Chapter 2
Review of Literature

Abstract This chapter reviewed studies of Mandarin competence, both worldwide and in Singapore, with a focus on the approaches adopted by studies and their findings on Mandarin competence of monolingual and bilingual Chinese children. In particular, the methodological approaches to Lexical Diversity, Syntactic Complexity, and Code-Switching in these studies were reviewed. From the reviews, it was found that internationally, child language studies, including studies on child Mandarin development, began with the less systematic diary keeping of small samples to the more systematic large sample and longitudinal approach, where both psychometric testing (via established language scales or inventories) and naturalistic or semi-naturalistic language data analysis (via diaries or corpora) were employed. Research on child language in Singapore mainly used the psychometric testing approach and lacked oral language data-based description of child Mandarin competence.

Keywords Child language development · Mandarin competence · Lexical diversity · Syntactic complexity · Code-switching

2.1 Child Language Study on Mandarin

Child language study has been a well-established field of research since the 1870s among academia interested in English. As pointed out by Ingram (1989: 7), the developments in this research area can be roughly divided into three stages namely "Period of diary studies (1876–1926)," "Period of large sample studies (1926–1957)," and "Period of longitudinal language sample studies (1957–1989)." Methodologically, such studies began with the less systematic diary keeping of small samples to the more systematic collection of language data involving large samples. As for the case of child language study on Mandarin, these approaches of research are generally similar. In what follows, this chapter will provide a brief overview on the development of child language studies in both international and

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local academia, with specific focus on Mandarin competence studies of children of comparable age to this study. This section hopes to provide a glimpse of what have been done and understood about Mandarin competence and its development among young Chinese children. It is hereby noted that this study will be using the terms "Chinese" and "Mandarin" with specific reference in this and subsequent chapters. Chinese will be used to refer to the ethnicity or cultural background of the children or community at large who are ethnically Chinese whereas Mandarin will be used to refer to the Chinese language they speak.

2.1.1 Child Language Study on Mandarin in the International Academia

In the review on the development of child language studies of Mandarin, Li (2002) divided child language studies of Mandarin into two stages. The first stage of child language studies of Mandarin began with the introduction of methodologies and findings from research in Western countries and Russia. During this period, there were some individual case studies similar to those of diary studies mentioned previously [see Li (2004) for example of such studies]. And there were also studies that replicated the research design of these introduced Western studies [see Li (2004) and Xu (1996) for examples of such studies]. In the second stage, child language study of Mandarin were largely psychological in nature, and one of the most cited studies during this period was a research carried out by Prof. Zhu Zhixian and his colleagues, entitled "Zhongguo Ertong (Han Qingshaonian) Xinli Fazhan Tedian Yu Jiaoyu" [Characteristics of Psychological Development and Education of Children (inclusive of Teenagers) in China], or sometimes simply referred to as the "Shishengshi Yanjiu" (Ten Province-and-City Study). This study involved about 8000 informants from 10 provinces and cities in China over a period of 6 years (1983–1989). Among many sub-studies in this large-scale study, there was a study by Shi Huizhong, which explored the language development of Chinese children at age 3–6 (Shi 1990). Her study analyzed the speech data of more than 2000 Chinese children sampled from the 10 provinces and cities, and described the development of Mandarin in terms of phonology, lexicon, syntax, and pragmatics of the informants. As her work was one of the few empirical attempts to capture various aspects of Mandarin with a fairly large sample of children, her findings were important to studies on child language development in Mandarin. In order not to deviate from this account of child language studies of Mandarin, this review shall not delve deeper into her findings but instead address her important findings in the next two subsections.

Apart from Y. Li's account up to the 1990s, more recently, child language studies on Mandarin developed along two major threads. One thread followed the psychological approach whereas the other thread followed the naturalistic or semi-naturalistic data analysis approach (usually corpus-based). For the thread

using psychological approach, studies (such as Hao et al. 2008, 2015; Tardif 2005) adopted a systematic sampling approach whereby informants were selected on the basis of their social classes. The informants were then assessed based on the established inventories, such as the Chinese Communicative Development Inventory, CCDI (adapted from the MacArthur–Bates Communicative Development Inventory) from the 16 months (i.e., babbling stage) to 30 months (i.e., about age 2.5 years old). In such studies, Mandarin development was examined in terms of morphology and syntax, and the development of the child's language was indicated by scores from the inventories (Hao et al. 2008, 2015; Tardif et al. 1997; Tardif 2005). Among these studies, issues on vocabulary development were often discussed, and the proportion of nouns and verbs acquired at early infancy was one of the common focuses of these researchers. Their findings are indeed controversial so far, as Tardif et al. (1997) found a more advanced development of nouns among Mandarin-speaking children, while Hao et al. (2015) found no advancement of nouns over verbs among the 900 over Chinese children investigated.

As for the thread using naturalistic or semi-naturalistic data analysis approach, studies by Zhou Jing and Chang Chien-Ju were typical of such an approach. By adopting the famous Child Language Data Exchange System (CHILDES), they collected recording of semi-structured interactions between mother and child to construct corpora of young Chinese children between 14 and 72 months old, which they conducted studies on the informants' lexical development, sentence length development, communicative development, narrative development, etc. over age (for details of their studies, see Zhou and Chang 2009). By and large and with particular relevance to this study, their findings basically showed that lexical items (both its word-type and word-token) and sentence length increased over age with a higher rate of development between 14 and 36 months, after which their rate of lexical and sentence length development slows down and stabilizes by the age of 6.

In summary, it was found that child language studies of Mandarin were largely in line with the approaches of similar studies worldwide. There are diary studies, large sample studies, and longitudinal language sample studies. The preferred approach of such studies is generally psycholinguistic, with the aim of uncovering psychological and cognitive development through the analysis of child language development. Such studies used adapted versions of established inventories or batteries developed and normed for the English-speaking children, so that results can be compared with the norm. Besides the psychological trend, more recently, studies that look into the gathering and analysis of naturalistic or semi-naturalistic language data from children are getting popular. Similar to the corpus-based studies by Zhou and Chang (2009), they gather semi-natural language data from sampled children over specific intervals of visits with controlled topic of interactions. The data were collated into a corpus so that frequencies of language phenomenon could be described and analyzed at ease with the empirical evidence.

2.1.1.1 Mandarin Lexical Competence of Chinese Children

Among the studies mentioned earlier, the general consensus on Mandarin lexical competence of Chinese children was that their lexicon increased over age (Shi 1990; Li 2004; Zhou and Chang 2009). As found by Shi (1990), the Mandarin lexical coverage of Chinese children at age 5 was about 3000 words and their Mandarin lexical coverage at age 6 is about 3500 words. These words cover large number of adjectives, adverbs, and quantifiers, on top of their well-developed lexicon for nouns and verbs. Li (2004) further found that, among these words, content words were most prominently developed among children of all ages, covering a high ninety percent of their total Mandarin lexicon. Among these content words, most of them were nouns and verbs, and their combined proportion in content words was at least fifty percent. Among the nouns the children acquired, most of these nouns were concrete nouns (about eighty percent of their total nouns) while the others were abstract nouns. Y. Li believes that the lexicon (especially the content words) is related to the children's daily experience with concrete entities, and the individual differences in word items can be great among children, as different children have different experiences or exposure.

In line with the previous two studies, Zhou and Chang (2009) found that both word-types and word-tokens increased rapidly with age growth, and the rate of such growth slowed down after the 26th month. During 14 and 26 months of age, word-types and word-tokens of content words showed the greatest growth over age, and nouns stood out as the most produced word class, followed by verbs, adjectives, adverbs, and pronouns. Function words such as auxiliary words were the least among all word classes produced. Though both word-types and word-tokens of word classes grew over age, Zhou and Chang however found that the word-type and the word-token of each word class do not grow in proportion when they computed the coverage of word-type and word-token of each word class against the total number of words produced by children at each age interval. In their analysis, the word-type of a word class may increase rapidly but the word-token of this particular word class may not increase as rapidly. In other words, knowing more words (or having more word-types) does not guarantee their frequent use, and Zhou and Chang believed that there were many reasons that affected the children's display of word-types (which represents a child's lexical competence), and a highly possible reason was the frequency of word-type exposure by the parents.

As pointed out by Li (2004) and Zhou and Chang (2009), there are common trends of age-appropriate development among the children. However, these studies also noted that there are complex differences in the configuration of lexicon of individual child due to their different exposure to Mandarin from their parents. In other words, language development is complex among Chinese monolingual children as they show variations in terms of vocabulary conceived. It is reasonable to predict that the complexity and variation will be exaggerated among bilingual children in this study, taking into account that the two languages could have developed simultaneously under the context of multilingual exposure in Singapore. With

regard to the approach of lexical study, the above literatures similarly studied and compared the word-types and word-tokens of word classes of grouped children. This study shall adopt this approach to compare the lexical outputs of children from different home language backgrounds.

2.1.1.2 Mandarin Syntactic Competence of Chinese Children

For Mandarin syntactic competence among Chinese children, studies, in general, came to the common understanding that children produced syntactically less complex utterance at a younger age, and gradually produce more complex utterances as age increases (Shi 1990; Xu 1996; Li 2004; Zhou and Chang 2009). This syntactic competence is often discussed in terms of sentence or utterance length, syntactic structure within a clause or clausal relationship among multiple clauses. For example, Shi (1990) found that the length of complete sentences among children at age 5 and 6 was similar, having an average sentence length of seven to ten words per sentence. These sentences were mostly simple sentences (i.e., sentences with one clause), whereas complex sentences (i.e., sentences with multiple clauses) were relatively scarce. She also noticed that these sentences were more linearly constructed, as simple sentence will mainly made up of single clause with a simple subject-predicate construction, whereas the complex sentences were mainly made up of clauses having a coordinate clausal relation.

Unlike Shi's account that solely analyzed complete sentences, Li (2004) accounted for syntactic competence in terms of utterances. He highlighted that children generally begin with the production of single-word and single-phrase utterances, which are mostly vague in referent. Subsequently, the children became more specific in their referent, and the syntactic structure became more complex, and hence consisted of single-clause and multiple-clause utterances. With the more complex utterance structures, the Mean Length Utterance (MLU) also increased over age (for example, the MLU of 5-year-old children is about 7.87 words per utterance while the MLU of 6-year-old children is about 8.39 words per utterance (Li 2004: 155). Among the many other features that Y. Li discussed about syntactic development, he highlighted that coordinate-clause relation (CCR) in multiple clause-utterance (MCU) is more easily produced by children than subordinate-clause relation (SCR) in MCU. He believed that this is due to a higher requirement of logical processing in SCR, which is deemed more difficult for children as compared to their production of CCR.

In the more recent study of Zhou and Chang (2009), their findings on sentence length development (using MLU as a measurement) were partially in line with Shi and Li's findings. They found that the children's sentence length, in general, increased over a younger age, after which the MLU hit the ceiling effect and ceased to increase after the age of 48 months. This finding was different from what was found by Shi (1990) and Li (2004) as they recorded differences in sentence length after the age of 48 months. As admitted by Zhou and Chang in their discussions, they believed that their findings could be due to a few reasons, which

include the unfamiliar environment of activities, the nature of activities, and the untrained facilitator who overparticipated in the activities.

In summary, studies on syntactic development in Chinese children's Mandarin basically account for their data in terms of syntactic structures, such as single-word utterance, single-phrase utterance, simple sentence, and complex sentence. The findings generally align these syntactic structures in the said order to represent their level of complexity, which is underpinned by the level of difficulty to produce them over age maturity. This underlying assumption and its respective approaches will hence be adopted in this study. As the mean length utterance showed differences over age development, it is reasonable to assume that it is representative of syntactic competence and this study shall employ this measurement to show syntactic competent differences in Mandarin of children from different home language exposures.

To take stock of Sect. 2.1.1, child language research on Chinese children in China has substantially covered the various age groups of preschool children (from 0 to 6 years old) with research like diary studies, large-scale studies, and longitudinal sampled studies. Though these studies covered monolingual Chinese children, their findings are still valuable as they provide referential benchmarks for studies of Chinese children in Chinese communities worldwide. For example, Opper et al.'s (1999) research on Cantonese development of children in Hong Kong also made reference to the above studies. Hence it will be interesting for this present study to make reference to some of the above results and explore if Singapore bilingual Chinese preschoolers fare similarly in Mandarin competence like their monolingual counterparts.

2.1.2 Child Language Study on Mandarin in Singapore

In the previous section, studies were reviewed to outline the developmental trends overseas, which were found to be either psychometric or naturalistic language-based in nature. In this section, this review shall focus on local research on language development, in particular, studies dealing with Mandarin competence or proficiency. Generally speaking, child language studies on Mandarin alone are rather scarce in Singapore. In most cases, research into children's Mandarin proficiency has been subsumed under studies of their English proficiency. In these instances, Mandarin proficiency is just analyzed for comparison purposes. Such studies on child language are often diverse and complex in methodologies employed, which include case studies, observations, psychometric testing (adapted from established inventories), transcription analyses, or a combination of some or all of these said approaches. As it is difficult to categorize these studies by their research objectives and their specific methodology, this review will cluster them by their general approach in view of the research trends observed in the last two sections. Therefore, these studies will be reviewed in terms of tests approach, naturalistic language analysis (corpus-based) approach, and social survey approach.

2.1.2.1 Testing Approach

Like many child language research worldwide, child language studies in Singapore prefer the psychometric testing tradition. Generally, these studies can be further divided into the following categories—norming studies, test-application studies, and self-developed test studies. Norming studies usually aim to establish the norm of language development, using established psychometric tests, so that children-at-risk (i.e., children who have certain deficiencies or impairments that would hinder their educational development) can be identified early and managed in specific ways. Test-application studies apply established psychometric tests (such as vocabulary tests and language development tests) to examine children's language abilities, so as to capture their literacy skills and correlate these skills with areas like literacy performance, which usually refers to their test or exam results. Self-developed test studies are research that develops their own assessment tools to analyze the bilingual language competence of children.

(A) Norming Studies, as have been pointed out, are studies that employ established test inventories from the US (such as the Denver Development Screening Test, DDST) or Europe (such as the British Picture Vocabulary Scale, BPVS), which were previously normed with English monolingual children. In order for these tests to be used accurately in Singapore, the studies often select a substantial sample of Singaporean children from different ethnic groups, so as to re-norm or calibrate the test instruments or test items. Some of these studies include Chan (1990), Chong (1999) and Richard-Liow et al. (1992). Such studies, in general, found that the Singaporean children behaved differently in the administered tests as compared to the original normed English monolingual children (Chan 1990; Chong 1999). Singaporean children's differences in test performance were usually found to have relation with home-related factors, such as mothers' education attainment (Chan 1990) and dominant language spoken at home (Chong 1999). This variation in language competencies with regard to children's dominant language indeed demonstrates the complexity of language competence among bilingual children.

(B) Test-Application Research are studies that apply established psychometric tests (such as vocabulary tests and language ability scales) to determine Singaporean children's language proficiency in English and their mother tongue (i.e., Mandarin, Malay, or Tamil). For these studies, various test instruments are often simultaneously administered so as to collectively capture the literacy skills of an informant. The test results are often seen as an indication of the children's literacy skills and are usually correlated with their school results of the respective languages to illustrate the relationship between literacy skills and school performance. Demographic and sociolinguistic information were also obtained from the informants by these studies to provide possible explanation or factors that resulted from their findings. Dixon (2004) and Pang (2004) are two typical examples of such studies that used the said approach. Dixon (2004) generally found that Singaporean children from different ethnic groups showed different achievements in the tests she administered, and such differences were not found to be related

to ethnicity, but due to their different levels of exposure to English at home. This in a way supported the findings of Chan (1990) and Chong (1999). Pang (2004), via her study on English-Chinese bilingual children, found that despite differences in language and orthography (writing system), there seemed to be evidence of transfer of literacy skills between the children's English and Mandarin. Such transfers were found to be bidirectional, which suggested that the language abilities in the two languages of a bilingual are intertwined in an intricate way. And such intricacy may also have resulted from the informants' language dominance (Pang 2004).

(C) Self-Developed Assessment Studies are studies on language competence of Singaporean bilingual children, usually done by Chinese education academics, using self-developed test instruments. These instruments are generally language tests in the form of formal in-class assessments or final examinations. Such studies include Goh (2010) and Leong and Neo (1986). As Leong and Neo (1986) have been more systematically reported, this study shall use their study as a typical example of such studies. In their study, Leong and Neo found that there was no strong correlation between the English and Mandarin skills of their informants, although these informants generally performed better in English tests than in Mandarin tests. Leong and Neo concluded that learning both English and Mandarin concurrently had no adverse effect on the children's language abilities. They also concluded that bilingual abilities differed from skill to skill and even within a specific skill. Leong and Neo's observation on the variation of bilingual abilities among different language skills suggested that the language ability of the children not only differs between the two languages but also within each language.

To sum up this section on the test approach, it is obvious that the testing approach is preferred by many studies that hoped to uncover language competence of children in Singapore (e.g., Chong 1999; Dixon 2004; Leong and Neo 1986; Pang 2004). The above-reviewed studies, except that of Leong and Neo (1986), are mainly interested in the study of English proficiency or competence whereas Mandarin proficiency or competence is just a basis for comparison. The approach of such studies was often psychometric in nature, i.e., established language proficiency inventories normed for English-speaking monolingual children were employed and adapted to the other languages for comparison. Upon attaining test results, such studies often correlated their results with demographic information obtained from a survey administered to parents or the children's caregivers. In general, they often found a positive correlation between home language dominance or exposure and their test results, and the complexities of the children's language competence were often noted by findings on the varied performance among children of different language dominance. In some cases, their results seemed to contradict each other [e.g., Chan (1990) and Dixon (2004) found adverse results on language proficiency attainment among Singaporean children, while Leong and Neo (1986) and Pang (2004) found adverse relationship between English and Mandarin skills of Singaporean children], probably due to the different test instruments that came with different preconceptions of language competence. Although such a test approach is a simple and easy way of data collection, the contradictory

findings raise questions about the reliability of such an approach. This study believes that naturalistic or semi-naturalistic data should also be obtained for a useful analysis of Singaporean children's language competence.

2.1.2.2 Naturalistic or Semi-naturalistic Language Analysis Approach

By naturalistic or semi-naturalistic language analysis approach, this study refers to those works that involve the collection and analysis of substantial naturalistic or semi-naturalistic language data. This approach can be generally said to be "bottom-up", as its findings on language competence are based on the synthesis of a pool of language data, which is unlike the "top-down" approach, such as the test approach mentioned earlier, that comes with a preconceived vocabulary list or language ability scale to identify specific language competence features. Among the naturalistic or semi-naturalistic language analysis studies in Singapore, the IE-BvLF large-scale longitudinal project has a few sub-studies with this approach. This project was funded by the Bernard van Leer Foundation (BvLF) for 9 years (from 1983 to 1992) and was undertaken by the then Institute of Education (IE) to investigate the cognitive and social developmental processes of Singapore preschool children between 3 and 6 years old. This project had diverse objectives and was multidisciplinary in nature. It surveyed broad areas like language, cognition, and socialization of children; language competency of children was just a 'subpart' of its interest. Similar to the test approach studies, the analysis on mother-tongue (or ethnic language) competence were often incorporated into studies on bilingualism of Singaporean preschoolers (e.g., Kamsiah 1986; Lee 1992; Loh and Sim 1993), which were mainly interested in the language acquisition and development of the children's L1 (i.e., English). Their research into L2 (i.e., the various ethnic mother tongues) was just for comparison purposes.

Of the above-mentioned related studies, Sim (1988) found that more children were successful in their second language[1] (i.e., Mandarin and other mother tongues) word knowledge test than their first language (i.e., English) word knowledge test. This finding comes coincided with the fact that a majority of the informants use their second language at home. Sim's study also found that the majority of the tested preschoolers did not do well in both English and the second language fluency test despite Mandarin being their home language. Hence Lee (1992: 53) concluded from Sim's (1988) findings that Singaporean children, though having promising word knowledge in both English and second language, had communicative problems in both languages. She believed that language acquisition and later language development were the reason for such results. As such, Lee selected six Chinese preschoolers from the IE-BvLF corpus to further analyze their development in English and Mandarin via language data collected during the fluency test

[1]This notion of second language that Sim used is not in terms of acquisition sequence, but the official classification of language by the then Ministry of Education of Singapore.

at the different age intervals (i.e., four, five, and six years old). From the transcribed speech of these children, Lee found that, as the children grew and shifted from socialization at home to kindergarten, they showed obvious improvement in verbal fluency in their weaker language. On the whole, Sim (1988) and Lee's (1992) studies highlighted two points that are relevant to this study: Firstly, linguistic competence (i.e., word knowledge) has obvious relations to the preferred home language of children; secondly, communicative competence (i.e., verbal fluency) is not directly related to linguistic knowledge (or competence) and home language dominance, it may indeed be related to exposure at kindergarten. The first point asserts the language-and-home relationship found by various studies using the test approach mentioned in the previous section, while the latter point opens the door for the reconsideration of communicative competence studies.

Apart from Sim (1988) and Lee (1992), there was a study in the IE-BvLF project conducted by Ong (1988) that solely looked into children's oral lexicon and grammar in Mandarin. He found that the overall vocabulary capacity of the Chinese preschoolers was 1411 words, of which 180 words were non-Mandarin words. Other than vocabulary, Ong also reported that the children were able to produce two types of sentence, i.e., simple and complex sentences. Other than lexical coverage and types of sentences, he also vividly reported that code-switching was evident and natural among the children, especially when expressing proper nouns (such as see-saw, cartoon, and NTUC[2]) which are rarely known to children in Mandarin. Ong concluded on the verbal fluency of his informants, i.e., 79.94 % of his informants could speak Mandarin fluently. This finding on fluency contradicted the findings in Lee (1992) and Sim (1988)'s studies mentioned above; where both found that the verbal fluency of their informants was weak in both languages. However, with the findings on verbal fluency, Ong claimed that the acquisition of both Mandarin and English would not be a burden to children in general. On the whole, as Ong mentioned in his brief review on child language research of Mandarin in Singapore, his research was the first of its kind ever done on children's Mandarin in the Singapore context (Ong 1988: 1). As such, his study is of referential value as it marks the Mandarin competence of Singaporean Chinese children at the time of his research. It will definitely be worthwhile to revisit similar issues to see how Mandarin competence has changed among Chinese children at the present time.

Since Ong's study, no research of similar scale and approach has been carried out until the work of the Chinese Research Team (CRT) in the Centre for Research in Pedagogy and Practice, NIE, NTU. CLRT (2008) constructed the largest Mandarin speech corpus in Singapore, entitled "Singapore Children Spoken Mandarin Corpus (SCSMC)", which consists of elicited speech data from 600 Singaporean preschoolers from different types of kindergartens situated in different parts of Singapore, from 2005 to 2006. The speech data were collected via

[2]The abbreviation of National Trades Union Congress, usually referring to the chain of supermarkets or grocery stores under the congress.

audiotaping of interviews, picture elicitations, and classroom observations of children and were fully transcribed. A home language survey was also administered to parents or grandparents of the children to identify their language dominance at home. Among various studies done with this corpus (e.g., Goh et al. 2007a, b; Goh 2012; Zhao 2008; Zhao and Liu 2008; Zhao et al. 2007), Zhao et al. (2007) investigated the language competence of 180 children in terms of the Number of Different Words, the Index of G, and the mean length utterance. Upon comparison of these indicators with the children's home language (namely, English-speaking, both English and Chinese-speaking family, and Chinese-speaking), the study found that the language competence of the children were generally correlated with their language dominance at home, with the lexical indices having a higher correlation with the children's home language, while the sentential index (MLU) showed weaker correlations with the children's home language. As such, the study concluded that the relationship between home language and language competence of children in Singapore was much more complex. Noteworthy, this study acknowledged that the majority of Singapore Chinese children indeed came from bilingual-speaking families, other than the English-speaking or Chinese-speaking families that conventional studies used to proclaim (CLRC 1999).

In summary, this section has explored two large-scale projects in Singapore that collected massive language data and generated many studies on language competence. Among these studies, it was found (in tune with the test approach studies) that language competence of children is highly correlated with their dominant language at home. In other words, there is usually a positive effect of ample exposure on the proficiency in a particular language. The IE-BvLF project, in particular Lee's study, showed that the proficiency in the weaker language will develop or excel when children gain more exposure to the language in their kindergarten. The corpus of SCSMC has shown that children's language proficiency varies in complexity depending on the degree of exposure in their home environment. These observations are very valuable to this study as they have established that language exposure is a key factor affecting language proficiency, particularly so among bilingual children in Singapore.

2.1.2.3 Sociolinguistic Survey Approach

Apart from the test approach and naturalistic language analysis approach mentioned in the previous sections, some studies used the sociolinguistic survey approach to investigate the factors (such as demographics, parents' education attainment, parents' dominance use of language) that influence language choice or language proficiency of children in Singapore (Chen et al. 1999; Platt 1980; Saravanan 2004; Zhao and Liu 2008). Among them, Saravanan (2004) was typical of such studies. In her analysis, Saravanan found that Chinese children's English proficiency was affected by their fathers' and mothers' English preference. She also found that Chinese children's Mandarin proficiency was positively correlated with their fathers' and mothers' community language network; and

the language choice of Chinese children was affected by their fathers' and mothers' English preference. Hence Saravanan concluded that as the parents attained higher educational qualification, their English proficiency was also correspondingly higher, and they naturally preferred to socialize in English. Their preference to communicate in English in turn affected their children's language choice and posed certain negative effects on their children's Mandarin proficiency. With these findings, Saravanan urged both parents to be aware of their language preference and network, and to play a more active role in ensuring a stable and secure environment for the balanced development of biliteracy in their children. Generally, Saravanan's study again highlighted the effect of family language preference or choice on the language proficiency of their children.

In a recent study, funded by the Lee Kwan Yew Fund for Bilingualism, a research team in the Singapore Centre for Chinese Language embarked on a sociolinguistic survey with 1261 preschool Chinese children from various types of kindergartens and childcare centers in Singapore. Out of these 1261 cases, 381 children were further sampled and invited to participate in a picture elicitation task and a Chinese character recognition test with self-developed instruments. The purpose of this survey was to understand the home language environment of Singapore Chinese preschool children, in terms of language exposure and language use among parents, siblings, grandparents, and caregivers with the children, whereas the purpose of the elicitation and test was to assess the oracy and literacy competence of the children in Mandarin. The final report of this study has been submitted to the respective authority, and is yet to be published. But two of its journal publications, by Li et al. (2016) and Puah and Tan (2015) shall provide a glimpse of their findings. Li et al. (2016) focused on the analysis of the survey and found that the surveyed children were generally exposed to both Mandarin and English at home, with different proportion of exposure with different interlocutors. Children generally spoke at least some Mandarin with their parents, but chose to interact in English among siblings and peers. Among Mandarin activities at home (such as watching of Mandarin TV program and reading Chinese stories books), parents were found to be less engaged with their children in such activities, especially reading. With these survey findings, Li et al. correlated the survey results with children's achievement in the elicitation and character recognition test. They found that there was high correlation between the survey results and children's achievement. In other words, home language environment (in terms if language choice of parents, and their choice of language activities with the children) had an impact on children oracy and literacy competence. This conclusion concurred with many past studies (such as Goh et al. 2007a, b; Goh 2012; Saravanan 2004; Zhao 2008; Zhao and Liu 2008; Zhao et al. 2007) that home language input has an effect on language output of children.

In another study by Puah and Tan (2015) which tapped on the same pool of data of the abovementioned project funded by the Lee Kwan Yew Fund for Bilingualism, 11 out of the 381 children were sampled, who participated in the survey, elicitation and Chinese character recognition test. The sampling was based on an index calculated based on the survey, similar to the Chinese Dominance

Index, put forward by Zhao et al. (2007). The elicitation audio recordings of these children were transcribed and annotated for lexical and syntactic features using CHAT and CLAN in the renowned CHILDES system. Upon analysis, Puah and Tan claimed that there was no significant difference across the three home language groups (i.e. the Chinese-speaking families, the bilingual-speaking families, and the English-speaking families) in terms of the total lexicons produced. The tests for mean word token showed no significant difference across children of different family language backgrounds as well. This finding is indeed rare, as past studies (such as Zhao et al. 2007; Goh 2012) had found difference in type and token produced by children of different home language backgrounds. However, they found significant differences in the word-type and mean length of utterance predicted by children from the three groups, i.e., children from English-speaking families produced the least word-types and shortest mean length of utterance as compared to the other two home language groups. By means of qualitative analysis of the recording transcripts of the children, Puah and Tan believed that the lower competence displayed by the English-speaking children has to do with their lack of function words such as conjunctions and prepositions. Puah and Tan believed that preschool teachers shall hence focus on the teaching of function words to the children of English-speaking families.

To sum up this section, this chapter has attempted to review child Mandarin language research in Singapore. By and large, child Mandarin language studies are scarce as they are often subsumed under English language proficiency studies, and mainly for comparison purpose. Among the literatures reviewed above, the approaches of such studies are generally psychometric testing in nature, with some studies based on naturalistic or semi-naturalistic language analysis. Regardless of the approaches adopted by these studies, there are two common findings that are indicative to this research. Firstly, the studies have shown that language proficiency or competence is positively related to home language exposure (e.g., Dixon 2004; Lee 1992; Pang 2004; Saravanan 2004; Sim 1988), i.e., children's high Mandarin competence is associated with a Chinese-speaking home environment, whereas low Mandarin competence is associated with an English-speaking environment. A point worth noting in this finding is the division of home language backgrounds by the cited literatures, which are often twofold (i.e., Chinese-speaking language background and English-speaking language background) based on home language surveys. This binary grouping, as critique by Zhao and Liu (2008) has oversimplified the complex sociolinguistic situation, and the rationale of their division is often not revealed. As such, this study shall avoid this binary approach and seek a more scientific way to describe the home language backgrounds of Singaporean children. Secondly, the studies have found that language competence is indeed complicated or complex among Singaporean children (e.g., CLRT 2008; Pang 2004; Sim 1988), as obvious variations in their language performance were commonly observed under the same home language environment. These variations were probably related to the complex development of bilingual children. Hence in the next section, this review shall expound on what is known of the bilingual children and what theoretical assumptions can be made for this study using the respective findings.

2.2 Development of Bilingualism in Children

As mentioned earlier, many child-language studies employ similar approaches (such as diary keeping, large-scale observation, and longitudinal tracking) and language studies on bilingual children have adopted these approaches as well. Some studies have adopted the diary study approach and focused on the observation of the relationship between the bilingual development of children and the types of linguistic inputs (e.g., one-parent-one-language input, one-language-one-environment input or mixed-language input, etc. For details on the types of inputs, see Romaine (2004) which the children have been exposed to. These studies analyzed bilingual children's language features and attempted to relate these features to the types of linguistic input the children received. Other than studies using the diary approach, there were also studies that were based on large samples of bilingual children. These studies mainly involved European bilinguals who juggle English and one other European language (e.g., German, Spanish, and French). They took into account the children's demographics (e.g., their parents' native language, educational level, economic status, and immigration history), which were later correlated with the children's language production to explore which social factors affected the language performance of the bilingual children. Upon using these methodologies, many studies on the language development of bilingual children focused on exploring the rate, pattern, and process of bilingual development in children. This exploration was often done through observing the children's language behaviors and finding the cognitive, linguistic, and social (communicative) explanations or justifications that underlie these language behaviors (Genesee 1993: 63). Hence, this section will look at various issues concerning bilingual development in children, so as to shed light on the present study of bilingual children in Singapore. This section will discuss the bilingual development of children looking at three aspects, namely, the cognitive, linguistic and communicative aspects, and illustrate the basic theoretical understanding of each aspect.

2.2.1 Cognitive Aspect of Bilingual Development

Among studies on the cognitive aspect of bilingualism, one of the fundamental issues concerns the existence of proficiency systems in the bilingual mind. Some researchers see bilinguals as having two Separate Underlying Proficiency systems (i.e., SUP systems, sometimes known as the Balance Theory), whereas other researchers believe that there is only one Common Underlying Proficiency system (i.e., CUP system, sometimes known as the Think-Tank Theory or Iceberg Analogy) (Baker 1988; May et al. 2004). Adherents to the SUP system mainly believe that languages are kept separate in a bilingual mind, and due to the fixed storage capacity of the bilingual mind, the growth in one language will automatically decrease storage space for the other languages (Baker 1988: 170–171; May

et al. 2004: 32). As for the CUP system, the languages of bilinguals are believed to be separate on the outlook, but are kept as one integrated resource in a bilingual mind. In other words, the concepts (e.g., images) and representations (e.g., words) in each individual language are being associated with and stored in a centralized operating system, which generates language output for each relative case (May et al. 2004: 38–40).

In line with the differentiation of SUP and CUP systems in the bilingual mind, another issue with regard to the cognitive aspect is about treating cross-language influence as differentiation or fusion. Bilingual speakers reflect this issue in the phenomenon of the switching of linguistic codes. This phenomenon reflects differentiation and fusion via the distinction of the switching of linguistic code as being an aware and unaware behavior of the speaker (Romaine 2004: 298). For a speaker who is aware of his/her switch in linguistic codes, it is deemed that this speaker is experiencing differentiation from cross-language influence; for a speaker who is unaware of his/her switch in linguistic codes, it is deemed that this speaker is experiencing fusion from cross-language influence.

Besides arguing how the languages are stored in the bilingual mind via the SUP or CUP systems, Cummins (1991) worked at establishing a model to explain the relationship between bilingual proficiency and its positive and negative effects on the cognition of bilingual children in order to provide explanations for the different academic performance of bilingual children in schools. He introduced the threshold hypothesis, which saw the development of bilingual children as undergoing thresholds when moving through three levels in bilingual development, i.e., Limited Bilingualism (also known as "Semilingualism" by Cummins), Less Balance Bilingualism, and Balance Bilingualism (Baker 1988:174–177; May et al. 2004: 40–44). At the Limited Bilingualism level, the bilingual child is expected to have low competence in both languages and the effect of such bilingualism on cognition is deemed to be negative. After passing the threshold and arriving at the Less Balance Bilingualism level, the bilingual child is no different from a monolingual child, as he/she has obtained age-appropriate competence for one of his/her two languages. At this level, the bilingual development is deemed to have neither negative nor positive effects on the child's cognition. Lastly, when the child passes through the threshold at the Less Balance Bilingualism level and enters the Balance Bilingualism Level at which stage both the languages of the child have reached age-appropriate competence, the effect of bilingual development is then considered as having a positive effect on the child's cognition. In general, Cummins' threshold hypothesis provided some explanation on why some bilingual children succeed in school while others did not. But, his notion of semilingualism and vague definitions for what is to be considered as less balance and balance bilinguals have subjected this hypothesis to criticism. In view of the setbacks to his threshold hypothesis and the intricacies of the bilingual child's two languages, Cummins introduced the developmental interdependence hypothesis, which stresses the relatedness of the two languages in bilingual development. In this hypothesis, Cummins suggested that the competence of the weaker language of a bilingual child is dependent on the competence of his/her other more competent language.

2.2.2 Linguistic Aspect of Bilingual Development

The linguistic aspects of bilingual development are related to the three basic areas of language—phonology, lexicon, and syntax. As the present study is concerned only with the lexical and syntactic areas, phonology will be omitted from the discussion. This study has left out phonology because Singaporean children's pronunciation is not simply affected by English or Mandarin home language backgrounds. It is also affected by various Chinese dialects, which have influenced the children's pronunciation regardless of the home language background they come from. Furthermore as the SCSMC corpus on which the present study was based is built using Chinese characters, phonological information is not retrievable from this corpus.

(A) Lexicon: In studies on bilingual children's lexical or vocabulary development, it was pointed out that the size of their lexicon is not simply the sum of two lexicons of their monolingual counterparts, as there will be some equivalent lexical items shared between the two languages, which overlap in their lexicon. It was often found that bilingual children do not know equal number of words for the two languages they know. If one takes the number of words in one of the two languages of a bilingual child, and compares it with the same language in a monolingual child, it is almost always the case that the monolingual child will know more words than the bilingual child in the particular language. Though bilingual children generally knew fewer words in one of their two languages than monolingual children, it does not compromise their ability to communicate efficiently in that language. This is because bilingual children are able to pool their lexical items from both languages and use them as a whole to fulfill any communication task. (For a review on research findings in support of the above findings, see Romaine 2004: 292–293).

(B) Syntax: Where syntax is concerned, it mainly revolve around two key issues, i.e., the degree of separateness of the two syntactic systems acquired by the bilingual child and whether common syntactic structures in the two languages are transferred in the bilingual child's language development. For these two issues, some studies have shown that the syntactic systems of the two languages known to a bilingual are kept separate except for certain common word orders, whereas other studies claim that a single syntactic system (usually from the more dominant language of the bilingual) dictates sentence production in the initial years of bilingual children (Romaine 2004: 294–295). The current consensus on the issue is that bilinguals do differentiate between the two syntactic systems like their monolingual counterparts, but due to some overlapping word orders and syntactic structures of the two languages, there seems to be some transfer of this common syntactic knowledge from one language to another. These overlaps or transfers may be due to the still developing language competence of the bilingual children in their initial years (Genesee 2002).

2.2.3 Communicative Aspect of Bilingual Development

On the communicative aspect of bilingual development, many researchers have made a link between the quality of input and communicative competence. In research on the quality of input, scholars have found that social input is an important indicator of communicative competence, as aspects of social languages that relate to social structures are found to be more easily conceived by children with extended exposure in the social context (Foster et al. 2005; Hoff 2003; Li and Lee 2001; Scheele et al. 2010). Besides social or community exposure, parents' interaction with children has also been found to be crucial for the development of communicative competence (Genesee et al. 2004); research has shown that the consistency of a parent's language to the child (e.g., one-parent-one-language approach) has positive influence on the child's overall bilingual competence (Romaine 2004: 301). Some studies even believe that bilingual phenomenon, such as the use of code-switching as a communicative strategy among bilingual children, may be due to the code-switched inputs from parents and other adults the children engaged with (Genesee 1993).

To summarize this section, what has so far been understood about the bilingual mind is that the two languages of a bilingual child are complexly stored, and the development of the two languages is believed to be interdependent. It is also noted that bilingual children's lexicon is different from the monolinguals' in terms of its size and complex configuration, whereas their syntactic system is differentiated into two, which is no different from two monolinguals of the respective languages, except for some common word orders that are similar in surface structure. On the communicative aspect, bilingual children are believed to be highly influenced by their social environment, (inclusive of home environment) where communicating styles and strategies (such as code-switching) are acquired as part of the language exposed to. In general, the aspects of bilingual development (whether cognitive, linguistic, or communicative) are often stated in the form of dichotomies—single proficiency system versus dual proficiency systems, differentiation versus fusion of languages; interference versus transfer of language skills, etc. These dichotomies are indeed relative rather than exclusive, and the aspects of bilingual development are often (inter-)linked within a network of complex relationships, which usually work in dual or multidirections in a continuous manner among the said dichotomies. There is therefore a need for a framework that can encompass and explain the intricate networking of complex factors at play in bilingual children's language development, and such a framework will be further discussed in Sect. 3.3 in terms of the bilingual continuum suggested by Hornberger (2004) and Valdés (2001).

2.3 Lexical Diversity

The concept of Lexical Diversity (LD, also known as "vocabulary richness or coverage" in the field of language teaching and assessment) can be defined as the range or variety of words in a given body of text or a given sample of verbal production (Duran et al. 2004; Horton-Ikard and Weismer 2007; Read 2000; Wong et al. 2010). From a more traditional or layman perspective, it simply refers to the number of different words (usually known as "Types") in a given body of language sample (usually known as "Tokens"). In child language development and language learning studies and many other areas of studies in applied linguistics (see Malvern et al. 2004: 5–14 for a list and review), lexical diversity is regarded as an important indicator or index of language development, language proficiency, and language ability or competence (Daller et al. 2003; Le Normand et al. 2008; McCarthy 1930; McCarthy and Jarvis 2010; Zhao et al. 2007). It has been found to be related to or have a significant effect on the cognitive development and language learning of children in their formal schooling (Hu and Nation 2000; Lightbown and Spada 1993; Nation 2001; Zhu 1990). The underlying assumption or understanding of this concept of lexical diversity shared by different studies is that higher lexical diversity denotes or resembles larger vocabulary size and its effective use by the subject(s) under study. Although this assumption is considered by some researchers as an oversimplification of vocabulary and its deployment (Broeder et al. 1993; Jarvis 2002), the usefulness of lexical diversity remains unchallenged as many studies have shown statistically its significance and reliability as an index of language performance or outcomes (Duran et al. 2004; Le Normand et al. 2008; McCarthy and Jarvis 2010; Quiroz et al. 2010; Wong et al. 2010).

Without doubting its usefulness as an indicator of language performance, many literatures have focused on the discussion, development, and validation of the technical representations of lexical diversity, i.e., how lexical diversity should be computed. As summarised by Duran et al. (2004: 220–222), this computation of lexical diversity began with the traditional and most straightforward calculation of the number of different words (NDWs) in a given body of written text or speech transcripts. This computation was often criticized for its oversimplified measurement as words were counted regardless of the text or transcript length. We now know that text or transcript length is a more accurate reflection of one's lexical ability. To improve the computation of NDWs, the most influential type-token ratio (TTR) was introduced by Mildred Templin (Fletcher 1985; MacWhinney 1994; Malvern et al. 2004). This ratio takes text or transcript length into consideration by dividing the number of different words by the total numbers of words in the body of text or transcript. In other words, this ratio represents the proportion or percentage of the number of different words in the given body of text or transcript. The reading of this ratio is rather simple and straightforward. As this ratio approaches "1", it means that the lexical diversity of the text or transcript is high, whereas if the ratio approaches "0", it means that the text or transcript is less diverse lexically.

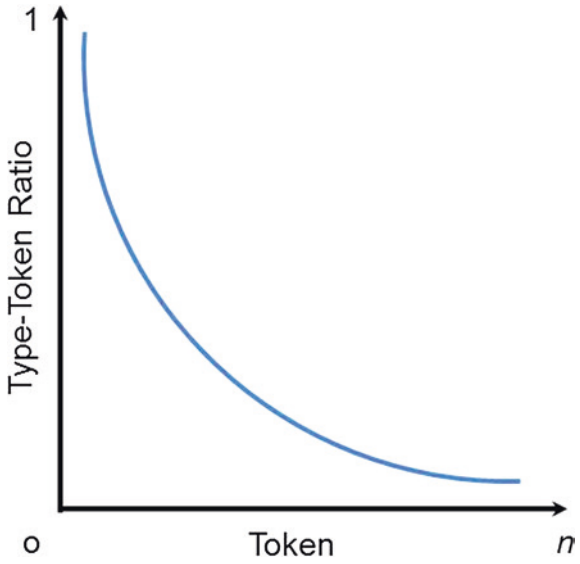


Fig. 2.1 Behavior of TTR over token size

Since its introduction, the type-token ratio has been employed by studies on lexical diversity. Like NDWs, the type-token ratio does have a major flaw, i.e., it is highly dependent on text length or in statistical terms, the "sample size". More specifically, this ratio reduces extensively as the body of text or transcripts gets larger, and this tremendous fall can be represented by the falling curve in Fig. 2.1.

This falling effect is indeed understandable as speakers or writers exhaust their vocabulary (or the number of different words that they know) over their language output, especially when such output gets lengthy. To treat this effect, many literatures have explored different methods of computing this ratio, and its varieties include the "Index of Guriaud", "Advanced TTR", "vocd-D", "HD-D", etc. (Daller et al. 2003; Duran et al. 2004; McCarthy and Jarvis 2007, 2010). These varieties were basically introduced by their respective studies to mathematically or statistically ratify the effect of large token size (in lengthy text or transcripts), which acted as the denominator in the TTR ratio.

Generally, three basic approaches were employed to improve the accuracy, stability, and reliability of the TTR ratio. The first approach is to mathematically transform the token size into a smaller but yet representative value of the actual token size, so as to increase the stability of the ratio. For example, "Index of Guriaud" introduced by Guriaud in 1954 (Daller et al. 2003; Malvern et al. 2004), reduced the token size by taking its square root as the denominator of the TTR ratio, hence contributing to its other name—"Root TTR". This revised ratio is found to be more stable in withstanding the effect of a large token size (Vermeer 2000; Zhao 2008), but did not remove the token size effect entirely, especially when the token size gets too large (Malvern et al. 2004). The second approach is to restrict the denominator or token size by truncating a portion of

the text or transcript to compute the TTR ratio. Laufer (1991), for example, truncated the first 250 words of the essays she collected for her research and computed the TTR of each essay. This method of restricting the token size is effective in countering the text or transcript length dependency of TTR, but it obviously triggered another issue, i.e., the rationale for choosing which portion of the language sample for computation. In other words, this method did not take the full language sample into consideration in its computation, and the choice of the truncated sub-sample becomes questionable if the rationale for the choice is not justified. The third approach basically applies the sampling method of statistics on top of the second approach that restricted the token size. For example, Arnaud (1984) applied the random sampling method to select 180 words from each of his collected essays written by L2 learners so as to compute their lexical diversity for comparison. Malvern and colleagues (Malvern et al. 2004; Duran et al. 2004) further improvised this method by applying a multiple random sampling method to calculate a coefficient of TTR termed vocd (demoted as D). The vocd is computed via CHILDES's CLAN software, which in principle runs 16 cycles of random selection of words without replacement. Each of the 16 cycles conducts 100 trial selections over the interval from 35 to 50 tokens and a mean TTR was computed for each cycle. With the sampling results, the D coefficient is generated via a formula to best represent the TTR curves formed by the 16 mean TTRs calculated earlier. With this coefficient, lexical diversity is read proportionately with the value of D, which means a higher D will represent a greater lexical diversity. This method improved the shortcoming of not using the entire text or transcript as mentioned in the second approach of this section, and it was claimed to have overcome the token size dependency effect by restricting the token size denominator in the 16 cycles of sample selection for the computation of D. However, as pointed out by McCarthy and Jarvis (2007), the D coefficient is theoretically and empirically questionable as the coefficient is purely the sum of probability of diversity rather than a direct index of diversity. Moreover, the random sampling approach together with the mathematical model of D over-compensated the token size dependency effect, which caused the coefficient to increase with the increase of repeated tokens. This is indeed contradictory to the assumption of lexical diversity, i.e., diversity shall decrease (or at least remain unchanged) with token increment. In taking stock of the three approaches of computing lexical diversity, researchers have not discounted the role and importance of the type-token ratio as an indicator of lexical diversity. What they have strived to contribute are ways to improve the precision, stability, and reliability of this ratio. However, at the time of this study, none of these computation methods has been unanimously accepted as the standard computation of lexical diversity.

Although an important indicator of lexical diversity, the type-token ratio only reflects the quantitative aspect of diversity, i.e., the size of vocabulary in terms of the number of words. The qualitative aspects of lexical diversity, such as word rarity and semantic suitability, are also important indicators in revealing one's language ability lexically (McCarthy and Jarvis 2010). Read (2000) carried out one of the most renowned efforts in redefining lexical diversity (which he term 'vocabulary

richness') from a more holistic perspective (Malvern et al. 2004; McCarthy and Jarvis 2007). He illustrated four statistics to evaluate lexical diversity, i.e., Lexical Variation, Lexical Sophistication, Lexical Density, and Number of Errors (Read 2000: 201–205). Lexical Variation (LVar) is identical to the classic "Type-Token Ratio" mentioned above. It measures the range of different words used or produced in a body of written or spoken text. Lexical Sophistication (LSop), as suggested by its name, reflects how sophisticated the vocabulary of a text or transcript may be. This sophistication is defined as the number of rare words (or low frequency words) used in the text or transcript. This statistic rests on the assumption that the use of low frequency or rare words demonstrates one's lexical precision (or level of sophistication) in his/her language production. In other words, Lexical Sophistication measures the appropriate choice of the number of low frequency or rare words in a text or transcript in terms of word types. Lexical Density is a statistic underpinned by the belief that a higher number of content words (i.e., nouns, verbs, and adjectives) will mean a more diverse vocabulary in a language production. This statistic is hence measured by computing the number of content words (token) as a proportion off the total number of words in the text or transcripts. Unlike Read, Ure (1971) has a varied measurement of Lexical Density, which is the proportion of content words over function words, i.e., conjunction, determiners, auxiliaries, etc. Number of Errors (NoE) generally demonstrates the effectiveness of vocabulary use in a language production. It measures the numbers of errors in spelling, word inflections, word choice, etc. in a body of text. This statistic is more suitable for the analysis of written text as errors in speech are difficult to identify, especially in spontaneous speech. These four statistics (or rather indices) collectively indicate the different aspects of lexical diversity. However, to date, there seems to be no literature that fully explores all four aspects of LD as redefined by Read. Most of the literatures are still in favor of analyzing the TTR ratio and its varieties.

To sum up this section, lexical diversity, in simple terms, is merely the variety of words used in a given body of spoken or written text. Over the past few decades, researchers have been striving to capture this variety by establishing an index that is free from the dependency of text length so that texts of different lengths (in natural language production) can be reliably compared. Based on their hard work, the TTR ratio, and its varieties have been introduced as indices of lexical diversity, but none of these indices are perfect. A fully valid and reliable index of lexical diversity is yet to be established (Jarvis 2002; Tweedie and Baayen 1998). Although a less than perfect index, the TTR ratio and its varieties have been popularly applied in many lexical analyses, especially child language studies. In such studies, researchers found that lexical diversity is strongly related to socioeconomic status and home language exposures, especially maternal language exposure (Horton-Ikard and Weismer 2007; Le Normand et al. 2008; Quiroz et al. 2010), and this diversity, regardless of "expressive (speaking)" or "receptive (listening)" correlates moderately to strongly with later literacy achievements (Dixon 2004; Scarborough 1990). In other words, lexical diversity of preschool children, being part of their linguistic competence obtained at home, is predictive of later ability in their language attainment.

2.4 Syntactic Complexity

Syntactic Complexity (SC) refers to the variety of ways in which objects, attributes, or relationships are handled in a sentence (Pollard and Biermann 2000). However, not much attention has been paid to the SC of child language, arguably because studies on LD have been far more popular and insightful in offering explanations on a child's cognitive and psychological development (Szmrecsányi 2004). Among child language research that has dealt with SC, most of them use Sentence Length (SL, also commonly known as Mean Length Utterance, MLU) as an indicator or gauge (McCarthy 1930; Smith 1926; Tempin 1957, cited in Ingram 1989). These studies generally explore the complexity of sentences produced longitudinally, based on the assumption that as children grow older, they will produce longer and more complex sentences or utterances. Sharing this assumption, the notion of SL was interpreted in at least two ways: most studies interpreted SL in terms of words in a sentence or utterance, while others interpreted SL as the number of syllables or intonation units in a sentence or utterance (Szmrecsányi 2004: 1032–1033). Other than differences in the measurement unit of SL, these studies also varied in their definition of utterance or sentence boundaries. Some interpreted the boundary at clause level while others preferred the full sentence as a boundary. To counter the varied definitions of boundaries, Hunt (1970: 188) proposed the "Minimal Terminal Unit (T-unit)" as a standard boundary, defined as "the shortest units into which a piece of discourse can be cut without leaving any sentence fragments as residue". This T-unit is then measured for the number of words in its boundary. Sentences with subordinate clauses will be considered as one T-Unit, whereas sentences with two coordinated clauses will be considered as having two T-units. The following are some examples illustrating the T-unit boundary (ies):

Construction with subordinate clause:

… [John is a lecturer who lectures in the university.]$^{T\text{-}unit\ 1}$…

Coordinated clauses:

… [John is a lecturer]$^{T\text{-}unit\ 1}$ [and he lectures in the university.]$^{T\text{-}unit\ 2}$

In general, the T-unit is deemed to be a more well-defined measurement boundary for MLU, and has been used to measure the overall SC of both spoken and written language in studies on first language acquisition (e.g., Loban 1976; O'Hare 1973) and second language acquisition (e.g., Bardovi-Harlig 1992; Cooper 1976; Harrington 1986; Larsen-Freeman 1978, 1983). It has been accepted as a useful and satisfactory boundary for the measurement of language complexity. However, like any form of measurement, the approach to computing SL (or MLU) and the use of T-unit as measurement boundary face certain drawbacks. Firstly, as pointed out by Szmrecsányi (2004), an increase in the length of a sentence or utterance does not necessarily mean increased complexity in its syntactic structure. In other words, such a measurement for length of sentence (and any measurement of

boundary of utterance) can only show how far a sentence (or boundary of utterance) has been extended physically, but it does not show how this sentence (or boundary of utterance) is constructed, and this description on how sentence is constructed will reveal more about the degree of complexity than just the computation of physical length. Secondly, as noted by Sagae et al. (2005), the measurement of MLU showed a ceiling effect in computed results for children beyond the age of three, and failed to effectively distinguish children at different levels of SC. This is probably because the language of children after age three is highly influenced by many factors such as language exposure, personality, etc. Regardless of what caused this MLU to reach its ceiling, the loss in the predictive ability of MLU on SC will definitely provide the impetus for alternative or complementing methods for analyzing SC. Lastly, the boundary of what consists a measurable unit is extremely difficult to decide in the computation of SL for speech data, especially of children. This is because children's utterances are often incomplete or loosely connected, and it is always arguable if one is to decide whether their utterance (or part of their utterance) is a sentence, a clause, or a T-unit. The identification of a measurable unit for the computation of SL is more complicated if this study takes into consideration the meaning or discourse of the utterance, which is required by computational methods like T-unit. Although it has its drawbacks, MLU is still a popular way of analyzing SC due to its ease in computation (Sagae et al. 2005; Szmrecsányi 2004), and it still serves as a straightforward quantity.

In view of the drawbacks of MLU, some studies resorted to counting phrasal nodes to determine SC of utterance or sentence (e.g., Ferreira 1991; Johnson 1966; Rickford et al. 1995), based on the paradigm of Phrase Structure (Szmrecsányi 2004). This method counts the nodes, excluding the top "S" node, in the phrase structure tree of a sentence or utterance. For example, the complexity of the sentence "Ali is a farmer" has seven phrasal nodes, as illustrated in the phrase structure tree in Fig. 2.2. This sentence thus has a complexity score of seven.

As Szmrecsányi (2004: 1033) commented, "[this measurement of complexity via] counting the number of dominated nodes is conceptually the most direct and intuitively the most appropriate way to assess syntactic complexity". However, node-counting is tedious and time consuming as the computation requires the construction of phrase structure trees for each utterance or sentence. Hence, it is often used in experimental research where data are relatively small in size, and rarely used to compute SC for a large amount of data (Szmrecsányi 2004).

A less tedious approach takes the form of a scoring scheme with pre-set categories reflecting various phrasal and clausal properties. Scarborough (1990) developed such a scoring scheme in his study and used it to compute the SC of a corpus of 100 transcribed child utterances. The scoring included categories such as questions, negations, noun phrases, verb phrases, etc. and each category was subdivided into structural items that belonged to each category (see Scarborough 1990: 6–7 for details of the score-sheet). Each utterance was analyzed with each item of these categories and a score of 0–2 was given to each item. With the scored results, he formulated his well-known "Index of Productive Syntax (IPSyn)" by summing all the results on each score-sheet. While insightful, Scarborough's study

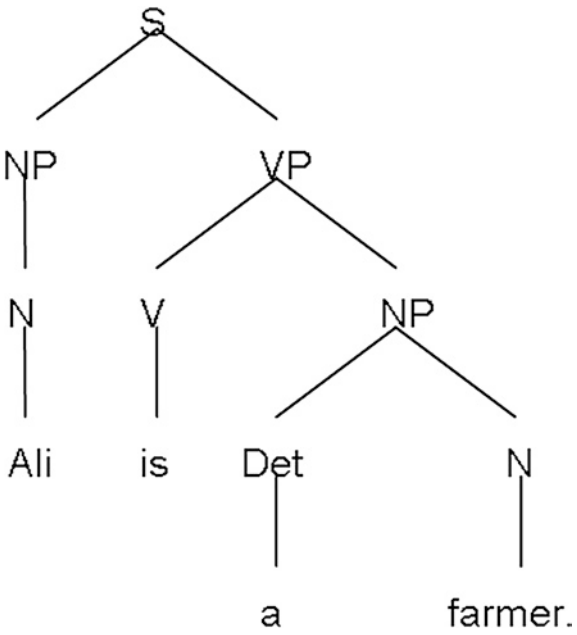


Fig. 2.2 SC using phrasal node as measurement unit

had several weaknesses. Firstly, as IPSyn is only based on 100 utterances selected from each child, the computed result will be highly influenced by the selection criteria and quality of the selected utterances. Secondly, as mentioned above, each item of the categories is only scored to a maximum of two (which denotes that the particular structure is found two or more times in the scored utterance), and this may not precisely reflect the actual occurrence of the structural item in a particular utterance, especially when it has occurred more than twice. Notwithstanding these flaws, Scarborough's IPSyn is still an important indicator of SC—it was used by Rsecorla et al. (2000) to analyze the speech of late-talking toddlers. IPSyn was also used and improvised by Sagae et al. (2003, 2005) in the development of an automated syntactic analysis program.

Apart from scoring schemes, the measurement of SC via annotation of language data is another explored approach. Studies using this approach generally develop annotation schemes, which consist of Grammatical Categories (e.g., Nouns, Verbs, Adjectives, etc.), and Grammatical Functions (e.g., Subject, Verb, Object, Complement, etc.). These schemes can be used to annotate phrasal and clausal structures of language data. The annotated data are then computed and analyzed for significant linguistic trends or properties, which are then co-related to the specific phenomenon under research. Yaruss (1999) was one of the cited studies that used this annotation approach. In the study, Yaruss aimed to analyze the relations between SL, SC, and stuttering of children (which was often deemed to

be caused by extensive length and complexity of sentence). He developed a very comprehensive syntactic annotation scheme to describe SC. With this scheme, he annotated 75 utterances from conversational speech samples of 12 boys (aged 40–66 months) who stuttered during their 30-min free-play interactions with their mothers, and he computed the SL and details of SC of these utterances. With these processed data, Yaruss analyzed and found that both SL and SC showed significant differences between fluent and stuttered utterances produced by the informants. It was also found that both SL and SC were not predictive for individual informants, but SL seemed to be a more prominent predictor for the occurrence of stuttering when logistic regression was performed. In general, Yaruss's annotation scheme, though comprehensive, had focused on describing Grammatical Categories and Grammatical Function of elements within a clause. Though this scheme did annotate for complex clausal constructions, the annotation mainly differentiated for Conjoint Clauses Structure (i.e., sentences containing two main clauses) and Complex Clause Structure (i.e., sentences containing one main clause and one embedded clause), and determined the functions of these embedded clause in Complex Clause Structure, i.e., whether the embedded clause served as subject, object, or complement. Hence, this scheme is obviously lacking a component to describe the relationship between clauses in complex clausal construction.

Summing up this section, SC can be measured via word-counting (SL or MLU), phrase-structure node-counting, scoring, or annotating. Among these methods, word-counting measurement is straightforward and relatively easy to administer, whereas the other three measurements are more complex and sometimes tedious to administer when the data size for analysis is relatively large. In comparing word-counting, node-counting, and scoring methodologies and measurements, Szmrecsányi (2004) pointed out that results obtained via these methods were rather comparable and hence he suggested that SL (or word-counting) is a less hazardous and most time-effective research method to compute SC. However, as mentioned above, SL can only provide a rough sketch on SC as it does not describe beyond the complexity of length, i.e., the number of words or syllables an utterance or sentence has. To capture a more holistic view of SC, more informative description methods (like annotation) will have to be used as a complement to SL. Besides methods of measuring SC, one fundamental issue of concern in this study is the definition of measurement boundary. Regardless of the use of sentence, clause, or T-unit as the measurement boundaries, difficulties arise in the analysis of speech data. These difficulties are exaggerated when the analysis contains children's conversation data. This is because children are prone to the production of incomplete utterances and loosely connected sustained utterances. Especially in the latter, it is difficult to segment them into unambiguous units (i.e., sentence, clause, or T-unit), particularly when meaning is taken into consideration for segmentation, e.g., in the case of T-unit. Hence, this study will look into defining a suitable and less ambiguous measurement boundary for SC when describing its methodology in Chap. 4.

2.5 Code-Switching

Code-Switching (CS) is a common linguistic phenomenon found in almost any bilingual or multilingual community. This phenomenon often means alternation between two or more sets of linguistic codes in a person's utterance during a conversation. Such alternation of linguistic codes is not only found in adults' talk, but also among conversations of young children in a bi/multi-lingual environment. In past research, many studies in this area had strong reservations over this phenomenon, as researchers viewed the changing or switching of codes in a child's utterance as a manifestation of his/her incompetence or fusion in his/her two languages. This misconception of CS is still perceived by some language purists and language educators today. However, CS is viewed positively by recent researchers, as studies like Poplack (1980) and Genesee (1993, 2002) have shown that CS of bilinguals consistently adhere to certain linguistic patterns or constraints, and this means that CS is not a result of fusion or incompetence in bilinguals' languages. Furthermore, some research into the use of CS by bilingual children has also revealed that these children used CS for various communicative purposes, like showing intimacy to interlocutors or differentiating interlocutors who speak different languages, etc. (Al-Khatib 2003; Genesee 1993, 2002; Genesee et al. 2004; Li and Milroy 1995; Poplack 1980; Reyes 2004; Romaine 2004). Though CS has undergone many years of research, as mentioned in Plaff (1997), there is to date little consensus on its definition. This lack of consensus is not only a result of the diverse research perspectives of researchers analyzing the phenomenon, but also of the basis of what researchers considered as a switch of linguistic codes. This is best reflected in the terminologies that researchers have used to address this phenomenon, i.e., Code-Mixing, Code-Changing, Language Alternation, and Nonce-Borrowing (Al-Khatib 2003; Genesee et al. 2004; Plaff 1997). Other than differences in terminologies, the criteria for what is to be considered a CS are also rather diverse. Some researchers have chosen to give CS more specific criteria by restricting it to switch instances of certain physical length, e.g., beyond a word (Poplack 1980; Reyes 2004), or switch instances that bear intentions for discourse or pragmatic purposes (Auer 2005; Li 2005a, b, c), while other researchers have set no specific criteria and put all switch instances under the umbrella term of "Code-Switching" or "Code-Mixing" (Genesee et al. 2004; Romaine 2004).

Despite these differentiated views on the notion of CS, the phenomenon itself has been diversely studied from many perspectives. Some studies approached this from a social constructivist point of view, and regarded CS as some sort of reflection on the speaker's identity, mirroring societal change or growth that one has undergone in a particular social context (Al-Khatib 2003; Baynham 1993; Kanno 2000). There is another set of studies that focused on discourse or pragmatic perspectives and they regarded CS as a function or conversational tactic in communicative activities among bilinguals (Auer 2005; Li 2005a, b; Reyes 2004). Other than these two perspectives, another key area of research on CS is from the linguistic perspective, which seeks to uncover the nature of CS via descriptive

analysis of its frequency, pattern, and the grammatical constraints that govern the CS phenomenon in bilingual utterances (Dimitrijević 2004; Muysken 1997; Poplack 1980). As the key concern of this research is to outline differences in CS frequency, pattern, and components among children from differentiated family language backgrounds via quantitative illustration. This review will focus on the linguistic perspective of CS analysis with some discussion on conversational analysis of CS. The qualitative method of conversational analysis will then be used to facilitate the description of the CS differences obtained from the quantitative account.

In an attempt to analyze the CS phenomenon, Poplack (1980) "incorporate(ed/s) both linguistic and extra-linguistic factors into a single analytical model". She derived a set of sophisticated rubrics to annotate her transcribed data and generated a comprehensive quantitative outline on the CS details and CS tendencies of her 20 Puerto Rican informants, by reporting on the percentage of syntactical categories of CS occurrences found in her database. Besides obtaining this quantitative sketch of CS, she also attempted to map her findings with her informants' demographic details, e.g., age, educational status, and social network details, through a language-attitude questionnaire administered for her study. Syntactically, the study found that there were virtually no ungrammatical combinations of Spanish and English in the CS occurrences of the Puerto Rican informants, and this finding held for non-fluent bilingual informants as well. It was also noted that the informants were more likely to switch larger constituents than smaller constituents. From a pragmatic point of view, she concluded that discourse was a choice of modes that appealed to the speaker in a speech community, rather than a choice of codes. Once the criteria were met for the discourse mode, the constituent in a sentence was free to switch as long as the switch adhered to the various CS constraints (e.g., equivalent constraint or free morpheme constraint). Apart from these findings, the following findings of Poplack have implications for this study. She found that speakers who had greater bilingual ability had engaged in more instances of intra-sentential CS, which were deemed traditionally by researchers and educators as trails of language deficiency. She also observed that true bilinguals who were learners of both languages since early childhood most likely produced such intrasentential CS. Hence, she concluded that intrasentential CS which occurs within a single sentence is indeed a linguistic performance that requires a high level of linguistic skills in both languages. Poplack's findings may have an impact on this study in that the common intrasentential CS found among Singaporeans, and probably also among this study's informants, is indeed not an indication of language deficiency but an indication of having obtained a certain level of bilingualism.

Besides Poplack (1980) and Muysken (1997) also constructed a framework for the CS phenomenon. In his study, Muysken put forward three types of intrasentential CS, i.e., Alternation (CS that involved switches from L1 to L2 with switches in grammar and lexical items), Insertion (CS that embedded lexical or phrasal items of L1 into the sentential structure of L2) and Congruent Lexicalization (CS for which lexical items from L1 and L2 could be filled interchangeably due to the

sharing of an identical grammatical structure between the two languages), which he used to analyze CS instances presented in various past research papers. In the midst of his analysis, he noted that the differences between the three types of CS might not be clear-cut, for example, longer Insertion would result in the imposition of grammatical structure of the inserted language and hence could be also seen as an Alternation. Despite illustrating the criteria of the three types of CS, he also attempted to map the CS categories onto the various typologies of societal settings. With these categories, Muysken hypothesized that Alteration was common in societies that had a relatively stable language environment, where languages were clearly separated among the bilinguals. Insertion, on the other hand, was common in neo- or ex-colonial societies, or the first or third generation of an immigrant society, where languages conformed to one of the dominant language system in the bilinguals. Lastly, Congruent Lexicalization was common among the second generation in an immigrant society where languages were accorded almost equal prestige by the bilinguals. However, throughout his study, Muysken did not further elaborate on this hypothesis.

Other than Poplack and Muysken's analysis from the linguistic point of view, the phenomenon of CS had also been explored from the pragmatic perspective, with the intention to understand the social or interaction causes contextualized for CS via conversational analysis. For example, Li and Milroy (1995) examined CS in a Chinese community in Britain via sequential analysis of their conversations and found that CS had been used by bilingual speakers to contextualize preference organization and repair their daily verbal communications. It acted as an additional conversation management resource for bilinguals as compared to monolinguals. Reyes (2004) also incorporated the conversational analysis methodology into his study on the functions of CS among school children's conversation, and he illustrated that children used CS for various functions like clarification and persuasion. As pointed out in Li (2005a, b), CS was indeed essentially a conversational activity and would be best analysed with a conversational or communicative methodology, for he concurred with Mackey's views on bilingualism that such bilingual phenomenon does not belong to the domain of "Langue" (i.e., linguistics), but the domain of "Parole" (i.e., Pragmatics) (for details on Langue and Parole, see Sect. 3.2). In other words, the methodology of conversation analysis, as attested by W. Li and many other researchers has the capacity to illustrate the intricate pragmatic or communicative factors underpinning the CS occurrence in a bilingual's speech.

Apart from internationally established studies, researchers in Singapore have also shown interest in the CS phenomenon. Tan (1988) did an observational study of one family and attempted to map out the CS tendencies of speakers across the family's three generations. It was found that the informants in the study code-switched functionally with reference to conversation topics (i.e., CS is motivated by the topic in conversation; see Tan (1988: 72) for specific examples), situations (i.e., CS is motivated by the degree of formality or intimacy between interlocutors, Tan 1988: 74), repetition (i.e., CS is motivated as repetition of a term for the purpose of clarification or emphasis, Tan 1988: 75), habitual usage of lexical items

(i.e., CS is motivated because certain lexical items are habitually said in one code rather than the other, Tan 1988: 77), etc. Other than showing the functions of CS, Tan also found in her study that her informants' CS does not conform to various constraints like Phrasal Constraint, Conjunction Constraint, Embedded Relative Clause Constraint, Equivalence Constraint, etc. For example, in the case of Phrasal Constraint, it is believed that the bonds between the elements of certain phrase structures are unbreakable, e.g., Article + Noun, and CS will not occur in such phrases' elements. However, Tan found that her informants performed CS in such phrases, e.g., "a suing (this is a Hokkien lexical item which means box) so dirty" (Tan 1988: 85), which obviously violated this constraint, as an English article had been strung with a Mandarin noun (for other explanations and examples on other constraints, see Tan 1988: 86–91). Tan's study hence concluded that the various linguistic constraints of CS postulated by many linguists do not hold scientifically in the Singapore context. She believed that general social factors or functions are still the key indicators that trigger CS in Singapore.

Other than Tan (1988) and Soh (1987) also carried out a study on English-Chinese CS with a larger sample of primary school children in Singapore. His study followed the traditional methodology of psycholinguistics as it sought to explore the phenomenon of CS via test instruments. Soh constructed and administered a set of four tests (two monolingual and two CS tests), using the same content, item stem and options to assess comprehension and CS at the word level. These tests were given to 221 students from Primary Three to Five academic levels in two schools that had above-average performance in both English and Chinese language in the national school-leaving examination. The test scores of the informants were then statistically analyzed. Soh found from the analysis of the test scores that the two CS tests were highly correlated and were comparable to the two monolingual tests, and that there were high correlations in the results of the students between and within the four tests. Hence, the study concluded that despite the classical view of these two languages being linguistically unique and different, there was a high correlation between the English and Chinese language, and primary school children were able to tap on one language to complete test items in the other language. Soh suggested that educators and curriculum planners should revisit their first language (or monolingual) approach in curriculum design and pedagogical practices in language education, and take into account the possibilities of a second language or bilingual approach in language education that could capitalize on the potential benefits of CS.

In general, both Poplack and Muysken's studies provided systematic descriptive approaches for the CS phenomenon. However, their research does have room for future expansion. Pollack's study was done mainly on bilingual adults and it will be interesting to apply her approach on bilingual children. As for Muysken, his study was an exploratory discussion of his CS framework and awaits further testimony. Besides these linguistic analysis frameworks, which provide a more quantitative outline of the CS phenomenon, it will also be more concrete if these quantitative features found in CS can be further illustrated with transcribed data via conversational analysis. As for the two studies in Singapore, they dealt with

the phenomenon of CS differently. Tan attempted to look at CS from the sociolinguistic or communicative perspective, while Soh focused on the psychological aspect of the CS abilities. Their findings and implications are valuable as many of their findings are still valid today. However, probably due to their research focus and perspective, neither of them had systematically detailed the linguistic description of a Singapore CS. Their research had mainly focused on CS in the English language, but not CS in Mandarin. This lack of research on CS in Mandarin leaves room for further systematic research in Singapore. To ease subsequent discussion on CS in this present study, CS will be defined as any alternation between two or more sets of linguistic codes in an utterance. Such alternation, though differentiated by some researchers in comparison to instances of code-mixing and nonce-borrowing, is indeed difficult to identify for such differences in this study's CS context. Hence, this study will view all code-alternation instances of the informants as CS, regardless of whether such alternating-instances occur at word, phrase or sentence level.

2.6 Summary

To sum up this review, despite numerous studies on child language, child LD, child syntactical complexity and child Mandarin literacy, many of these studies obtained results based on previous findings and/or the use of some briefly mentioned methodologies or instruments. Many of these studies were also found to be either quantitative or qualitative in nature, and those quantitative results were rarely supported with qualitative illustration to further examine the implications of the obtained results and further discuss their applicability to language education issues. Those studies on bilingual children, though not following the stages of monolingual child language studies, have also engaged in the methodologies of these stages. Regardless of monolingual or bilingual, their research basically focused on relating oral production (and verbal abilities) with demographic factors or literacy skills, like reading and writing. Though these studies covered many aspects of child language research, many of them were done on European languages and European bilinguals; there is very little research that dealt with Mandarin–English bilinguals. Hence, this study will fill the gap of bilingual child language research. For research done on Singapore bilingual children, a high premium was placed on psychometric tests and the correlation of test results with demographics (such as household types, parental education level, etc.). Almost no research explored the relationship between home-language exposure and linguistic performance or competence. Their findings generally showed correlations between language environment and language development, but rarely went beyond numbers that only sketched language competency. Explicit details of language competence were never analyzed in such studies. For those few research that gathered naturalistic or semi-naturalistic data, they were either conducted too long ago for our current interest or their research samples usually consisted of only

one child. Hence their findings were rarely generalizable. In view of the gaps in various aspects of bilingualism and Mandarin competence research in Singapore, this study seeks to analyze LD, SC, and CS in the speech of Singapore Chinese bilingual preschoolers with reference to three groups of identified preschoolers, i.e., Predominantly English-speaking, Both English- and Mandarin-speaking and Predominantly Mandarin-speaking. With specific focus on LD, SC, and CS, this study hopes to illustrate, qualitatively and quantitatively, a language competency continuum of Singapore Chinese preschoolers in view of their differentiated language backgrounds.

References

Al-Khatib, H. (2003). Language alternation among Arabic and English youth bilinguals: Reflecting or constructing social realities? *International Journal of Bilingual Education and Bilingualism, 6*(6), 409–422.

Arnaud, P. J. L. (1984). The lexical richness of L2 written productions and the validity of vocabulary tests. In T. Culhane, C. Klein-Bradley, & D. K. Stevenson (Eds.), *Practice and problems in language testing: Papers from the International Symposium on Language Testing* (pp. 14–28). Colchester: University of Essex.

Auer, P. (2005). A postscript: Code-switching and social identity. *Journal of Pragmatics, 37*(3), 403–410.

Baker, C. (1988). *Key issues in bilingualism and bilingual education*. Clevedon: Multilingual Matters.

Bardovi-Harlig, K. (1992). A second look at T-unit analysis: Reconsidering the sentence. *TESOL Quarterly, 26*(2), 390–395.

Baynham, M. (1993). Code-switching and mode-switching: Community interpreters and mediators of literacy. In B. Street (Ed.) *Cross-cultural approaches to literacy* (pp. 294–314). Cambridge: Cambridge University Press.

Broeder, P., Extra, G., & van Hout, R. (1993). Richness and variety in the developing lexicon. In C. Perdue (Ed.), *Adult language acquisition: Cross-linguistic perspectives* (pp. 145–232). Cambridge: Cambridge University Press.

Chan, W. L. T. (1990). *Language development in preschool Singapore children—A nominative study*. Unpublished Master's thesis, National University of Singapore, Singapore.

Chen, S., Xu, D., & Tan, H. (1999). Xinjiapo huaren de yuyan taidu he yuyan shiyong qingkuang de yanjiu baogao [Report on language attitude and language use of Singapore Chinese]. In R. Li (Ed.), *Dongnanya huaren yuyan yanjiu lunwenji [A compilation of research on language of Southeast Asia Chinese]* (pp. 48–90). Beijing: Beijing Language and Culture University Press.

Chong, S. K. S. (1999). *Language impairment in multilingual populations: A test battery for Singapore bilingual kindergarten children*. Unpublished Master's thesis, National University of Singapore, Singapore.

CLRC (Chinese Language Review Committee). (1999). *Report of Chinese language teaching and learning in Singapore*. Singapore: Ministry of Education.

CLRT (Chinese Language Research Team). (2008). *An investigation of Singaporean Chinese children's oral linguistic competence in Mandarin: A corpus-driven study*. Singapore: CRPP, NIE, Nanyang Technological University.

Cooper, T. C. (1976). Measuring written syntactic patterns of second language learners of German. *The Journal of Educational Research, 69*(5), 176–183.

Cummins, J. (1991). Interdependence of first and second language proficiency in bilingual children. In E. Bialstok (Ed.), *Language processing in bilingual children* (pp. 49–70). London: Cambridge University Press.

Daller, H., van Hout, R., & Treffers-Daller, J. (2003). Lexical richness in spontaneous speech of bilinguals. *Applied Linguistics, 24*(2), 197–222.

Dimitrijević, J. (2004). Code-switching: Structure and meaning. *Linguistic and Literature, 3*(1), 37–46.

Dixon L. Q. (2004). *Learning to read in a non-native language: The relationship between English oral-language and early literacy skills of kindergarten children in Singapore*. Unpublished doctoral dissertation, Harvard Graduate School of Education.

Duran, P., Malvern, D., Richards, B., & Chipere, N. (2004). Developmental trends in lexical diversity. *Applied Linguistics, 25*(2), 220–242.

Ferreira, F. (1991). Effects of length and syntactic complexity on initiation times for prepared utterances. *Journal of Memory and Language, 30*(2), 210–233.

Fletcher, P. (1985). *A child's learning of English*. Oxford: Blackwell.

Foster, M. A., Lambert, R., Abbott-Shim, M., McCarty, F., & Franze, S. (2005). A model of home learning environment and social risk factors in relation to children's emergent literacy and social outcomes. *Early Childhood Research Quarterly, 20*(1), 13–36.

Genesee, F., Paradi, J., & Crago, M. B. (2004). *Dual language development and disorders: A handbook on bilingualism and second language learning*. Baltimore: Brookes Publishing.

Genesee, F. (1993). Bilingual language development in preschool children. In D. Bishop & K. Mogford (Ed.), *Language development in exceptional circumstances* (pp. 62–79). Hove, East Sussex: Lawrence Erlbaum Associates.

Genesee, F. (2002). Portrait of the bilingual child. In V. J. Cook (Ed.), *Portraits of the L2 user* (pp. 167–196). Clevedon: Multilingual Matters.

Goh, H. H. (2012). *A study of lexical diversity, syntactic complexity and code-switching in spoken Mandarin of Chinese preschoolers in Singapore: A corpus-based analysis*. Unpublished Ph.D. thesis, CRPP, NIE, NTU.

Goh, H. H., Zhao, C., & Liu, Y. (2007a). Xinjiapo xueqian ertong huayu shiyong yu guojia rentong [Singapore preschoolers' Mandarin usage and national identity]. *Zhongguo Shehui Yuyanxue [Sociolinguistics in China], 7*(1), 54–68.

Goh, H. H., Liu, Y., & Zhao, C. (2007b). Jiating yuyan beijing yu huayu kouyu nengli de guanxi: Dui duoyu huanjing ertong huawen jiaoyu de qishi [The relationship between home-language background and Mandarin speaking skills: An insight into Chinese language education of children in a multilingual environment]. *Taiwan Huayuwen Jiaoxue [Taiwan Chinese Language Teaching], 3*(2), 90–94.

Goh, Y. S. (2010). *Hanyu guoji chuanbo: Xinjiapo shijiao [The international spread of Chinese language: A Singapore perspective]*. Beijing: Shangwu Yinshuguan [The Commercial Press].

Hao, M., Shu, H., Xing, A., & Li, P. (2008). Early vocabulary inventory for Mandarin Chinese. *Behavior Research Methods, 40*(3), 728–733.

Hao, M., Liu, Y., Shu, H., Xing, A., Jiang, Y., & Li, P. (2015). Developmental changes in the early child lexicon in Mandarin Chinese. *Journal of Child Language, 42*(3), 505–537.

Harrington, M. (1986). The T-unit as a measure of JSL oral proficiency. *Descriptive and Applied Linguistics, 19*, 49–56.

Hoff, E. (2003). The specificity of environmental influence: Socioeconomic status affects early vocabulary development via maternal speech. *Child Development, 74*(5), 1368–1378.

Hornberger, N. H. (2004). The continua of biliteracy and the bilingual educator: Educational linguistics in practice. *International Journal of Bilingual Education and Bilingualism, 7*(2&3), 155–171.

Horton-Ikard, R., & Weismer, S. E. (2007). A preliminary examination of vocabulary and word learning in African American toddlers from middle and low socioeconomic status homes. *American Journal of Speech-Language Pathology, 16*(4), 381–392.

Hu, M., & Nation, P. (2000). Vocabulary density and reading comprehension. *Reading in a Foreign Language, 13*(1), 403–430.

Hunt, K. W. (1970). Recent measures in syntactic development. In M. Lester (Ed.), *Reading in applied transformational grammar* (pp. 179–192). New York: Holt, Rinehart and Wiston.

Ingram, D. (1989). *First language acquisition: Method, description, and explanation*. New York: Cambridge University Press.

Jarvis, S. (2002). Short texts, best fitting curves, and new measures of lexical diversity. *Language Testing, 19*(1), 57–84.

Johnson, N. (1966). On the relationship between sentence structure and the latency in generating the sentence. *Journal of Verbal Learning and Verbal Behaviour, 5*, 375–380.

Kamsiah, D. A. (1986). *The performance of preschool Malay children in Malay and English language task: A comparative study*. Singapore Paper presented at Fourth ASEAN Workshop on Child and Adolescent Development.

Kanno, Y. (2000). Bilingualism and identity: The stories of Japanese returnees. *International Journal of Bilingual Education and Bilingualism, 3*(1), 1–18.

Larsen-Freeman, D. (1978). An ESL index of development. *TESOL Quarterly, 12*(4), 439–448.

Larsen-Freeman, D. (1983). Assessing global second language proficiency. In H. W. Seliger & M. H. Long (Eds.), *Classroom oriented research in second language acquisition* (pp. 287–304). Rowley, MA: Newbury House Publishers, Inc.

Laufer, B. (1991). The development of L2 lexis in the expression of the advanced language learners. *Modern Language Journal, 75*(4), 440–448.

Le Normand, M., Parisse, C., & Cohen, H. (2008). Lexical diversity and productivity in French preschoolers: Developmental, gender and socio-cultural factors. *Clinical Linguistics and Phonetics, 22*(1), 47–58.

Lee, M. F. (1992). Children's language: How do our children communicate? In P. S. Ko, & W. K. Ho (Eds.), *Growing-up in Singapore: The preschool years* (pp. 52–80). Singapore: Longman Singapore Publisher (Pte.) Ltd.

Leong, W. K., & Neo, E. G. (1986). *The bilingual ability of a sample of primary three pupils: A collection of three papers*. Singapore: Institute of Education.

Li, L., Tan, C. L., & Goh, H. H. (2016). Home language shift and its implications for Chinese language teaching in Singapore. *Cogent Education, 2016*, 3.

Li, W., & Lee, S. (2001). L1 development in an L2 environment: the use of Cantonese classifiers and quantifiers by young British-born Chinese in Tyneside. *International Journal of Bilingual Education and Bilingualism, 4*(6), 359–382.

Li, W., & Milroy, L. (1995). Conversational code-switching in a Chinese community in Britain: A sequential analysis. *Journal of Pragmatics, 23*, 281–299.

Li, W. (2005a). Starting from the right place: Introduction to the social issue on conversational code-switching. *Journal of Pragmatics, 37*(3), 275–279.

Li, W. (2005b). "How can you tell?" Towards a common sense explanation of conversational code-switching. *Journal of Pragmatics, 37*(3), 375–389.

Li, Y. (2002). Ertong yuyan xide yanjiu [Child language acquisition research]. In Z. Li (Ed.), *20 shiji Zhongguo xueshu dadian—Yuyanjuan [Chronicle of academics of 20th century China—language volume]* (pp. 20–21). Fujian: Fujian Jiaoyu Chubanshe [Fujian Education Press].

Li, Y. (2004). *Ertong yuyan fazhan [Children language development]*. Wuhan: Huazhong Shifan Daxue Chubanshe [Huazhong Normal University Press]. (Original work published 1984).

Li, Z. (2005). Xinjiaposhi Huayu [Singaporean Chinese language]. *Lianhe Zaobao*, June 10.

Lightbown, P. M., & Spada, N. (1993). *How languages are learned*. Oxford: Oxford University Press.

Loban, W. (1976). *Language development: Kindergarten through grade twelve*. Urbana Illinois: National Council of Teachers of English.

Loh, S. H., & Sim, W. K. (1993). *NIE-BvLF Project sub-study on the development of bilingual ability in pre-school children*. Singapore: Education Paper, National Institute of Education.

MacWhinney, B. (1994). New Horizons for CHILDES research. In J. Sokolov, & C. Snow (Eds.), *Handbook of research in language development using CHILDES* (pp. 408–542). Hillsdale, NJ: Lawrence Erlbaum Associates.

Malvern, D. D., Richards, B. J., Chipere, N., & Durán, P. (2004). *Lexical diversity and language development: Quantification and assessment*. Basingstoke: Palgrave.

May, S., Hill, R., & Tiakiwai, S. (2004). *Bilingual/Immersion education: Indicators of good practice.* New Zealand: Wilf Malcolm Institute of Educational Research, School of Education, University of Waikato.

McCarthy, D. (1930). The language development of the pre-school child. *Institute of Child Welfare Monograph Series 4*. Minneapolis: University of Minnesota Press.

McCarthy, P., & Jarvis, S. (2007). vocd: A theoretical and empirical evaluation. *Language Testing, 24*(4), 459–488.

McCarthy, P. M., & Jarvis, S. (2010). MTLD, vocd-D, and HD-D: A validation study of sophisticated approaches to lexical diversity assessment. *Behavior Research Methods, 42*(2), 381–392.

Muysken, P. (1997). Code-switching processes: Alternation, insertion, congruent lexicalization. In M. Platz (Ed.), *Language choices: conditions, constraints, and consequences* (pp. 361–380). Amsterdam: Benjamins.

Nation, I. S. P. (2001). *Learning vocabulary in another language*. Cambridge: Cambridge University Press.

O'Hare, F. (1973). *Sentence combining: Improving student writing without formal grammar instruction*. NCTE Research Report No. 15. Champaign, IL: National Council of Teachers of English.

Ong, Y. P. (1988). *Xinjiapo xueqian ertong huayu kouyu cihui [The oral Mandarin vocabulary of Singapore preschool children]*. Singapore: Paper presented in Special NIE-BvLF Project Seminar—Together we grow… how to develop your children's potential.

Opper, S., Chen, G, Kuang, Q., & Tse, S. K. (1999). *Xianggang you'er yuyan fazhan yanjiu baogao [Research report on language development of preschool children in Hong Kong]*. Research Report. Hong Kong University.

Pang, S. H. E. (2004). *Cross-linguistic transfer of reading skills in bilingual children*. Unpublished doctoral dissertation, Stanford University.

Plaff, C. W. (1997). Contacts and conflicts: Perspective from code-switching research. In M. Platz (Ed.), *Language choices: Conditions, constraints, and consequences* (pp. 341–360). Amsterdam: Benjamins.

Platt, J. (1980). Multilingualism, polyglossia, and code selection in Singapore. In E. A. Afendas & E. C. Y. Kuo (Eds.), *Language and society in Singapore* (pp. 63–83). Singapore: Singapore University Press.

Pollard, S. & Biermann, A. W. (2000). A measure of semantic complexity for natural language systems. In A. Bagga, J. Pustejovsky, & W. Zadrozny (Eds.), *Syntactic and semantic complexity in natural language processing systems* (pp. 42–45). Seattle, Washington: Association for Computational Linguistics.

Poplack, S. (1980). Sometimes I'll start a sentence in Spanish y termino en español: Toward a typology of code-switching. *Linguistics, 18*, 581–618.

Puah, L. D., & Tan, C. L. (2015). Effect of home language on the Chinese lexical ability of 6-year-old Singaporean children. *Taiwan Journal of Chinese as a Second Language, 10*, 95–125.

Quiroz, B. G., Snow, C. E., & Zhao, J. (2010). Vocabulary skills of Spanish-English bilinguals: Impact of mother–child language interactions and home-language and literacy support. *International Journal of Bilingualism, 14*(4), 379–399.

Read, J. (2000). *Assessing vocabulary*. Cambridge: Cambridge University Press.

Reyes, I. (2004). Functions of code switching in school children's conversations. *Bilingual Research Journal, 28*(1), 77–98.

Richard-Liow, S. J. R., Chong, S.-K. S., & Anwar, R. (1992). *Singapore primary school norms for the multilingual British picture vocabulary scale: English, Mandarin and Malay*. Singapore: Department of Social Work and Psychology, National University of Singapore.

Rickford, J., Denton, M., Wasow, T., & Espinoza, J. (1995). Syntactic variation and change in progress: Loss of the verbal coda in topic-restricting as far as constructions. *Language, 71*(1), 102–131.

Romaine, S. (2004). Bilingual language development. In K. Trott, S. Dobbin, & P. Griffiths (Eds.), *The child language reader* (pp. 287–303). London: Routledge.

Rsecorla, L., Dahlsgaard, K., & Roberts, J. (2000). Late-talking toddlers: MLU and IPSyn outcomes at 3;0 and 4;0. *Journal of Child Language, 27*(3), 643–664.

Sagae, K., Lavie, A., & MacWhinney, B. (2003). Combining rule-based and data-driven techniques for grammatical relation extraction in spoken language. In *Proceedings of the Eighth International Workshop on Parsing Technologies (IWPT 2003)*. Nancy, France.

Sagae, K., Lavie, A., & MacWhinney, B. (2005). Automatic measurement of syntactic development in child language. In *Proceedings of the 42nd Meeting of the Association for Computational Linguistics*, Ann Arbor, Michigan.

Saravanan, V. (2004). Bilingual children's language proficiency and language choice patterns. *Journal of Australian Research in Early Childhood Education, 11*(1), 13–25.

Scarborough, H. (1990). Index of productive syntax. *Applied Psycholinguistics, 11*, 1–22.

Scheele, A. F., Leseman, P. P. M., & Mayo, A. Y. (2010). The home-language environment of monolingual and bilingual children and their language proficiency. *Applied Psycholinguistics, 31*, 117–140.

Shi, H. (1990). Zhongguo ertong qingshaonian yuyan fazhan yu jiaoyu (yi)—3–6 sui ertong yuyan fazhan yu jiaoyu [The language development and education of children and adolescents in China (1)—The language development and education of 3–6 year-old children]. In Z. Zhu (Ed.), *Zhongguo ertong qingshaonian xinli fazhan yu jiaoyu [The psychological development and education of children and adolescents in China]* (pp. 94–127). Beijing: Zhongguo Zhuoyue Chuban Gongsi.

Sim, W. K. (1988). *Together we grow…how to develop your child's potential*. Education Paper, National Institute of Education, Singapore.

Smith, M. E. (1926). An investigation of the development of the sentence and extent of vocabulary in young children. *University of Iowa Studies in Child Welfare* (Vol. 3, No. 5). Iowa City: University of Iowa.

Soh, K. C. (1987). *English–Chinese code-switching of primary school children in Singapore*. Singapore: Institute of Education.

Szmrecsányi, B. 2004. On operationalizing syntactic complexity. In *Le poids des mots.* In G. Purnelle, C. Fairon, & A. Dister (Eds.), *Proceedings of the 7th International Conference on Textual Data Statistical Analysis. Louvain-la-Neuve* (pp. 1032–1039). Louvain-la-Neuve: Presses universitaires de Louvain.

Tan, P. T. (1988). A description of patterns of code-mixing and code-switching in a multilingual household. In J. A. Foley (Ed.), *New Englishes: The case of Singapore* (pp. 70–99). Singapore: Singapore University Press.

Tardif, T., Shatz, M., & Naigles, L. (1997). Caregiver speech and children's use of nouns versus verbs: A comparison of English, Italian, and Mandarin. *Journal of Child Language, 24*, 535–565.

Tardif, T. 2005. But are they really verbs? Mandarin words for action. In K. Hirsh-Pasek, & R. M. Golinkoff (Eds.), *Action meets word: How children learn verbs* (pp. 477–498). New York, NY: Oxford University Press.

Templin, M. C. 1957. Certain language skills in children: Their development and interrelationships. *Institute of Child Welfare Monograph Series, No. 26*. Minneapolis: University of Minnesota Press.

Tweedie, F. J., & Baayen, R. H. (1998). How variable may a constant be? Measures of lexical richness in perspective. *Computers and the Humanities, 32*, 323–352.

Ure, J. 1971. Lexical density and register differentiation. In G. Perren & J. L. M. Trim (Eds.), *Applications of linguistics* (pp. 443–452). London: Cambridge University Press.

Valdés, G. (2001). *Learning and not learning English: Latino students in American schools*. New York: Teachers College Press.

Vermeer, A. (2000). Coming to grips with lexical richness in spontaneous speech data. *Language Testing, 17*(1), 65–83.

Wong, A. M.-Y., Klee, T., Stokes, S. F., Fletcher, P., & Leonard, L. B. (2010). Differentiating Cantonese-speaking preschool children with and without SLI using MLU and lexical diversity (D). *Journal of Speech, Language, and Hearing Research, 53*, 794–799.

Xu, Z. 1996, *Ertong Fazhan Xinlixue [Children developmental psychology]*. Jilin: Jilin Jiaoyu Chubanshe [Jilin Education Press].

Yaruss, J. S. (1999). Utterance length, syntactic complexity, and childhood stuttering. *Journal of Speech, Language, and Hearing Research, 42*(2), 329–344.

Zhao, S. 2008. Cihui nengli pingce de litiguan [A multi-dimensional perspective of assessment of lexical competence]. *Jinan Daxue Huawen Xuekan [Jinan University Journal of Overseas Chinese Language], 30*(2), 22–30, 56.

Zhao, S., & Liu, Y. (2008). Xinjiapo huazu shequn jiating yongyu de shehui yuyanxue fenxi [A sociolinguistic study on home-language use in Singapore Chinese community]. *Shehui Kexue Zhanxian [The Social Science Frontier], 158*(8), 131–137.

Zhao, S., Liu, Y., & Hong, H. (2007). Singaporean preschoolers' oral competence in Mandarin: A corpus study. *Language Policy, 6*(1), 73–94.

Zhou, J., & Chang, C. (Eds.). (2009). *Hanyu ertong yuyan fazhan yanjiu [Research on language development of Chinese children]*. Beijing: Jiaoyu Kexue Chubanshe [Educational Science Publishing House].

Zhu, Z. (Ed.) (1990). *Zhongguo ertong qingshaonian xinli fazhan yu jiaoyu [Psychological development and education of children and teenagers in China]* Beijing: Zhongguo Zhuoyue Chuban Gongsi.

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