recordings and characteristics of eligible individuals that provide inaccurate data, grow up in bilingual families, have any acute disease or chronic conditions, declare their refusal to give informed consent, miss the scheduled appointment of the experiment, and distract attention from the experiment (Patino & Ferreira 2018).

The preschoolers of Group 1 from age 3 to age 6 were recruited from Affiliated Preschool of Taichung Municipal Tsau-Hu Elementary School[3] and Chan-Chan Preschool[4] in order to revisit the result of previous literature (e.g., Cairns & Hsu 1978, Tyack & Ingram 1977, Hanna & Wilhelm 1992, Fahn 2003). At this stage, preschoolers are taken care of during the weekdays; each learning mission lasts one hour to one-and-half hours. During the learning missions, they learn life education, etiquette[5] and tidy-up routinely in the early morning. Later on, preschoolers do some warm-up exercises, start their morning run routine or rhythm and movement, and learn to be in a sanitary manner after a workout as well as before-after meals. In addition, preschoolers are provided with various kinds of theme-based learning and hands-on activities like a story corner, science observation, art work, math, puzzle games, and playing with building blocks. During the time when preschoolers listen to the story and read picture books, they engage in co-generative dialogues with their homeroom teachers. In the meanwhile, preschoolers are encouraged to raise and answer questions during the activities. In the period of sharing time, they have to express their thoughts about their art works to their peers. Sometimes they work in groups and have discussions with others based on different theme-based activities[6], so at this period they begin to learn how to cooperate and communicate with partners around the same age.

The schoolers of Group 2 from age 6 to age 9 were recruited from Taipei Municipal Guting Elementary School, Taoyuan Municipal Zhongli Elementary School and Taoyuan Municipal Datong Elementary School, who start to receive their first stage of a twelve-year

[3] In Taiwan, the Chinese-English translation mainly adopts Hanyu Pinyin, which follows the transliteration regulation (called as 中文譯音使用原則 in Mandarin Chinese, https://edu.law.moe.gov.tw/LawContent.aspx?id=GL000499) by the Ministry of Education. This affiliated preschool is located in Taichung City.
[4] Chan-Chan Preschool is situated in Taoyuan City.
[5] Preschoolers learn the method to greet, wash hands before meals, brush teeth after meals, clean up their environment after having activities, make their bed before-and-after nap, organize their materials, and ask for permission to go to the lavatory.
[6] For instance, preschoolers work in groups and perform with their peers together on their sports day.

basic education curriculum in elementary schools. They receive education five days a week; only one day is full-day lessons, and the rest is half-day lessons. Each lesson participants take lasts for forty-five minutes a period. At this stage, schoolers lay their foundation of learning ability, with an emphasis on competencies related to living habits, moral characters, active learning in daily life and practice, and basic usage of language and symbols[7]. The illustration of the schoolers' routine is provided as follows. In the morning, schoolers maintain their tidy-up practices and have self-directed learning. Aside from the clean-up, schoolers take domain-specific courses like Language Arts[8], Mathematics, Life curriculum[9], Health and Physical Education to develop their fundamental knowledge and skills, and facilitate their learning in any field. Besides, schoolers have outdoor education, homeroom guidance, or receive domain-specific remedial instruction from subject teachers. They are provided with alternative courses, such as club activities, special need domain courses and after-school programs as well.

The adults of Group 3 aged 18 and above were mainly college and graduate students at National Taiwan Normal University. The number of this group in gender was imbalanced[10], as shown in Table 3-1. All participants are in Chinese-speaking families, and Mandarin is the primary language used in their families. The natives have received a twelve-year education in various learning fields since their age 6. They also have high proficiency in language ability due to the requirement of enrolling in the school which regulates the standard of Language and Literature ability.

[7] In the first year of elementary school, schoolers have to learn Mandarin Phonetic Symbols, also known as *bopomofo* (informal name), as they take a Mandarin course.
[8] Language Arts include Mandarin, Native Languages like Hakka and Minnan (also called Taiwanese dialect), Languages of New Immigrants or Taiwan Sign Language, English and Second Foreign Languages.
[9] Life curriculum is an integrated course. It is associated with natural science, arts, social studies and integrative activities.
[10] The unbalanced number of males and females can be shown with the statistics retrieved and calculated from the Department of Statistics, Minister of Education herewith the website https://university-tw.ldkrsi.men/female/0004. The ratio of male and female students shows that female students studying in National Taiwan Normal University surpass male students by over five percent.

3.2 Methods and Materials

So far, both quantitative and qualitative approaches have been used widely as the methodology to observe language development (McLeod 2019). The quantitative approach can be further differentiated as a hypothesis-based model and an experimental study (e.g., Erreich 1984), and the qualitative approach can be divided into a longitudinal and case study (e.g., Evrin-Tripp 1977, Tyack & Ingram 1977, Cairns & Hsu 1978, Bloom et al. 1982). Considering the following reasons, a quantitative approach was adopted in this study, rather than a qualitative approach. First of all, the span of the experiment normally lasts for a long period of time not only to observe the children's performance but also to collect the data. Second, the child's parents as well as school administrators might feel burdensome to make time to take part in the experiment; therefore, the children and their parents would decide not to join the follow-up experiment test so that the data could not be collected easily. Third, in the experiment process, participants are usually recorded and observed so as to take any other possible responses into consideration; however, some participants might feel oppressive as they are asked to interact with unfamiliar people or things.

Apart from the quantitative approach, a production task was adopted for the experiment as well in order to test hypotheses under the framework of Fahn (2003). According to Fahn (2003), a production task is more complex than a comprehension task since it involves the comprehensive ability, the complexity of language, and the utterance of the interrogative sentence structures. Based on the method from Hanna and Wilhelm (1992) and Fahn (2003), a similar process was adopted in this study. In the production task, pictures were adopted with targeted questions for all participants to gauge and were used to set out the acquisitional ordering of *wh*-questions. The materials used for the production task in this study are presented in the following sections. The list of examples is shown in Table 3-2, whereas a full list of the target sentences is shown in the appendix (see Appendix A).

Table 3- 2. The structure of the test design

Type	Question Word	Example	Total	Question Number	
				Subject	Object
T1 *wh*-argument	T1-1 *shei* 'who'	*Shei qu gongyuan liu guo?* 'Who walked the dog to the park?'	2	Q2	Q12
	T1-2 *shenme* 'what'	*Shenme (dongxi) zai didi shou zhong?* 'What did the boy hold in his hands?'	2	Q3	Q6
T2 *wh*-adjunct	T2-1 *shenme shijian* 'when'	*Shenme shijian hui jia?* 'When did they go home?'	2	Q1	Q11
	T2-2 *nali* 'where'	*Qiu de weizi zai nali?* 'Where was the ball?'	2	Q9	Q4
	T2-3 *zenme* 'how'	*Tamen zenme hui jia?* 'How did they go home?	2	Q8	Q7
	T2-4 *weishenme* 'why'	*Mama weisheme ku?* 'Why did Mama cry?'	2	Q10	Q5
Total			12	6	6

As can be seen in the above table, the production task comprises two categories of *wh*-questions—*wh*-argument (T1) and *wh*-non-argument (T2); T1 has two subtypes *shei* 'who' and *shenme* 'what,' and the others *shenme shijian* 'when,' *nali* 'where,' *zenme* 'how' and

weishenme ‘why’ belong to T2. Totally there are six subtypes of *wh*-words, each of which has two test items. That is, there are twelve questions in total in this production task. Besides, these test items were designed based on daily life conversations and experiences. All participants listened to the background information of a story, and they were expected to produce questions with *wh*-word either in subject position or in object position. All their responses were recorded by the researcher. The story was provided with pictures and scenario descriptions added on Mandarin Phonetic Symbols, as in Table 3-3.

Table 3- 3. An example of the production task

The participants saw:	The participants heard:
	*Zouzhe zouzhe zou zai gongyuan de budao shang…. A! You ge dongxi xiyin le xiaogougou han didi de zhuyi!* ‘While walking on the pedestrian pavement around the park, you found something stealing the attention of your little brother and little dog!’ *Meimei xiang zhidao zhe ge dongxi, ni hui zenme bang meimei wen ne?* ‘If your little sister wants to know it, how will you help her to ask the question?’ Expected answer: *Shenme (dongxi) zai didi shou zhong?* ‘What did the boy hold in his hands?’

3.3 Procedures

This section presents the procedures of the present study. Section 3.3.1 describes the procedures of the formal study. Section 3.3.2 explains the scoring policy and the statistical analysis.

3.3.1 Formal Study

In the first step, the consent forms (see Appendices B and C) were given to all groups of participants and children's parents to make sure that they gave permission to participate in the study in advance. All participants were voluntarily to engage in the experiment[11], and all of them were rewarded with small gifts after finishing the production task. In this study, the production elicitation task was a still face experiment. During the experiment, all sounds participants made were recorded and transcribed. Also, their behaviors and other noticeable outputs were observed and kept on the record.

During the experiment, all child participants took turns to take this one-by-one production task at the corner of a classroom. Also, there was a warm-up time between the researcher and the participants to appeal the participants' attention and to raise their motivation, especially their interest. All participants were asked some questions to confirm that they knew how to ask questions before the task. Besides, all participants had to listen to the experimental procedure first, and then they were informed that there was no right or wrong answer and that they could respond to the questions freely. On the other hand, all adult participants were asked to write their verbal replies on the worksheets.

All participants heard the questions according to the scenarios in the production task one by one with a few-second pause for them to come up with questions corresponding to the

[11] All participants here in this study are regarded as the volunteer subjects. Despite that there is a reward whoever finishes the production task even if the participants produce unrelated outputs (Chiang, Jhangiani & Price 2015). Part of the participants slightly show more interest in the topic of this research (Rosenthal & Rosnow 1976).

scenarios provided by the researcher (also the experimenter). It took each participant up to fifteen to complete the task, including the time for explanations of rules, answering questions and wrapping up.

3.3.2 Scoring Policy and Data Analysis

After completing data collection, the participants' production of *wh*-words was scored. Observed with the outputs, the participants asked questions by using a single word, a phrase, or an interrogative sentence in Mandarin Chinese. Some *wh*-words were not the target (i.e., other interrogative words like *nayige* 'which one' or *shenme mingzi* 'what's (your) name' and questions with the modal particles like *ma* and *ne*) so that they were not counted in this study. If the participants' questions contained the target *wh*-words or phrases, they were given one point; otherwise, no point was given to the utterance without target *wh*-words or phrases. Here are some examples of the participants that were found acceptable, as shown in Table 3-4.

Table 3- 4. Examples of the scoring criteria in the production task

Type	Example	
T1 *wh*-argument	T1-1	*shei* 'who' *shenme ren* 'which person' *na (yi) ge ren* 'which person' *na wei* 'which person'
	T1-2	*shen me* 'what'
T2 *wh*-adjunct	T2-1	*jidian* 'what time' *shenme shihou* 'what time' *shenme shijian* 'what time'

Table 3- 4. *(continued)*

Type	Example	
	T2-2	*nali* ‘where’ *shenme difang* ‘where’ *na ge di fang* ‘which place’
	T2-3	*zenme* ‘how’ *zenmeyang* ‘how’ *ruhe* ‘how’ *shenme fangfa* ‘how’
	T2-4	*weishenme* ‘why’ *zenme* ‘why’

The statistics system adopted two-way ANOVA and post hoc *t*-test to check the overall performance of the participants and the emergence of *wh*-words among different age groups, and TUKEY was adopted to compare the differences within subtypes.

3.4 Summary of Chapter Three

The information of the participants, materials, methods and procedures have been reported. A production task was designed and conducted in the present study with 40 Mandarin-speaking children and 20 native speakers of Chinese engaged in the experiment. Besides, all participants took voluntary participation in the experiment. The overall procedures are illustrated in Figure 3-1. The data collected was examined by statistical analysis to investigate the child participants’ production of interrogatives.

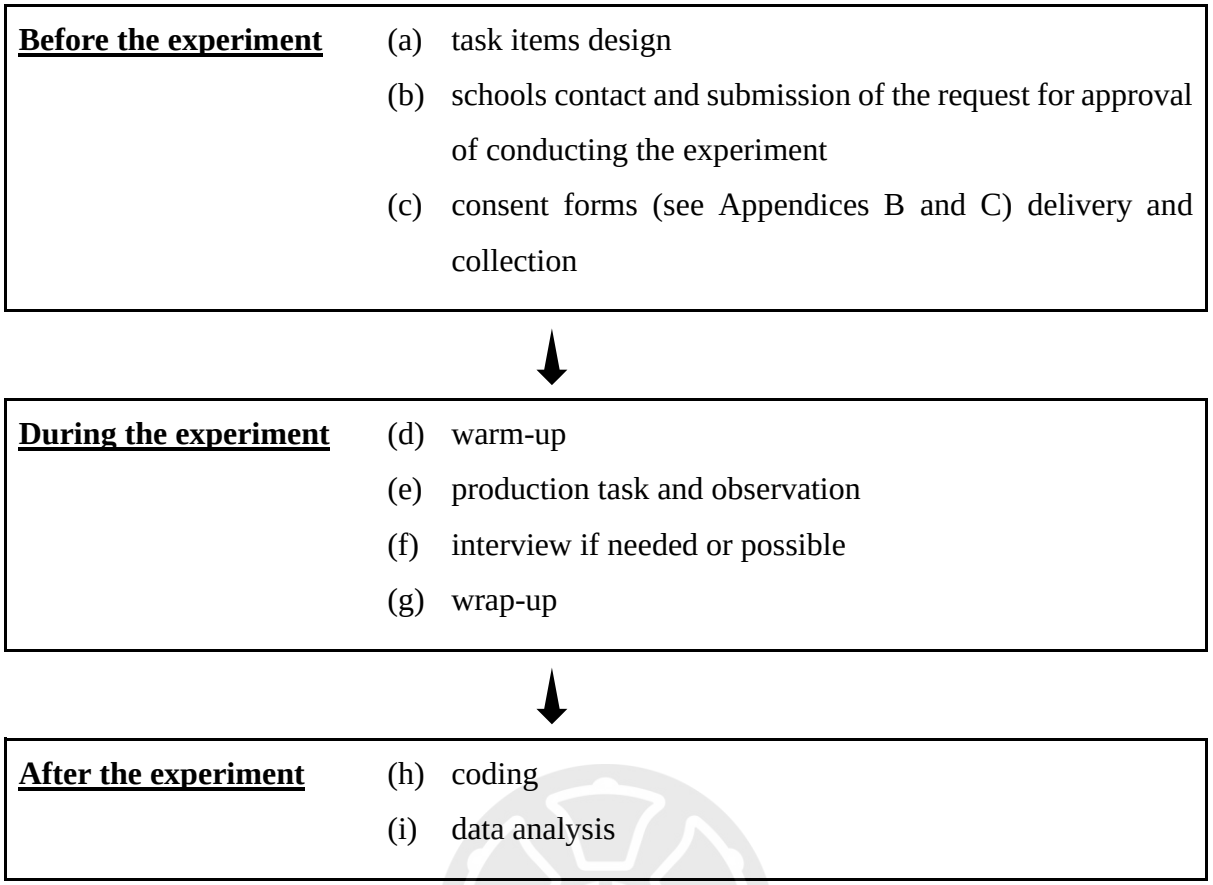

Figure 3- 1. Procedures of the experiment

CHAPTER FOUR

RESULTS AND DISCUSSION

In this chapter, six interrogative words and phrases are on close examination under two main distinctions (*wh*-arguments and *wh*-adjuncts), and their substitutes and correlative translations are listed here in Table 4-1.

Table 4- 1. Two main types of *wh*-words

T1 *wh*-arguments	T2 *wh*-adjuncts
T1-1 'who' *shei, shenme ren, na (yi) ge ren, na wei*	T2-1 'when' *ji dian, shenme shihou, shenme shijian*
	T2-2 'where' *nali, shenme difang, na ge difang*
T1-2 'what' *shenme*	T2-3 'how' *zenme, zenmeyang, ruhe, shenme fangfa*
	T2-4 'why' *weishenme, zenme*

The results are shown with statistical tables, and the discussions about the results are centered on the research questions raised in Chapter One, as follows:

1) At what stage do children mostly acquire between *wh*-arguments and *wh*-adjuncts in Mandarin?
2) Among six types of question words in Mandarin, what is the developmental sequence in use in child language?

Section 4.1 reports the differences of participants' performance on two main types of *wh*-

questions (*wh*-argument and *wh*-adjunct). A further examination of the acquisition of subtypes is presented in Section 4.2. Age effect is discussed in Section 4.3. Section 4.4 describes other factors like language change and case study. Finally, Section 4.5 is a brief summary of this chapter.

4.1 Acquisition of *Wh*-arguments and *Wh*-adjuncts

This section addresses the first research question on the acquisition of *wh*-arguments and *wh*-adjuncts in Mandarin. Here presents the participants' overall performances on *wh*-arguments and *wh*-adjuncts, and then further discusses the results. The overall findings are provided in Section 4.1.1, and Section 4.1.2 discusses the result.

4.1.1 Overall Findings

As seen in Table 4-2, a two-way ANOVA with the participants' overall scored responses as the dependent variable, *wh*-question types (*wh*-argument, *wh*-adjunct) and age groups (G1, G2, G3) as factors revealed a main effect of *wh*-question types ($F(1, 714) = 6.10$, $p < .01$), a main effect of age groups ($F(2, 714) = 385.24$, $p < .001$), and an insignificant interaction between two factors ($F(2, 714) = 0.39$, $p = 0.679$).

Table 4- 2. Two-way ANOVA on *wh*-question type and age group

	Df	Sum Sq	Mean Sq	*F* value	*p*-value
Wh-question Type	1	0.67	0.67	6.099	< .01
Age Group	2	84.31	42.16	385.237	< .001
Wh-question Type*Age Group	2	0.08	0.04	0.387	0.679
Residuals	714	78.13	0.11		

Table 4-3 illustrates the overall results of participants' performance on *wh*-questions. It compares the performance between different age groups (preschoolers (G1), schoolers (G2) and adults (G3)) and within two major types T1 (*wh*-argument) and T2 (*wh*-adjunct). As shown in the table, all age groups performed better on T1 as opposed to T2 (G1: M = 0.24 > 0.14, G2: = 085 > 0.81, G3 = 1.0 > 0.94). The participants' performance on both T1 and T2 showed the significant difference ($p < .001$). As mentioned to the within-type results of each age group, the performances of G1 ($p = 0.072$) and G2 ($p = 0.473$) were not significant as compared to that of G3 ($p < .05$). *Post hoc* comparison using the Tukey's test showed that G3 ($p < .01$) performed significantly performed differently on T1 and T2 (G3: t = 3.1712, $df = 238$, $p = 0.001718$).

Table 4- 3. The overall results of participants' *wh*-questions production on T1 and T2

Groups			Question Types				*p*-value
			T1		T2		
			M	SD	M	SD	
Child	Preschoolers	1	0.24	0.43	0.14	0.35	0.072
	Schoolers	2	0.85	0.36	0.81	0.39	0.473
Adult	College students	3	1.00	0.00	0.94	0.24	< .05
p-value			< .001		< .001		

Note: 'M' is the abbreviation of 'Mean Score'. 'SD' is the abbreviation of 'Standard Deviation'.

Table 4- 4. *P*-values for the between-group comparisons between T1 and T2

	G1 vs. G2	G2 vs. G3	G3 vs. G1
T1	< .001	< .05	< .001
T2	< .001	< .01	< .001

Regarding the between-group comparisons using Tukey's test, Table 4-4 compares the

participants' performance on T1 and T2. The results showed statistically significant differences (all $p < .05$) on T1 (i.e., *wh*-argument) and T2 (i.e., *wh*-adjunct). The comparison of G2-G3 performance on T2 ($p < .01$) presented more differences than that on T1 ($p < .05$). That is, there was a developmental pattern on *wh*-argument and *wh*-adjunct of three age groups where the adults obtained the highest mean score, followed by the schoolers and preschoolers.

Turning to *wh*-words in sentence structures, a two-way ANOVA was conducted to examine whether *wh*-question positions (subject, object) and age groups (G1, G2, G3) have any effect on the participants' performance on *wh*-words in sentence structures. As shown in Table 4-5. a main effect of *wh*-question positions ($F(1, 714) = 6.233$, $p < .05$), a main effect of age groups ($F(2, 714) = 390.897$, $p < .001$), and a significant interaction between two factors ($F(2, 714) = 5.615$, $p < .01$) were found.

Table 4- 5. Two-way ANOVA on *wh*-question position and age group

	Df	Sum Sq	Mean Sq	*F* value	*p*-value
Wh-question Position	1	0.67	0.67	6.233	< .05
Age Group	2	84.31	42.16	390.897	< .001
Wh-question Position*Age Group	2	1.21	0.61	5.615	< .01
Residuals	714	77.00	0.11		

As shown in Table 4-6, there was a significant difference among all age groups in two positions of *wh*-words used in the sentence structure. G1 performed slightly better on prducing object *wh*-question than subject *wh*-question (M = 0.19 > 0.16), but such difference was not significant ($p > .05$). Conversely, G2 performed better on subject *wh*-question than object *wh*-question (M = 0.91 > 0.74), and such difference was particularly apparent ($p < .001$). The *post hoc* comparison also showed that for the subject-object position, G2' performance was

statistically significant (t = -3.4679, df = 238, p = 0.00062). However, G3' performance presented no significant interaction between subject *wh*-question and object *wh*-question, even though G3 performed better on subject *wh*-question than object *wh*-question (M = 0.98 > 0.93).

Table 4- 6. The overall results of *wh*-question positions

Groups			*Wh*-question Position				*p*-value
			Subject		Object		
			Mean	SD	Mean	SD	
Child	Preschoolers	G1	0.16	0.37	0.19	0.40	0.499
	Schoolers	G2	0.91	0.29	0.74	0.44	< .001
Adult	College students	G3	0.98	0.13	0.93	0.25	0.053
p-value			< .001		< .001		

Table 4- 7. *P*-values for the between-group comparisons on *wh*-question position

	G1 vs. G2	G2 vs. G3	G3 vs. G1
Subject *wh*-question	< .001	0.096	< .001
Object *wh*-question	< .001	< .001	< .001

Concerning the between-group differences in the two positions of *wh*-words, there was a significant difference among the three age groups in two *wh*-question positions (p < .001). However, as shown in Table 4-7, only the comparative result of G2 and G3 was statistically insignificant for subject *wh*-question. That is, schoolers produced adult-like *wh*-questions in subject position.

4.1.2 General Discussion

In view of the participants' overall performance, the performance of *wh*-argument scored higher than that of *wh*-adjunct; it revealed a clear discrepancy between *wh*-arguments

(such as *shenme* 'what' and *shei* 'who') and *wh*-adjuncts (like *nali* 'where,' *zenme* 'how,' *shenme shihou* 'when,' and *weishenme* 'why'). That is, *wh*-arguments seemed to be easier than *wh*-adjuncts to all age groups—preschoolers, schoolers and adults. This result mostly supported the previous findings in the literature (e.g., Tyack & Ingram 1977, Bloom et. al 1982, Erbaugh 1992, Cairns and Hsu 1978), which generally presented those children had better performance on *wh*-words *who* and *what* than on *why, when* and *how*. That is, *wh*-arguments are easier than *wh*-adjuncts for children to acquire. In Yoon's proposal (2008), there is a clear asymmetry to be attributed to the inherently different properties of *wh*-arguments and *wh*-adjuncts in *wh*-in-situ languages like Chinese, Korean and Japanese. The properties are also tested via eye-tracking experiment by Akal (2017), which pointed out that *wh*-arguments were processed more quickly than *wh*-adjunct under the same condition. In other words, the syntactic properties function as a factor in language development: *wh*-arguments as nominals seem easier than *wh*-adjuncts as adverbials (cf. Yoon 2008, Hsu 2010).

On the other hand, age could be a factor affecting the child participants' production of *wh*-words in Mandarin. The data in Table 4-3 showed that the preschoolers' performance on *wh*-words scored lower than the schoolers and adults' performance. In addition, Table 4-4 revealed the significant difference on *wh*-argument and *wh*-adjunct question among three age groups. The schoolers-preschoolers' performance had a greater gap than the schoolers-adults' performance. It was clearly found that our children performed better on the production task of *wh*-questions as their age increased. However, for the 4-year-old children, their performance was far from adult-like language, but at age 7, children seemed to get closer to the adult language even though there still existed some errors in their speech. That is, the schoolers produced much more correct tokens of *wh*-words than the preschoolers when they were asked to form questions according to the scenario. In contrast to the schoolers' performance, it looked like that these preschoolers just began to implement *wh*-words and produce them to raise

questions as referring to specific items. Basically, the older the child participants were, the more adult-like language they produced to raise questions with *wh*-words in their life. In this study, to certain extent the children aged from 6 to 8 had acquired adult-like ability of forming *wh*-questions in their life, supporting the previous findings of Cairns and Hsu (1978).

In respect of *wh*-words in sentence structures, there was no difference in adults' production of subject *wh*-question and object *wh*-question though preschoolers and schoolers performed against to each other. It indicated that there is no subject-object asymmetry in Mandarin *wh*-questions. With regard to the differences between preschoolers and schoolers, subject-object positions of *wh*-words seemed at the same level of difficulty; on the contrary, subject *wh*-questions were an adult-like language to schoolers opposing to object *wh*-questions. That is, the subject *wh*-questions are easier than object *wh*-questions, which matches O'Grady's (1997) statement subject questions acquired earlier than object questions because of less complexity in sentence structure.

4.2 Acquisitional Sequence of *Wh*-word Subtypes

This section further examines the acquisition of the subtypes of *wh*-arguments (*shei* '*who*' and *shenme* '*what*') and *wh*-adjuncts (*shenme shihou* '*when*', *nali* '*where*', *weishenme* '*why*' and *zenme* '*how*') in Chinese, respectively. The second research question concerns the acquisition sequence of *wh*-word subtypes. The participants' performances on the subtypes of two main *wh*-interrogatives—*wh*-arguments and *wh*-adjuncts are reported in Section 4.2.1, and Section 4.2.2 is a follow-up discussion based on the results.

4.2.1 Overall Findings

As shown in Table 4-8, under the type of *wh*-argument (T1), a two-way ANOVA with the participants' overall scored responses as the dependent variable, *wh*-argument subtypes

(*shei* '*who*', *shenme* '*what*') and age groups (G1, G2, G3) as factors revealed a main effect of *wh*-argument subtypes ($F(1, 234) = 6.989$, $p < .01$), a main effect of age groups ($F(2, 234) = 129.573$, $p < .001$), and an insignificant interaction between two factors ($F(2, 234) = 2.027$, $p = 0.134$).

Table 4- 8. Two-way ANOVA on T1 subtype and age group

	Df	Sum Sq	Mean Sq	*F* value	*p*-value
T1 subtype	1	0.704	0.704	6.989	< .01
Age Group	2	26.108	13.054	129.573	< .001
T1 subtype*Age Group	2	0.408	0.204	2.027	0.134
Residuals	234	23.575	0.101		

Firstly, let us take a look at the participants' performances on the subtypes of T1 *wh*-argument: T1-1 *shei* '*who*' and T1-2 *shenme* '*what*,' as shown in Table 4-9. In the table, the performances of all age groups were statistically significant under two subtypes. Except for G3, whose performance was at ceiling, G1 and G2 (CG) performed better on T1-2 than on T1-1 (G1: M = 0.30 > 0.18, G2: M = 0.95 > 0.75). Among the three age groups, the schoolers' performance showed a significant difference in producing T1-1 and T1-2 ($p < .05$), but no such difference was found in the preschoolers' production. Furthermore, schoolers performed almost adult-like *what* questions since its result scored close to the adults' result. Result of *post hoc* comparison using Tukey's test showed the significance of schoolers' performance ($p < 0.05$) on *wh*-arguments ($t = -2.5765$, $df = 78$, $p = 0.01187$).

Table 4- 9. The overall results of the two subtypes in T1

Groups			Question Types				*p*-value
			T1-1		T1-2		
			M	SD	M	SD	
Child	Preschoolers	1	0.18	0.39	0.30	0.46	0.194
	Schoolers	2	0.75	0.44	0.95	0.22	< .05
Adult	College students	3	1.00	0.00	1.00	0.00	0.320
p-value			< .001		< .001		

Table 4-10 demonstrates the between-group differences on the subtypes of *wh*-arguments — T1-1 *shei* '*who*' and T1-2 *shenme* '*what*'. The results of *p-value*s were all significantly different in both subtypes ($p < .001$), except for the comparison between G2 and G3 on T1-2 *shenme* '*what*', which was not significant ($p = 0.732$). That is, the performance between G2 and G3 was similar in T1-2. Hence, it indicates that the developmental order on the subtypes of *wh*-arguments in accordance to the results among three age groups.

Table 4- 10. *P*-values for the between-group comparisons between T1-1 and T1-2

	G1 vs. G2	G2 vs. G3	G3 vs. G1
T1-1	< .001	< .01	< .001
T1-2	< .001	0.732	< .001

Table 4-11 presents a two-way ANOVA with the participants' overall scored responses as the dependent variable, *wh*-adjunct subtypes (*shenme shihou* '*when*', *nali* '*where*', *weishenme* '*why*', *zenme* '*how*') and age groups (G1, G2, G3) as factors. In terms of the subtypes of *wh*-adjunct (T2), the analysis revealed a main effect of *wh*-adjunct subtypes ($F(3, 468) = 3.419$, $p < .05$), a main effect of age groups ($F(2, 468) = 270.218$, $p < .001$), and a significant interaction between two factors ($F(6, 234) = 2.878$, $p < .01$).

Table 4- 11. Two-way ANOVA on T2 subtype and age group

	Df	Sum Sq	Mean Sq	*F* value	*p*-value
T2 subtype	3	1.11	0.369	3.419	< .05
Age Group	2	58.29	29.144	270.218	< .001
T2 subtype*Age Group	6	1.86	0.310	2.878	< .01
Residuals	468	50.48	0.108		

Now let us turn to the participants' performances on the subtypes of *wh*-adjunct—T2-1 *shenme shihou* '*when*', T2-2 *nali* '*where*', T2-3 *zenme* '*how*' and T2-4 *weishenme* '*why*'—in Table 4-12. As shown in the table, the participants' performances (G1, G2 and G3) on four subtypes of T2 *wh*-questions were statistically significant ($p < .001$). Compared to the performances on T2-2, T2-3 and T2-4, all age groups outperformed on T2-1 (G1: M = 0.18 > 0.13 > 0.10, G2 = 0.95 > 0.88 > 0.83 > 0.60, G3: 0.98 > 0.93), with a slightly different inclination to preschoolers' performance of *why* question (G1: M = 0.18). Additionally, for the within-type results, the preschoolers' performance scored low, and the adults' performance approached one. The result of G1 presented no significant difference in producing *wh*-adjuncts ($p = 0.718$), as compared with the results of G2 ($p < .001$). Also, G3 performed insignificantly on T2 subtypes, but their scores approached to one.

Table 4- 12. The overall results of the four subtypes in T2

Groups			Question Types								*p*-value
			T2-1		T2-2		T2-3		T2-4		
			M	SD	M	SD	M	SD	M	SD	
Child	Preschoolers	1	0.18	0.39	0.13	0.34	0.10	0.30	0.18	0.39	0.718
	Schoolers	2	0.95	0.22	0.88	0.34	0.83	0.39	0.60	0.50	< .001
Adult	College students	3	0.98	0.16	0.93	0.27	0.93	0.27	0.93	0.27	0.739
p-value			< .001		< .001		< .001		< .001		

Table 4-13 and Table 4-14 separately compare the within-type performances and between-groups through Tukey's test. First, Table 4-13 shows that all age groups performed similarly on all the comparison of T2 subtypes ($p > .05$) in their production, except for that G2' performances compare T2-1, T2-2 and T2-3 with T2-4 ($p < .05$). That result indicated that the subtype T2-4 '*why*' question was least frequent in use. Besides, it was found that G3 did not significantly perform better on T2-2, T2-3 and T2-4 ($p = 1.00$). In other words, G3 produced three subtypes of questions in the same frequency. Regarding the comparison of T2-1 and T2-4-, G1 also did not significantly perform differently ($p = 1.00$). It was elucidated that the difficulty of these two subtypes seemed the same for preschoolers. Then, Table 4-14 shows that G1 significantly outperformed G2 and G3 on all T2 subtypes (all $p < .001$). G2 only significantly outperformed G3 on T2-4 ($p < 0.01$), and the results of G2-G3 comparison were insignificant ($p > .05$). Similarly, the comparative data of G1 along with G2 and G3 depict the language gap in the acquisition development. Likewise, G2 and G3 production of T2-4 exists a language gap in question production.

Table 4- 13. *P*-values for the within-type comparisons among age groups

	T2-2 vs. T2-1	T2-3 vs. T2-1	T2-4 vs. T2-1	T2-3 vs. T2-2	T2-4 vs. T2-2	T2-4 vs. T2-3
G1	0.9216	0.7789	1.0000	0.9890	0.9216	0.7789
G2	0.8046	0.4396	< .001	0.9318	< .01	< .05
G3	0.7964	0.7964	0.7964	1.0000	1.0000	1.0000

Table 4- 14. *P*-values for the between-group comparisons among T2 subtypes

	G1 vs. G2	G2 vs. G3	G3 vs. G1
T2-1	< .001	0.911095	< .001
T2-2	< .001	0.7566288	< .001
T2-3	< .001	0.350582	< .001
T2-4	< .001	< .001	< .001

4.2.2 General Discussion

Following by the discussion on T1 and T2 (i.e., *wh*-argument and *wh*-adjunction, respectively) in the last section, we can see that the participants' performance on the T1 subtypes showed an inclination that they produced more correct token of T1-1 *shei* 'who' than those of T1-2 *shenme* 'what'. Chang (1992) proposed that question words like *shenme* 'what' begin to appear occasionally in posing questions at early stage, as the finding here that our preschoolers produced more frequently than the other *wh*-words at around age 4. Fahn's finding (2003) supported the result of a high emergent use of 'what' and 'who' with a low error rate produced by the participants. Also, the result here supported the findings of Erbaugh (1992): *shenme* 'what' was the question word most frequently used, and *zenme* 'how' was the one less frequently. As can be seen in the results in the previous section, the preschoolers' performance (G1) was significantly different from the schoolers' (G2) and adults' (G3) performance. One step further, based on the performance of the schoolers (G2), T1-2 'what' and T2-2 'where'

were the most adult-like language as forming *wh*-questions at age 7 approximately. Yet, still one subtype T2-4 'why' was far away to be produced like an adult language. Among three age groups, most of the participants did not form *why* question (i.e., *weishenme* question) as frequently as they did to other *wh*-questions so that their performances on T2-4 'why' scored the lowest among the T2 subtypes (i.e., *wh*-adjuncts). Erbaugh (1992) also mentioned that 'why' was the last type to emerge among all types of *wh*-question words due to the cognitive complexity, which statement fitted with the result of this study. However, the result here contradicts with the findings of Cairns and Hsu (1978), which recorded that *how* occurred later than *why* and *when*. Cairns and Hsu (1978) considered the reason for *why* occurring before *when* lying in that causality is easier than temporality for children to encode the concept, and the ability to encode temporal concept relies on the ability to encode causal concept. Thus, the child acquires *why* question before *when* question. They, then, also mentioned that *how* occurred later than *why* and *when* because there is no certain ability to encode causality or temporality for *how*. As regard to the three age groups' performances on *how* question, the older the child grows, the better the child performs. It also conforms to the statement that cognitive development going with age would influence question-forming performance; however, the previous literature was not coordinated with the results of this study overall.

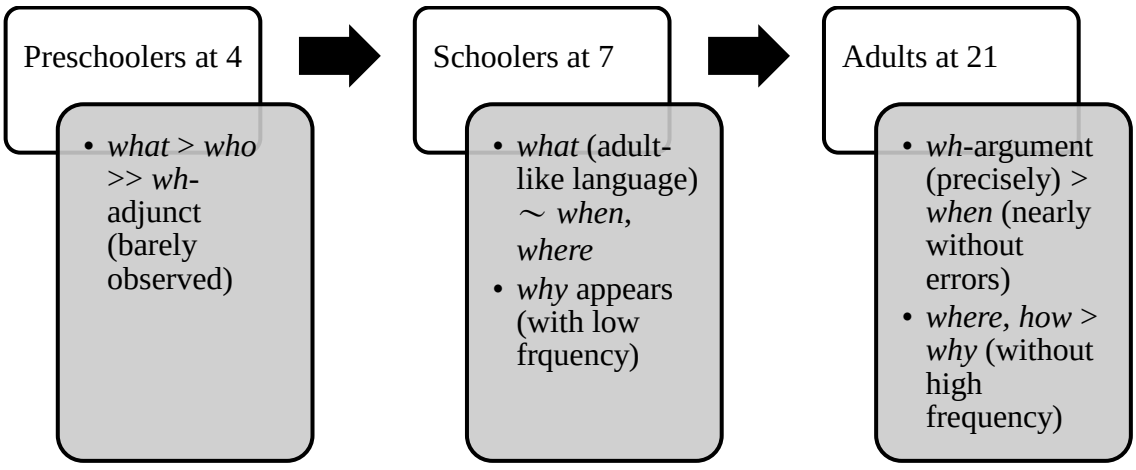

Figure 4- 1. Difficulty ranking of *wh*-questions in this study

4.3 Age Effect

Language acquisition is a gradual development involving cognition and linguistics from the infant period till adulthood (Robinson & Ellis 2008). Thus, age is a factor that could reflect the first language development. Children learn language through the actual usage events or experiences in their life (Lieven & Tomasello 2008). In other words, children acquire particular language use in peculiar contexts, and develop their linguistic representations gradually from complex to abstract since the innate. The present study, thus, adopted a production task to check out the performance between children and adults. The experiment task here differed from the previous literature, which exemplified the language development via the comprehension tasks only. The reason for taking on the production task was that 'a production task for participants could include all the processes involved in a comprehension task with the addition of output production' (Fahn 2003). As if from the view of psycholinguistics, a production task for participants is more difficult than a comprehension task. Some grammatical errors can cause mistakes in speech production. In some sense, a production task could use body language such as nodding as a verbal clue of reply without verbalizing a word. From the result in this study, the performance on different question words might present the developmental sequence of Mandarin interrogatives *wh*-words. The finding was consistent with the result of previous literature (e.g., Ervin-Trippm1970, Stromswold 1995, Hanna & Wilhelm 1992, Cheung & Lee 1993).

In order to depict the acquisition order in first language acquisition, more participants than previous studies (e.g., Fahn 2003) were recruited to examine two types of *wh*-questions—argument-adjunct *wh*-words. The children's performance (G1 and G2) differed from the adults' performance (G3). Generally speaking, children perform better on *wh*-argument rather than *wh*-adjunct, especially on the *wh*-word *what*. The older children (G2) produced adult-like

questions to refer to objects. Yet, the result showed that *wh*-argument *who* seemed not to perform as well as some *wh*-adjuncts *when, where* and *how*. That is, at this stage, some question words *who* and *how* were still used occasionally by some children (Chang 1992). With respect to the performance of *who* in the present study, younger children (G1) started to produce *who*-questions. This finding matched the investigation of children' respondents on *who*-question by Ervin-Tripp (1970), which stated that most of the children could acquire *who*-questions at 3. The performance on *wh*-questions were obvious differences between the children aged 4 to 5 years and the children aged 6 to 7 years (Cao 2007) in that the number of errors done by the children aged 4 to 5 is larger than the error number by the children aged 6 to 7. The children's performance (G1 and G2) improved significantly in this study.

Later, one word similar to English 'why' was absent at this stage. Even though in this study, the *wh*-word *weishenme* indicated to question the reason for an action or event[1], which is similar to the English question word 'why' without regard to its ambiguity proposed by Tsai (1999, 2000). The finding that *weishenme* 'why' was a less frequent occurrence in speech was consistent with the finding of Rowland and Pine (2000), which noted that *why* questions occur relatively infrequently as arguing for an input-based explanation. This acquisitional order could reflect universal cognitive order concerning children's understanding about objects, time, places, methods, people, reason, etc. (Chang 1992). In sum, Mandarin-speaking participants can easily acquire interrogative sentences with in situ *wh*-words (Jiang 2019), and a summary of the children's developmental stages is illustrated in Figure 4-2.

[1] Before having the formal study, the participants were told at the very beginning of the experiment that another interpretation of *weishenme* 'for what' would not be taken into account.

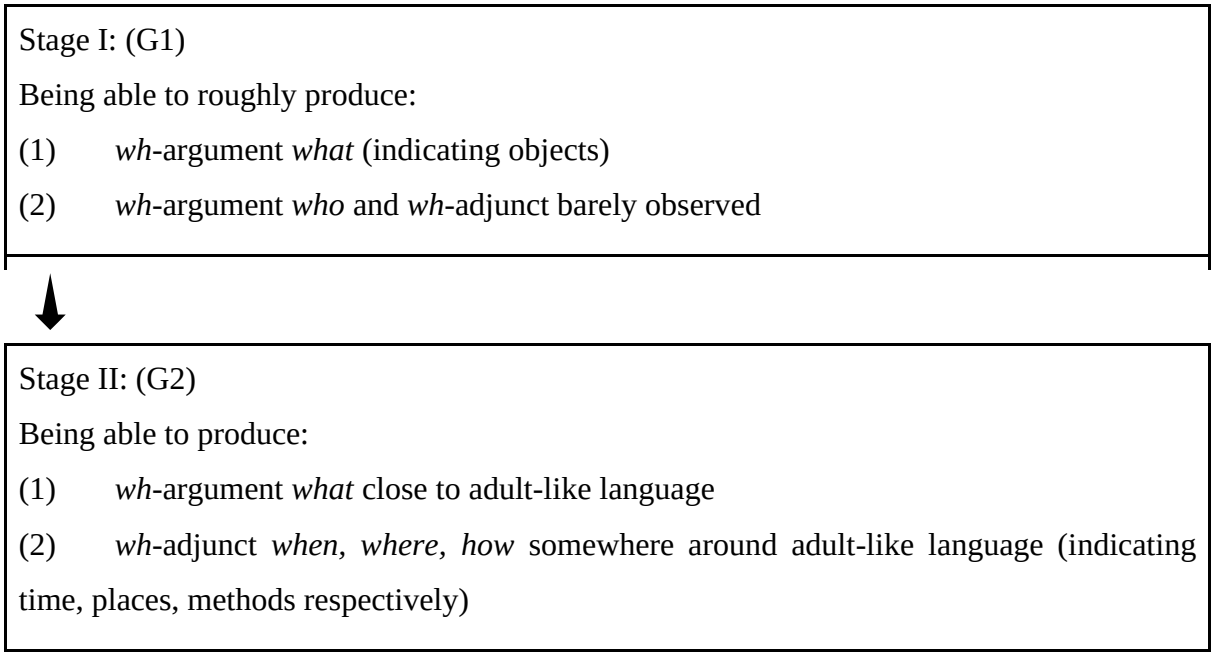

Figure 4- 2. Acquisitional development stages of *wh*-questions

4.4 Possible Factors

In the section, some possible factors[2] are mentioned here, such as the language use (in Section 4.4.1) and a case study (in Section 4.4.2).

4.4.1 Change of Language Use

The change of language use is clearly observed from the path of the experiment and results in this study. All participants' production were recorded in Table 4-9. Observed from the outputs, other interrogative formations, such as A-not-A, A-or-B and questions with particles[3], indeed appeared in the production task. According to Chang's (1992) study, the sentence-final particle (or the particle question) in the Mandarin question would be the first emergent in the production. However, in this study, particle questions were not observed intensively. In the same way, both A-not-A and A-or-B disjunction questions were applied and

[2] During the experiment, the time length of production differed in the age groups. In the same scenario, the more time younger participants take to process sentences, the less time older participants need to produce questions.
[3] Here the participants tended to form questions with the particle *ma*.

used correctly, but that could not indicate the emergent period.

Table 4- 15. Elicited outputs from all participants in the production task

Type	Subtype	Scored Output[4]	Not Scored Output
T1 *wh*-argument	T1-1 'who'	*shei* (121) *shenme ren* (3) *na (yi) ge ren* (1) *na wei* (1)	*shenme mingzi* (6) *shenme* (1) *zenme* (1) A-or-B formation (1)
	T1-2 'what'	*shenme* (147)	*weishenme* (1) *shei* (1) A-not-A formation (1)
T2 *wh*-adjunct	T2-1 'when'	*ji dian* (85) *shenme shihou* (67) *shenme shijian*[5] (5)	*duo shao* (1) question particle (1) *shenme* (1)
	T2-2 'where'	*nali* (110) *shenme difang* (4) *na ge di fang* (3)	*shen me* (4) *na (yi) zhi* (1) *weishenme* (1) *duo gao* (1) *ruhe* (1)
	T2-3 'how'	*zenme* (97) *zenmeyang*[6] (2) *ruhe* (2) *shenme fangfa* (5)	*shen me* (25) *wei shen me* (2)

[4] The produced outputs are provided in Hanyu Pinyin. Numbers in parentheses (x) are the counted emergent times that participants in this study produced during the experiment. The collected outputs were scored in the data analysis, whereas still some outputs were not scored collected in this study.

[5] As far as I know, the question word *shenme shijian* was once used as the target in the experiment in the literature, instead the question word *shenme shihou* was commonly used in either the production task or the comprehension task in the experiments (e.g., Jiang et al. 2019).

[6] The use of this question word would support the proposal of Tsai (1999, 2000). He stated that preverbal *zenmeyang* is subject to Agent-control to show the reading of method and style of action. From the scored outputs (see (i) below), the *wh*-word *zenmeyang* here was used to indicate the inquiry of method.

(i) Ta zenmeyang huahua?
she how paint
'How did she paint?'

Table 4-15. *(continued)*

Type	Subtype	Scored Output[7]	Not Scored Output
	T2-4 'why'	*weishenme* (81) *zenme* (17)	*shen me* (25) question particle (12)

As seen in Table 4-10, the frequency of question word use was taken into account. These Mandarin words performed similar functions to English *wh*-question words "who", "what", "when", "where", "why" and "how" (Chang 1992). Here presented the preference of language use in different age groups. When referring to a person, the *wh*-word *shei* was prevalent in speech. Also, the *wh*-word *shenme* was commonly used in speech as pointing to an object. There was no significant difference in language use on *wh*-argument. However, among four *wh*-adjuncts, the difference of language use showed up. When it comes to time, two *wh*-words were widely produced in the production; one was *jidian*[8], and the other was *shenme shihou*. The former one slightly surpassed the latter in speech. The word *shenme shijian* with a similar interpretation of *shenme shihou* appeared in speech as well though it was not widely accepted to form questions. This *wh*-question type was notable in comparison with the rest three *wh*-adjuncts. As people were asked to refer to a place or location, *nali* was common in use. Later, these two types of *wh*-words—*zenme* 'how' and *weishenme* 'why'— were less produced in speech with the count number below one hundred. If people wanted to ask for methods, it would be likely to use *zenme* the most, and other variations were accepted in their language. The other words like *zenme, zenmeyang, ruhe*, and *shenme fangfa*. When people want to know the reason or cause, they prefer to produce *weishenme*.

[7] The produced outputs are provided in Hanyu Pinyin. Numbers in parentheses (x) are the counted emergent times that participants in this study produced during the experiment. The collected outputs were scored in the data analysis, whereas still some outputs were not scored collected in this study.

[8] This *wh*-word was frequently used in the speech, which was not scored in previous studies like Erbaugh (1992) even though its interpretation indicated the time. Most of the studies observed the *wh*-word *shenme shihou* and *shenme shijian*. On the contrary, the elicited *wh*-words referring to time were all scored in this study. Thus, the scoring is different.

Table 4- 16. Distribution of used questions words in the production task

Type	Question Words		Group[9]	G1 (30)		G2 (51)		G3 (20)	
			Total	*f*	%[10]	*f*	%	*f*	%
T1 *wh*-argument	T1-1 *'who'*	***shei***	121	11	18.33	70	68.63	40	100.00
		shenme ren	3	0	0.00	3	2.94	0	0.00
		na (yi) ge ren	1	0	0.00	1	0.98	0	0.00
		na wei	1	0	0.00	1	0.98	0	0.00
		shenme mingzi	6	1	1.67	5	4.90	0	0.00
		shenme	1	0	0.00	1	0.98	0	0.00
		zenme	1	0	0.00	1	0.98	0	0.00
		A-or-B formation	1	0	0.00	1	0.98	0	0.00
	T1-2 *'what'*	***shenme***	147	15	25.00	92	90.20	40	100.00
		weishenme	1	1	1.67	0	0.00	0	0.00
		shei	1	1	1.67	0	0.00	0	0.00
		A-not-A formation	1	1	1.67	0	0.00	0	0.00
T2 *wh*-adjunct	T2-1 *'when'*	***ji dian***	85	7	11.67	57	55.88	21	52.50
		shenme shihou	67	0	0.00	49	48.04	18	45.00
		shenme shijian	5	0	0.00	5	4.90	0	0.00
		duo shao	1	0	0.00	1	0.98	0	0.00
		question particle	1	1	1.67	0	0.00	0	0.00
		shenme	1	0	0.00	0	0.00	1	2.50

[9] The number in the parenthesis here is the total number of the participants in different age groups in this study.
[10] The percentage of frequency is calculated by the formula = the count of *wh*-word use / (the number of participants in the age group * 2). The number '2' means two questions designed for each subtype in the study.

Table 4-16. *(continued)*

Type	Question Words		Group	G1 (30)		G2 (51)		G3 (20)	
			Total	*f*	*%*	*f*	*%*	*f*	*%*
	T2-2 *'where'*	***na li***	110	2	3.33	72	70.59	36	90.00
		shenme difang	4	0	0.00	4	3.92	0	0.00
		shenme	4	1	1.67	3	2.94	0	0.00
		na ge di fang	3	0	0.00	2	1.96	1	2.50
		na (yi) zhi	1	0	0.00	1	0.98	0	0.00
		weishenme	1	1	1.67	0	0.00	0	0.00
		duo gao	1	0	0.00	0	0.00	1	2.50
		ruhe	1	0	0.00	0	0.00	1	2.50
	T2-3 *'how'*	***zenme***	97	4	6.67	59	57.84	34	85.00
		zenmeyang	2	0	0.00	2	1.96	0	0.00
		ruhe	2	1	1.67	0	0.00	1	2.50
		shenme fangfa	5	1	1.67	3	2.94	1	2.50
		shenme	25	3	5.00	18	17.65	4	10.00
		weishenme	2	2	3.33	0	0.00	0	0.00
	T2-4 *'why'*	***weishenme***	81	4	6.67	47	46.08	30	75.00
		shenme	25	1	1.67	21	20.59	3	7.50
		zenme	17	3	5.00	7	6.86	7	17.50
		question particle	12	2	3.33	10	9.80	0	0.00
Total			818	63	105.00	536	525.49	219	28.52

Note: Scored outputs are marked in bold.

4.4.2 Performance of Special Children[11]

In this elicitation experiment, a nine-year-and-six-month-old male schooler X was recruited voluntarily to take part in the production task. He is a Taiwanese-Philippines child growing up with his parents in Taipei. Right now, he was only taken care of by his mother, and sometimes was accompanied by his neighbor Grandpa. In other words, he is exposed to his native language English frequently and most of the time, yet sometimes his neighbor Grandpa would read him some stories in Chinese. He never went to school to receive regular, intensive or extensive language learning before enrolling in elementary school last year. He usually learns things through his smartphone alone. At the age of eight and more, he was found by the Public Health Bureau and started to receive his first stage of the twelve-year basic education in Taiwan. In his first year of elementary school, he communicated with his classmates or teachers in English most of the time. In the meanwhile, he began to learn Chinese Alphabet Symbols and Mandarin first. Yet he stopped his learning for a few months last year due to the pandemic that has erupted since the year 2019. In autumn 2022, he began to take make-up lessons from the New Residents Family Growth Association. Until now, he can communicate with his classmates in Chinese.

During the production task of the experiment, he took more time than other Taiwanese children on average. As shown in Table 4-11, his elicited output mostly allied with previous studies (e.g., Erbaugh 1982, Chang 1992, Fahn 2003). His performance on T1 (*wh*-arguments) was better than on T2 (*wh-adjuncts*) based on the scoring policy. As for the emergent sequence, it could be predicted more precisely that T1-2 *shenme* 'what' may be the accurate one without errors in his production among six subtypes. Despite the fact that there exist some variations of *wh*-words in his questions, it could still be scored as the correct forms of inquiry. Apart from that, it could indicate that T2-2 *nali* 'where' may be tough for him to acquire because there

[11] This piece of information about past learning experience was provided by his homeroom teacher.

were no scored outputs in his speech. Additionally, in T2-3 *zenme* 'how' and T2-4 *weishenme* 'why', his production appeared with some errors. While producing questions with six types of *wh*-words, the boy X tended to form *wh*-questions with the *wh*-word *shenme*.

Roughly speaking, this boy X only received a one-year regular education in school. It could be a long-term tracing case study to investigate the period of time that a bilingual child would take to master the skill of raising questions. Furthermore, language transfer is a point to observe in second language acquisition in that the native language will have positive or negative transfers depending on the similarities and differences of language features (Jiang et al. 2019).

Table 4- 17. Elicited output of his production task

Type	T1		T2			
Subtype	T1-1	T1-2	T2-1	T2-2	T2-3	T2-4
Output	***na yi ge ren***, ***shei***	***shenme***[12]	***shenme*** ***shijian***, ***jidian***	--, *shenme*	*shenme*, ***shenme*** ***fangfa***	*shenme*, ***weishenme***

Note: Scored outputs are marked in bold. "—" presents the unproduced reply in the speech.

4.5 Summary of Chapter Four

Overall, the acquisition order of interrogative development, especially on *wh*-questions, appears to confirm the previous literature. The occurrence of *wh*-words from the most frequent to the least is provided as follows: *what*, *who*, *when*, *where*, *how*, and *why*. In general, *wh*-argument (*what* and *who*) seems to have occurred earlier than *wh*-adjunct (*when*, *where*, *how*,

[12] No variation observed in his production.

and *why*). During the experiment, variation of question words, even the question forming, exists in all types of *wh*-questions. Indeed, there are some overlapping findings both in Mandarin and in English. Through the production task, it could reflect universal cognitive processing concerning children's comprehension on the order of development of the question over years. At around age 3 to 5, children begin to acquire and produce the *wh*-argument. Later, at around 6 to 8, children almost master the *wh*-argument and acquire as well as produce the *wh*-adjunct precisely, except for one *wh*-word *why* (belongs to *wh*-adjunct classification).

CHAPTER FIVE

CONCLUSION

This chapter presents the conclusion of the present study. Section 5.1 summarizes the major findings of the study, and Section 5.2 discusses some limitations of the current research and provides some suggestions for future research.

5.1 Major Findings of the Present Study

The present study investigates the acquisition sequence of using six types of *wh*-words in Mandarin—*shenme* 'what,' *shei* 'who,' *shenme shijian* 'when,' *nali* 'where,' *zenme* 'how,' and *weishenme* 'why,' and the proximate time period that children acknowledge the differences between *wh*-arguments and *wh*-adjuncts.

Contrary to a *wh*-movement language like English, Chinese is a *wh*-in-situ language. As people inquire about things, there are several strategies used to form questions in Chinese, such as by asking binary questions (also called yes-no questions), producing disjunctive questions with *wh*-words or question particles, and forming content questions to search for information. Hence, the learning path of Chinese interrogatives has been widely investigated in the literature (Erbaugh 1982, Fahn 2003, just to name a few). The emergent order has been found as follows: *shenme* 'what,' *shei* 'who,' *shenme shijian* 'when,' *nali* 'where,' *zenme* 'how,' and *weishenme* 'why' (from the most frequently produced to the least in speech). These *wh*-words can be categorized into *wh*-arguments and *wh*-adjuncts.

First, the present study supports the previous result that children acquire *wh*-arguments earlier and perform better on *wh*-arguments than on *wh*-adjuncts (e.g., Erbaugh 1982, Bloom, Merkin & Wootten 1982) in some ways. For instance, Erbaugh (1992) pointed out that *wh*-questions appeared early in Mandarin acquisitional development and that they were also highly

frequent in language use. Yet, these *wh*-questions occurred differently in frequency, which was as the data presented in the present study. Questions consisting of *wh*-arguments (for example, *shenme* 'what') were produced correctly earlier than questions with *wh*-adjuncts (such as *shenme shijian* 'when' and *nali* 'where') in children's language development.

Second, regarding the subtypes of *wh*-arguments and *wh*-adjuncts, it was found that two *wh*-arguments acquire earlier than the other four *wh*-adjuncts. In this study, the statistics showed that the *wh*-word *shenme* 'what' was scored higher than *shei* 'who' and that *weishenme* 'why' was ranked the last *wh*-question in production due to its cognitive complexity.

Third, concerning the age issue, the age range of our child participants was 3 to 8, filling the gap of Fahn (2003). It was found that the children at the age of 3 had the ability to produce *wh*-arguments, but not adult-like. Years later, at age 7, they almost mastered the *wh*-arguments and produced *wh*-adjuncts correctly, except for *weishenme* 'why,' which requires reasoning and logical thinking. The rest of the *wh*-adjuncts were produced similarly in frequency. This result reflects the cognitive development of language acquisition from concrete objects (such as people and places) to abstract concepts (like reasons and methods). It also shows that children develop their comprehension from simplicity to complexity of logic (Jiang et al. 2019).

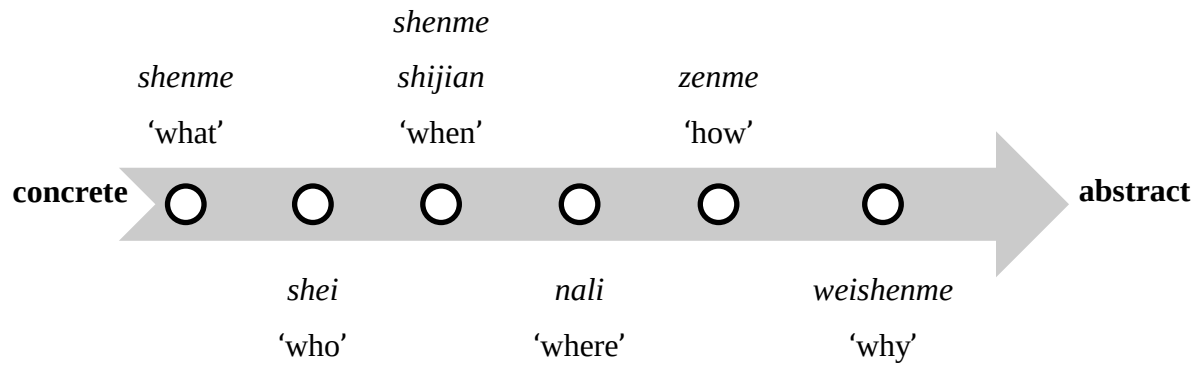

Figure 5- 1. Developmental sequence of *wh*-questions

5.2 Limitations of the Present Study and Suggestions for Future Research

The biggest obstacle in this study is the participants of the experiment design. It was difficult to recruit a large number of participants. With some limitations (e.g., school sports day, parental days, school administrative meeting, festival events, available schedule of participants), collecting productive data was constrained. In addition, our participants were mostly from northern Taiwan; therefore, it is suggested that future investigation can recruit participants from other cities, particularly those from southern Taiwan as well. Also, the gender of participants and experimenters is suggested to have an equal number. Aside from the first language acquisition, the study on the second or third language acquisition of interrogatives is desirable.

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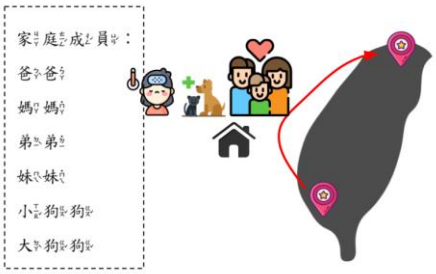
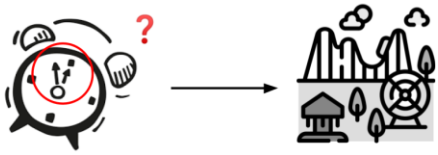
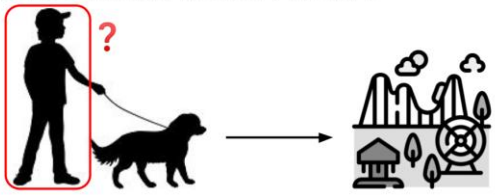
APPENDIX A

Test Items Used in the Production Task[1]

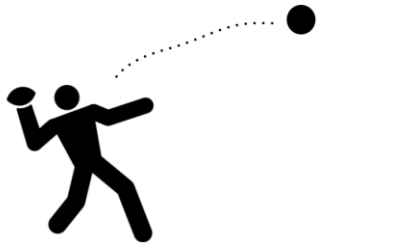
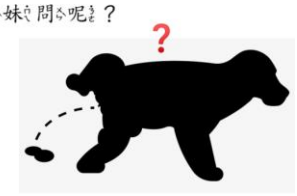
Picture number	Participants saw[2]	Participants heard
1		小朋友！有一家人剛從高雄搬到臺北居住。家中成員有：爸爸、媽媽、弟弟、妹妹以及兩隻狗狗－大狗狗和小狗狗。最近妹妹生病住院了，病得好嚴重，沒有聲音說話，所以妹妹想請你幫她發言，好嗎？
2		住家附近有一座好大的公園，每當周末的時候，都會一同至公園玩。但是，妹妹生病了，沒有去，只有爸爸、媽媽、弟弟以及兩隻狗狗去公園玩。
3		所以妹妹好好奇爸爸、媽媽、弟弟以及兩隻狗狗在公園野餐時所發生的事情。你可以幫妹妹問她的家人嗎？

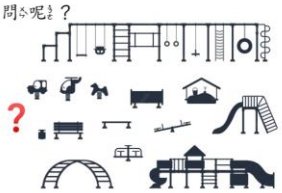
[1] The pictures and images used in the production elicitation task were respectively retrieved from the following websites:
(i) Shutterstock: https://www.shutterstock.com/zh
(ii) Pixabay: https://pixabay.com/zh/
(iii) Freepik: https://www.freepik.com/
(iv) Flaticon: https://www.flaticon.com/

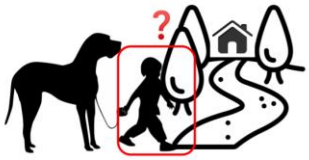
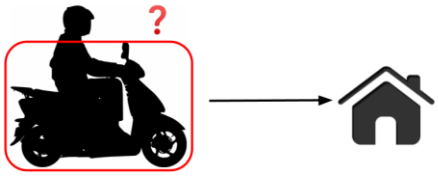
[2] The Chinese characters here are provided with pinyin which are generated by the website https://toneoz.com/imez/.

4	如果妹妹想知道他們去公園的時間， 我們要怎麼幫妹妹問呢？ 	[Q1] 今日是週末野餐日。妹妹想知道他們（爸爸、媽媽、弟弟和大狗狗、小狗狗）去公園的時間，你會怎麼問呢[3]？
5	如果妹妹想知道遛狗狗的人， 我們要怎麼幫妹妹問呢？ 	[Q2] 妹妹想知道遛狗狗去公園的人，你會怎麼問呢？
6	走著、走著， 走在公園的步道上， 有個東西吸引了小狗狗和弟弟。 	走著、走著。走在公園的步道上……啊！有個東西吸引了小狗狗和弟弟。
7	如果妹妹想知道這個東西， 我們應該怎麼幫妹妹問呢？ 	[Q3] 妹妹想知道這個東西，你會怎麼問呢？

[3] Question formations with question particles can be divided into two types: one is information-seeking questions, and the other is confirmation-seeking questions. Here *ne* (呢) is used in confirmation-seeking questions, and it gives audience a hint that here are questions. *ma* (嗎) and *ba* (吧) are used in information-seeking questions.

8	弟弟撿起了球並拋了出去。 	喔！原來是一顆球。弟弟撿起來並拋了出去，狗狗想要接球球.....。
9	如果妹妹想知道球球的位子， 我們要怎麼幫妹妹問呢？ 	[Q4] 妹妹想知道球球的位子，你會怎麼問？
10	兩隻狗狗和弟弟玩了好久， 大狗狗累了趴著休息中， 小狗狗擺出這個姿勢。 	兩隻狗狗和弟弟玩了好久，大狗狗累了趴著休息，小狗狗突然做出這個姿勢。
11	如果妹妹想知道 小狗狗做出這個姿勢的原因， 我們要怎麼幫妹妹問呢？ 	[Q5] 妹妹想知道小狗狗做出這個姿勢的原因，你會怎麼問呢？
12	野餐的時候，不遠的地方，有人在畫畫。 如果妹妹想知道畫的東西， 我們要怎麼幫妹妹問呢？ 	[Q6] 野餐的時候，有個女孩在畫畫。妹妹想知道女孩畫的東西，你會怎麼問呢？

13	如果妹妹想知道她畫畫的方法， 我們要怎麼幫妹妹問呢？ 	[Q7] 妹妹很好奇，也想知道女孩畫畫的方法，你會怎麼問呢？
14	這座公園裡，有好多好玩的遊樂設施。 如果妹妹想知道這些設施的地點， 我們要怎麼幫妹妹問呢？ 	[Q9] 這座公園裡面，有好多好多的遊樂設施，像是溜滑梯、盪鞦韆、蹺蹺板、搖搖馬。妹妹想知道這些東西的地點，你會怎麼問呢？
15	 突然之間，媽媽哭了。 如果妹妹想知道媽媽哭的原因， 我們要怎麼幫妹妹問呢？	[Q10] 玩著、玩著，突然間，媽媽哭了。妹妹想知道媽媽哭的原因，你會怎麼問呢？
16	時間很晚了！ 要回家了！ 	啊！太陽落下、月亮升起了。時間很晚了！要回家了！
17	如果妹妹想知道大家離開公園的時間， 我們要怎麼幫妹妹問呢？ 	[Q11] 妹妹想知道他們離開公園回家的時間，你會怎麼問呢？

18	如果妹妹想知道牽大狗狗的人， 我們要怎麼幫妹妹問呢？ 	[Q12] 妹妹想知道回家時牽大狗狗的人，你會怎麼問呢？
19	媽媽和弟弟玩得好累、好累。 如果妹妹想知道大家回家的方法， 我們要怎麼幫妹妹問呢？ 	[Q8] 玩了一整天，媽媽和弟弟好累、好累。妹妹想知道她們回家的方法，你會怎麼問呢？

APPENDIX B

Consent Form for the Child Groups

家長同意書

親愛的家長，您好：

百忙之中，叨擾了。

這是一封邀請函暨研究參與同意書。

於此，誠摯地邀請您參與敝人的碩士論文研究，本研究方向為臺灣兒童母語（國語）之華語疑問詞語言習得，望貴子弟參與實驗研究，以協助釐清當前華語語言發展情況。

以下將提供並說明相關資訊，以確保您於實驗開始之前能充分瞭解實驗內容。

一、本實驗研究時長約十分鐘，共一部分，為語言產出測驗。

二、實驗進行時，將以情境呈現施測內容。孩童將於聆聽故事過程中，依照情境內容口語回答問題以協助故事內容之完成。

三、研究場域將在孩童就讀的學校校園內進行，且一切以不影響學生受教權為原則。

四、實驗結束後，將贈與孩童一份小禮物，以表感謝之意。

若 貴家長您欲瞭解孩童之任務表現，待本實驗研究結束後，將可提供數據並輔以說明，供您參閱。本研究結果僅供學術研究使用，任何關於孩童暨家長的個人資訊絕不對外公開，且所有答題資訊僅供本研究使用並會嚴加保密。

再次感謝您撥冗參閱此資訊。本實驗研究之進行，極需 貴家長的支持，希望在此能徵得您的同意，讓孩童參與實驗研究。您有權以決定參加或退出本研究，且實驗中的個人資料和回答會保密處理。最後，在此獻上最誠摯的感謝與祝福！

敬祝 萬事順心

國立臺灣師範大學英語系研究所語言組

研究生 王韻嵐敬上

指導教授 陳純音教授

中華民國 111 年 12 月

同意書 收執聯

本人（請勾選）☐**同意** ☐**不同意** 孩童參與此臺灣兒童母語之疑問詞語言習得實驗研究計畫。於研究過程中，若因孩童適應不佳，本人有權終止孩童參與後續研究。

若您與小朋友同意參加此研究，敬請協助填寫以下問題：

孩童姓名：_____

孩童性別：☐ 男 ☐ 女（請勾選）

孩童出生年月：中華民國_____年_____月

家長簽名：_____（簽章）

簽署日期：中華民國_____年_____月_____日

APPENDIX C

Consent Form for the Adult Group

參與實驗研究同意書

親愛的受試者，您好：

百忙之中，叨擾了。

本研究旨在探討華語疑問詞語言習得與發展情況。實驗開始施測前，請先閱讀以下敘述。

1. 本實驗研究時長約十分鐘，共一個部分，為語言產出測驗。
2. 實驗進行時，將以情境呈現施測內容。請依照情境內容回答問題。所有答案皆無對錯之分，請依照直覺作答。
3. 本研究問卷與施測結果僅供學術研究使用，所蒐集之個人資訊將保密處理，不對外公開。
4. 如於實驗過程中有任何疑問，請隨時提出。

感謝您參與敝人的碩士論文研究，並於此獻上最誠摯的祝福！

敬祝　萬事順心

國立臺灣師範大學英語系研究所語言組

研究生 王韻嵐敬上

指導教授 陳純音教授

中華民國 111 年 12 月

我已閱讀完以上敘述，並同意於今日 2022 年 12 月_____日參與研究施測，且願意將施測結果提供此研究使用。

姓名：_____（簽名）

就讀學校：_____

性別：☐ 男　☐ 女（請勾選）

出生年月份：民國 _____年 _____月

手機：_____（僅供聯繫使用）

Email：_____（僅供聯繫使用）