

Challenging the “Linguistic Incompetency Hypothesis”: Language Competency Predicts Code-Switching

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1. Introduction

Code-switching, or code-mixing, is often defined as the use of two languages within a single discourse, sentence, or constituents (Lanza, 1992; Myers-Scotton, 1993; Poplack, 1980). Most studies on children’s code-switching are based on naturalistic observations and investigated all forms of switching or mixing, either between utterances or within utterances (e.g., Genesee, Nicoladis, Paradis, 1995; Grim, 2008; Mishina-Mori, 2011; Quay, 2008). In this paper, we refer to code-switching and code-mixing synonymously as the use of two or more languages, such as a word, an utterance, or a conversation, in a single unit of discourse (Genesee, Paradis, & Crago, 2004; Meisel, 1989).

Past studies viewed children’s early code-switching as an inability to differentiate two language systems (Redlinger & Park, 1980, Volterra & Taeschner, 1978). Redlinger and Park (1980) argued that the decreasing of mixing rate as the children spoke more complex sentences was an evidence of a transition process from an undifferentiated single language system to two distinct language systems. However, further examinations of young children’s mixed utterances revealed that they are able to differentiate the two language systems. For example, by the age of age 1;10, a child is able to use language-specific morphology in the appropriate context (Deuchar & Quay, 1998). In addition, studies showed that children do not use inflections of both languages interchangeably (e.g., Siri’s data in Lanza, 1992). In Siri’s case, she only used English grammatical morpheme with English lexical morpheme, such as “looks”, but she used Norwegian grammatical morphemes with both Norwegian and

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English words, such as “looker” and “*husker*”. This implied that children must have acquired a certain level of grammatical knowledge in order to code-switch.

Some researchers attempted to assess the relationship between children’s linguistic competency and code-switching through investigating whether code-switching in elicited narratives can be a mark of language impairment (LI), but so far they have yielded inconsistent results. Iluz-Cohen and Walters (2011) found that the Hebrew-English bilingual children with LI code-switched more than the typically-developing bilingual children. Using BESOS (Bilingual English-Spanish Oral Screener), Greene, Peña, and Badore (2012) also found that children who were identified as at-risk of LI code-switched more than the no-risk group on the English screener. However, the no-risk group code-switched more on the Spanish screener than the at-risk group. It is not clear whether this difference was merely caused by different methods employed or because of language-specific factors.

Despite earlier research that attempted to understand the impact of code-switching on children’s language development, the relationship between children’s code-switching and linguistic competency remains largely unknown, especially in multilingual societies (e.g., Singapore) where code-switching is a common aspect of daily conversation. Singapore is an Asian country with English as the official language and three other languages as the official mother tongues (Mandarin, Malay, Tamil). Majority of its population is ethnic Chinese (74.2%), while the ethnicities of the remaining population are Malay (13.3%), Indian (9.1%), and Others (3.3%) (Singapore Department of Statistics, 2012). English is the most frequently spoken language at home in families with children aged between 5;0 and 9;0 (50.5%), followed by Mandarin (28.3%), Malay language (13.1%), Indian languages (5.8%), and Others (2.2%) (Singapore Department of Statistics, 2010). In accordance with the Singapore bilingualism policy, all children enrolled in Singapore schools have to learn two languages -- English and a mother tongue according to their ethnicity -- but all other subjects are taught in English (Gopinathan, 1999). Hence, English is the shared language amongst all Singaporean children in school, while children are also expected to be fluent in one of the mother tongue languages. To date, little is known about the relationship between code-switching and linguistic competency in young bilingual children growing up in Singapore. Obtaining children’s spontaneous code-switching and language measures in a classroom-based observation in childcare centers in Singapore would enable us to investigate the relationship between the two.

2. Method

2.1. Participants

Fifty-five English-Mandarin bilingual children aged between 5;5 to 6;7 who came from two private childcare centers in Singapore (33 from Centre M and 22 from Centre E; 25 females, 30 males) were observed during their classroom

activities. Additional four participants were excluded either because of low attendance during the observation days that resulted in very little recording time (less than 5% of the total recording time in the center) or because he or she only spoke eight utterances throughout the whole observation session. Both childcare centers conducted classroom activities in English and Mandarin.

2.2. Procedure

Parents were informed about the study and requested to complete the language background questionnaires that were distributed through teacher-parent communication book. We observed the children in each of the two centres for about three hours per day over five days. Thus, we were able to capture children's behaviors in various activity sessions, such as free play, meal time, and group project time (e.g., arts and craft, group writing exercises). Two research assistants (RAs) each used a set of video camera and audio recorder to record the children's conversations and self-talk. As children were assigned into small groups for most of their activities, the two RAs recorded two different groups of children at the same time and each group consisted of about two to five children. The video recordings were used for transcription while the audio recordings were used to check the unintelligible conversations. At the end of the observation sessions, we administered the Peabody Picture Vocabulary Test during one-to-one sessions with the children.

2.3. Materials and Measures

Children's conversations were transcribed in accordance with the Codes for the Human Analysis of Transcript (CHAT) in the Child Language Data Exchange System (CHILDES) (MacWhinney, 2000). The transcripts were then analyzed using the Computerized Language Analysis (CLAN) (MacWhinney, 2000). At least two coders, trained on our criteria listed below, reviewed each section of the transcripts to ensure reliability and consistency of the coding. The basic unit of our analysis is an utterance, which is defined as "a word or group of words with a single intonation contour" (Lanza, 1992, p. 638). Routines (i.e., nursery rhymes, standardized greeting before meal/lesson, songs, and games, such as "scissors-paper-stone") were not included in all our analysis. Ambiguous communicators or interjections that can be used either in an English or Mandarin utterance such as "uh"/"哦", "ah"/"啊", "oh"/"噢", *Singlish*¹ particles (e.g., "meh", "la", "na", see Rubdy, 2007), and onomatopoeia (imitation of sounds, e.g., "woof woof") were marked as non-words in both English and Mandarin contexts in our transcriptions. Therefore, these elements were also automatically excluded from all analyses.

¹Singlish, also known as Singapore Colloquial English, is a creolized form of English spoken in Singapore (Platt, 1975).

2.3.1. Measures of Observed Code-switching

We computed an overall amount of code-switched utterances comprising intra-sentential, inter-sentential, and inter-utterance switches (see Table 1). We divided the number of code-switched utterances by the total number of utterances in each child to obtain a percentage of code-switched utterances for each child because children differed in the number of utterances that they spoke throughout the observation sessions.

Table 1. Measures and examples of code-switching

Measures of code-switching	Example
Intra-sentential switch: the use of two language elements in a sentence (Genesee, Nicoladis, & Paradis, 1995)	A: 我要 (I want to) test 这个 (this one).
Proper nouns in other languages, translation, and imitation were not considered as intra-sentential switches.	A: 我叫 Iron_Man 帮 Ben10. (I call Iron_Man to help Ben10)
Inter-sentential switch: a sentence in one language is followed by a sentence in another language (Genesee, et al., 1995), either immediately or after a gap.	A: No, yes, my mommy said no table manners cannot sit with us.
Turn-taking between interlocutors was not counted as an inter-sentential switch (e.g., child A speaks Mandarin and child B replies in English).	A: 你要改去坐在我们桌子上吗? (Do you want to change to sit on our table?)
Inter-utterance switch: a sentence in one language is followed by an intra-sentential switch, or vice versa, either immediately or after a gap.	A: 我要 (I want) the short piece. A: I need a short piece, any color.

We reported inter-utterance switches because the children in our study who produced intra- and/or inter-sentential switches also often switched between a pure utterance and an intra-sentential switch utterance, or vice versa. We believe that it is important to count these switches to better understand the children's full repertoire of code-switching behavior.

2.3.2. Measures of Receptive Language Competency

The Peabody Picture Vocabulary Test (4th Edition; PPVT-IV; Dunn & Dunn, 2007) was used to measure the English receptive vocabulary in individuals aged 2;6 or above. There was no equivalent approved Mandarin version that could be used in this study. Children were tested individually in this task. Children were asked to choose one out of four pictures that depicts the word that was spoken by the experimenter. Eleven children from Center M and five children from Center E did not participate in this task due to a lack of

parental consent for this task. Raw scores were converted to age-based standard scores according to the manual.

2.3.3. Measures of Expressive Language Competency

2.3.3.1. Number of different word roots (NDWR) per minute

We computed the number of different word roots (lemma), also known as word types, produced by the children in English and Mandarin. In English, different words that are from the same word roots are considered as one word type (e.g., eat-ate-eaten). All words produced in both complete and incomplete utterances were included in this measure. Words other than English and Mandarin (e.g., “*chaota*”, which means “burnt” in Hokkien language) and proper nouns (e.g., “Rapunzel”, which is a movie title, “小兔跳楼” (xiao3tu4tiao4lou2), which is the name of a local hand game) were excluded from the computation of this measure. We divided NDWR by each child’s duration of recording in minutes in order to control individual differences in the duration of recording (see Aukrust & Rydland, 2011).

To determine what a word is in both languages, we used the lexicon database from the CLAN website (dated 27 May 2013). We also added words that were not listed in the database, but we think that they should be regarded as words because of local context, for example, durian (name of local fruit) and 名卡 (*ming2ka3* which means business card, but in the mainland China 名片 (*ming2pian4*) is more commonly used to refer to the same thing). The use of word root as an indicator of children’s lexical diversity has been found to be positively associated with other measures of vocabulary (Condouris, Meyer, & Tager-Flusberg, 2003). It also has been frequently used as a measure of children’s lexical development (Hewitt, Hammer, Yont, & Tomblin, 2005; Thordardottir, 2005; Watkins, Kelly, Harbers, & Hollis, 1995).

2.3.3.2. Mean length of utterances (MLU)

Pure English or Mandarin utterances are defined as utterances that contained only English or Mandarin. We computed MLU (ratio of morphemes over utterances; Brown, 1973) of pure English utterances and pure Mandarin utterances as a measure of language complexity (Klee, Stokes, Wong, Fletcher, & Gavin, 2004; Mishina-Mori, 2011; Thordardottir, 2005). In addition, routines and utterances which only consisted of imitations, translations, or single proper nouns, were excluded from this analysis. Words other than English and Mandarin that have been assimilated in Singapore (e.g., “*chaota*”, which means “burnt” in Hokkien) were also excluded from the morpheme count.

Utterances that contained unintelligible words were still included in the computation, but these unintelligible words were excluded from the morpheme counts. Unintelligible utterances were automatically excluded in the analysis. This approach was used as in free play samples of recording, noises from toys

and the surroundings often decrease the children’s recorded utterances (Thordardottir, 2005). Furthermore, the classrooms in both childcare centers implemented an “open-concept”, which resulted in the interference of the voices of children from other classroom or other groups in the same classroom in most of the observation sessions.

2.3.4. Demographic information and language background

Parents completed a questionnaire about the child’s demographic information such as age and gender of the child, the child’s language exposure at home (e.g., “For a typical week, estimate how much time (%) your child hears and/or speaks _____?”), and socioeconomic status (SES) as measured by parents’ educational status (range from 0 for *no formal education* to 5 for *postgraduate degree*).

3. Results

A total duration of 21:16:43 hours and 30:09:48 hours of observation in Center M and Center E, respectively, was transcribed and analyzed. The demographic and language background information of the children are summarized in Table 2. The children were reported to have an average exposure of 55.30% English and 41.80% Mandarin at home. The average socioeconomic status (SES) as measured by parents’ educational status (0 for *no formal education* to 5 for *postgraduate degree*) was 3.98.

Table 2. Summary of children’s demographic and language background information

Variables	Mean (SD)
Age	6.06 (0.34)
Average of parents' education (SES)	3.98 (0.54)
Parental report of English exposure	55.30 (19.93)
Parental report of Mandarin exposure	41.80 (20.15)

Some of the measures of interest were not normally distributed. Thus, Spearman correlations were used. English receptive vocabulary (as measured by PPVT) did not significantly correlate with the percentage of code-switched utterances (number of code-switched utterances divided by total number of utterances; see Table 3). Children who switched more also tended to produce a larger variety of words, as indicated by the significant and positive correlations between English and Mandarin NDWR per minute and the percentage of code-switched utterances. Moreover, children who switched more also tended to produce more complex sentences in Mandarin, as measured by MLU.

Table 3. Spearman Correlations between Measures of Language Competency and Percentage of Code-Switched Utterances (controlled for age)

	Mean	SD	1	2	3	4	5
1. Number of code-switched utterances (%)	13.74	16.32					
2. MLU English	5.03	0.74	-.09				
3. MLU Mandarin	4.25	1.42	.68***	-.06			
4. English NDWR per minute	1.83	0.89	.29*	.43**	.24		
5. Mandarin NDWR per minute	0.85	0.96	.84***	-.09	.79***	.29*	
6. PPVT Standard Scores	100.69	12.33	-.24	.10	-.08	-.03	-.24

* $p < .05$, ** $p < .01$, *** $p < .001$

We computed a composite variable that measures *Expressive Language Competency* for each of the two languages by taking an average of the respective NDWR per minute and MLU. A hierarchical regression analysis (controlled for age) was used to examine whether English Expressive Competency, Mandarin Expressive Competency, and English PPVT predicted the percentage of code-switched utterances (log transformed). Only Mandarin Expressive Competency significantly predicted the percentage of code-switched utterances (see Table 4).

Table 4. Summary of Hierarchical Regression Analysis

	Predictors	β	F	ΔR^2
Step 1:	Age	.44**		
	F and ΔR^2 for Step 1		8.73**	.19
Step 2:	Age	.05		
	English expressive competency	-.02		
	Mandarin expressive competency	.82***		
	PPVT	-.04		
	F and ΔR^2 for Step 2		21.31***	.52

* $p < .05$, ** $p < .01$, *** $p < .001$

4. Discussion and Conclusion

This present study investigated the relationship between the amount of code-switch preschoolers engaged in their classroom and their receptive and expressive language competency. No significant negative relationship between the percentage of code-switched utterances and the various measures of

language competency was found. Instead, the percentage of code-switched utterances was significantly and positively associated with Mandarin competency as measured by MLU and NDWR per minute. Regression analyses also revealed that the composite of MLU and NDWR (Mandarin Expressive Competency) positively predicted the percentage of code-switched utterances. Children who code-switched more often also produced more complex pure Mandarin sentences and more diverse Mandarin words.

Our results showed no evidence of an association between linguistic incompetency and code-switching. On the contrary, English and Mandarin NDWR per minute were positively associated with the percentage of code-switched utterances. Although past studies have shown that some children used code-switching to fill lexical gaps (e.g., the use of Japanese word ‘*oni*’ (ogre) in narratives in Takemoto, 2001), this does not mean that bilingual children code-switch because they have lower vocabulary in either of the two languages. Children may code-switch because some concepts are better conveyed in one language compared to another (Heredia & Altarriba, 2001). It is also possible that the bilinguals know the words in both languages, but choose to use the equivalent word less frequently in one of the languages. Thus, our results support the argument that code-switching is not an indication of a lack of vocabulary in either one of the languages in bilingual children.

Our results also showed that children who code-switched tend to produce more complex pure Mandarin sentences, though similar trend was not observed in English sentences. One possibility that contributed to a lack of positive relationship with English MLU is the nature of Singapore Colloquial English (SCE) commonly used in Singapore. Two of the common characteristics of SCE are the absence of a subject in a clause (e.g., “(That car) very expensive, you know.”) and the deletion of the copula ‘be’ (e.g., “that boat \emptyset very short one”) (Leimgruber, 2011). This may limit the usefulness of MLU as an indicator of English language complexity in a Singapore sample.

As there is no approved equivalent standardized measure of receptive vocabulary in Mandarin, it is not known whether similar patterns would be observed between the amount of code-switch utterances expressed by children and their level of Mandarin receptive vocabulary. In addition, the indicator of Expressive Language Competency was measured at the same time as the code-switching utterances. Thus, we cannot claim that higher language competency leads to greater amount of code-switching or vice versa. We can only infer that young children who code-switch more frequently are generally more competent in Mandarin, and that they are not disadvantaged in their English competency.

In summary, there is no evidence of linguistic incompetency in bilingual children who code-switch. Children who code-switched more with peers demonstrated a greater level of expressive linguistic competency in one language, while showing no sign of a weaker level of competency in another, than children who code-switched less. Code-switching may be a mark of linguistic competency, i.e., bilingual children code-switch because they have the linguistic competency in both languages to do so.

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