Spring 2016

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Sentence Repetition in Sequential Bilingual Preschool Children

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Defense Date
March 31, 2016

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Abstract

This study explores how sequential bilingual children, who first learn Cantonese (L1) and then English (L2), process sentences in each language. Previous studies have examined the processing abilities in monolingual children and bilingual school-aged children using sentence repetition tasks. However, little is known about how younger bilingual children process sentences in L1 and L2. Specific research questions were: (1) How do sequential bilingual children process sentences in L1 and in L2? (2) Are there any relationships between children’s the sentence processing skills and their vocabulary skills within and across two languages? Participants were 50 preschool aged children, who were exposed to Cantonese from birth and had about one year of English experience in preschool settings. Participants’ vocabulary skills were evaluated using Cantonese-English bilingual vocabulary measures developed by Koenig and Kan (2011); and their sentence processing skills were measured using a sentence repetition (SR) task in Cantonese and in English. Results indicated that: (1) children’s SR performance in L1 was higher than that in L2; (2) their overall vocabulary appears to be related to sentence processing in both languages.

Keywords: Bilingualism, sentence repetition, sentence processing.
The purpose of this study, utilizing a sentence repetition task and vocabulary measures, was to determine how sequential bilingual children process sentences in their first language (L1) and in their second language (L2). In this study, I focus on sequential bilingual children who are exposed to Cantonese at home from birth and start to learn English in preschool settings. Specifically, I would like to examine if there are any relationships between children’s sentence processing skills and their vocabulary skills in the children’s home language (i.e., Cantonese) and in their second language (i.e., English). Sentence repetition (SR) tasks, which are also known as sentence recall or sentence imitation tasks, have been used to examine the underlying language processing skills (e.g., Archibald & Joanisse, 2009; Devescovi & Caseli, 2007; Ebert, 2014; Stokes, Wong, Fletcher, & Leonard, 2006). SR performance is linked to working memory, syntactic and semantic skills (e.g., Archibald & Joanisse, 2009; Stokes et al. 2006). Generally speaking, a SR task involves multiple sentences of varying length and difficulty. The participant is explicitly instructed to listen and repeat each sentence. That is, after each sentence is presented, the participant must then repeat the sentence, which is recorded and scored. Many forms of scoring exist for this task, which ultimately changes what the task is measuring.

Regardless of what it is measuring, there is agreement that “SR maps underlying language skills” (Ebert, 2014, p.632). According to Devescovi and Caselli (2007), “the repetition test is reliable, discriminates between the different age groups examined, highlights the relevant developmental stages described in the literature, and provide a reliable measure of the mean length of utterance” (pg 188). It has been used as a clinical marker to measure morphological and syntactic skills in typically developing monolingual children, as well as in language-impaired children (Christensen & Hansson, 2012; Devescovi & Caselli, 2007; Komeili & Marshall, 2013).
Further insight is needed to determine the relationship between vocabulary skills and SR performance, as well as to determine how this task can be applied to bilingual children.

Sequential bilingual children face a unique language challenge. The first day in the classroom, these children are removed from their typical language setting and surrounded by a language they have never used. This transition can be difficult for many children and families. For the child, these dueling languages can be confusing as the school may tell the child English is more important and the parents may emphasize the use of the home language. As children get older, they also face the challenge of bullying and feeling different because English is their second language. As a parent, being a minority speaker in a country that expects their child’s schooling to be completed in a language that is secondary to their own would be frightening and intimidating. Many Asian minorities in the United State have faced harsh adversity. This discrimination includes violence, anti-Asian riots, and laws against citizenship, many of which have only recently ended and the idea of this discrimination continuing through a child suffering in schooling because of a language difference is devastating. The outcomes of this study may have implications that help this population rise above the challenges that lie ahead of them.

**Language Processing in Young Children**

Language processing is a complex task. There are three main divisions within language: form (morphology and phonology), content (semantics) and use (pragmatics and syntax) (Bloom and Lahey, 1978). The form of a language is made up of the phonology, otherwise understood as the individual speech sounds accepted for that language, and the morphology is represented by the smallest meaningful units of speech for that language. For instance, in English, ‘cat’ is one morpheme created through the combination of 3 phonemes, or sounds, ‘c-a-t’; In comparison, ‘cats’ is two morphemes, comprised of four phonemes. This is because adding the -s at the end
of cat changes its meaning from one cat to plural cats. The units that carry meaning, but cannot exist on their own, such as plural -s, are considered bound morphemes, whereas morphemes that can stand alone, such as cat, are considered free morphemes. Morphemes will be used in the scoring process of this study. Not only do children have to learn these individual speech sounds and their combinations, but they must also learn to attach meaning to these combinations of sounds. This is understood as content, or semantics. Stress patterns, the melody of speech, tone, body language, and eye contact all fall under the umbrella of pragmatics, and syntax deals with the organization of structure and grammar of a language. One task can be used to measure many of these factors.

SR has been used to examine the language processing abilities in monolingual English-speaking children & SR has been shown to be a potential marker for Specific Language Impairment (SLI) (e.g., Devescovi & Caselli, 2007; Thordardottir & Brandeker, 2013); “SLI is a language disorder that delays the mastery of language skills in children who have no hearing loss or other developmental delays” (National Institute of Deafness and Other Communication Disorders, 2015). Performance on recall tasks have been found to correlate with scores on different language tests, and is understood as a quick and informative probe of children’s language (e.g., Chiat & Roy, 2008; Gupta, MacWhinney, Feldman, & Sacco, 2003). This prompts an interest in the use of the SR task to be used as a clinical marker in bilingual children. Because of the high diagnostic success rate of SR in typically developing monolingual children, with 97.1% of monolingual children with SLI were correctly identified (Leclercq, Quémart, and Magis, 2014), suggests more research should be performed with SR in bilingual children. The data and results of this study may aid in further research of the SR task and its use for SLI identification in the bilingual population.
However, Thordardottir and Brandeker (2013) suggest that typically developing bilingual children may be falsely identified as having language impairment when only sentence repetition is used. But this should not stop further research into the topic, as Leclercq et al. (2014) tells us, “a systematic application of various scoring measures to sentence repetition performances could offer a valid first glimpse into the linguistic difficulties of children with SLI” (p. 3429). One study has indicated that SR is a valid marker for SLI in monolingual Cantonese children. This same study, conducted by Stokes et al. (2006), determined the scoring methods for the SR task changes the effect of the testing. By measuring the amount of errors in a sentence, the most successful method for differentiating between SLI and typically developed age matched (TDAM) groups was found, although the authors suggest it may be best used as a screening tool. Other authors have determined that SR is a valid and suitable instrument for assessing grammatical abilities in 2-4 year old children and discriminating specific grammatical profiles in children with a variety of language disorders (Devescovi & Caselli, 2007; Vicari, Caselli, Gagliardi, Tonucci, & Volterra. 2002).

SR, as concluded by Thordardottir and Brandeker, has a promising outlook to become a clinical marker for Specific Language Impairment in the bilingual population. Another study, focusing on Spanish-English bilinguals explains, “Despite its apparent simplicity, SR appears to tap multiple underlying skills” (Ebert, 2014, p.631). However, when addressing bilingual children, some results have shown that SR, when used alone, may falsely identify children with SLI. An example of this is seen in Thordardottir and Brandeker’s (2013) study using SR with simultaneous bilingual children to determine the effect of language exposure, as well as determining the diagnostic accuracy of the task: the specificity of the SR task in bilinguals was only 57%. In a study comparing non-verbal working memory and sentence repetition
performance, Ebert shows us that nonverbal working term memory, or short term memory, is associated with SR scores in both languages for bilingual children with language impairment (LI), thus revealing weaknesses in memory rather than language.

Previous findings have uncovered the complexity of this task. The task is unique and interesting in the multitude of ways it can be implemented, with the ability to probe both underlying mechanisms, as well as linguistic abilities. The task has also been shown to be a clinical marker for SLI in monolingual children. Although many different aspects have been used in comparison with the SR task, little has been done to compare vocabulary and SR performance. As mentioned, semantics has been shown to play a role in SR performance, demonstrating a need for vocabulary measures to be compared with SR. Vocabulary is closely tied to the underlying mechanisms, causing this comparison to be probing more that just the linguistic aspect. The bilingual population is of particular interest, as the task has potential to be a clinical marker for this group of speakers as well. This study will utilize the task in a new way, comparing task performance with vocabulary scores to determine the connection between the two and determining its use as a clinical marker in young sequential Cantonese-English bilingual children.

**Sentence Repetition Performance: External and Internal Factors**

External factors are known to contribute to language processing, and are most relevant during the early years of life, when the brain is cracking the code and deducing the rules of the language(s) it is surrounded by. The amount of language exposure plays a large role in language skills, including how often the infant/child is surrounded by spoken language, how often the child is read to, and how much interaction that child has with caregivers, with limited exposure
in any of these criteria leading to stunted skills in early language (Thordarottir & Brandeker, 2013). The type of exposure is also relevant, such as conversational speech or reading.

These aspects have shown an effect in SR performance: External factors were discovered to play a role in SR performance by Westman, Korkman, and Mickos (2008) who found that bilingual children scored below their monolingual peers in a Swedish-Finnish language profile, suggesting that the amount of language exposure changes SR performance. The lower specificity found in the results of Thordardottir and Brandeker (2013) may also be related to the amount and type of language exposure the children had. There are many underlying mechanisms, or internal factors, that contribute to language processing including hearing abilities, attention span, cognitive abilities, comprehension, and memory (Turnbull & Justice, 2008).

Indeed, it is likely that both language experience and ability play a role in children’s performance on sentence repetition tasks. Cognition and language skills are deeply interwoven, a good example being shown in vocabulary skills. Vocabulary is the first building block of language: if a child does not begin to recognize the words that surround them, they surely cannot learn how to combine them to create more complex meanings. Because this is the first skill to develop, it is one of the only forms of language testing and insight available for young children, and it continues to be an important clinical marker for older children as well. Receptive vocabulary typically develops first, showing an understanding, or lack thereof, of words and gestures (Turnbull & Justice, 2008). Testing this skill requires no verbal production.

The next step in language development is expressive vocabulary, beginning with single words, followed by the addition of more words and bound morphemes, building into expressive phrases. Expressive language offers a much wider range of language testing and is used over the course of a child’s development to measure their language development progress. Vocabulary is
relevant to SR as children and adults have, in multiple languages, shown a higher accuracy rate in the recall of words over nonwords, demonstrated in a plethora of studies (Estes, Evan & Else-Quest, 2007; Coady & Evans, 2008; Hoff, Core, & Bridges, 2008; Walker & Hulme, 1999; Hulme, Maughan, & Brown, 1991; Saint-Aubin & Poirier, 2000; Romani, McAlpine, and Martin, 2008; Miller & Roodenrys, 2009) (as cited by Polišenská, Chiat, Comer, & McKenzie, 2014).

However, language gains cannot be achieved without a certain level of cognitive function. A child may hear all of the sounds and be able to understand the rules that combine them, but have poor verbal working (or, short term) memory, restraining them from producing words. Verbal working memory has been shown to play a unique role in children with language disorders, potentially distinguishing them from their typically developing peers (e.g., Weismer, Tomblin, Zhang, Buckwalter, Chynoweth, & Jones 2000; Vicari, Caselli, & Tonucci 2000). However, one must keep in mind that performance on SR tasks is not solely affected by factors above, as it has also been shown that children apply fewer memorization strategies or rehearse less than adults (Gathercole & Hitch, 1993) and that attention span can play a significant role in language task performance. Fatigue and boredom are other factors to consider when looking at task performance.

Many studies have agreed that SR also depends on linguistic abilities, including long-term syntactic and semantic knowledge, morphological knowledge, and lexical abilities (Allen & Baddeley, 2009; Archibald & Joanisse 2009; Leclercq et al. 2014; Devescovi & Caselli, 2007). Further evidence of linguistic abilities, specifically semantics, involvement on sentence recall can be seen when comparing the recall of words vs. nonwords (meaningless combinations of sounds that follow a language’s phonological rules). In children with specific language
impairment (SLI) domain-general memory, phonological short term memory, long term memory (specifically grammatical knowledge), and nonverbal working memory have all displayed a unique role in SR performance (Ebert, 2014, p. 631; Riches, 2012). Surely linguistic ability plays a role in recall, but there is debate as to what aspects of language the task draws upon. Some, such as Riches (2012), argue that ‘sentence repetition is poorly understood’ (p.499). Others claim that semantics plays a key role in sentence recall (Polišenská et al. 2014; Alloway, 2007; Potter & Lombardi, 1990). Potter and Lombardi’s (1990) evidence, supporting semantics use in recall, argues that sentences are not stored as a string of words, but rather the meaning of the sentence as a whole, which is imagined during comprehension and regenerated during the sentence production. This has suggests that the sentence’s meaning is stored longer than the arrangement of the words it is composed of. It has been emphasized that phonological information in sentence repetition depends on the delay between the presentation and recall.

This leads us to yet another factor that contributes to sentence recall: SR task presentation. There are multiple variations of task presentation including immediate recall, delayed recall with no intrusion, and delayed recall with intrusion. Intrusions can be understood as a distracting task between presentation and recall, such as counting or listening to a series of words (Rummer and Engelkamp, 2003). Devescovi et al. (2005) found that lexical-grammatical associations changed between these different types of task presentations. Studies with both adults and children have produced results that have a similar pattern, with immediate recall scoring better than delayed recall (Riches, 2012; Rummer & Engelkamp, 2003). It is also worth noting that the poor performance of children with SLI may stem from a combination of auditory processing difficulty and cognitive skill weakness (Ebert, 2014). Another view is when probing semantics, required for sentence comprehension, delayed repetition is more suitable for testing
and when probing for lexical phonology and morphosyntax, immediate provides more information (Poliszanka et al. 2014).

Perhaps it is best to think about sentence recall through a combination of cognition and linguistic abilities, influenced by the presentation of the task: therefore scoring should be applied according to purpose of assessment (Leclercq et al. 2014). Both immediate and delayed recall draw on all levels of linguistic representation, but the amount of their respective contributions differ: “Immediate sentence recall relies on lexical phonology and morphosyntax, while delayed recall relies more on semantics” (Poliszanská et al. 2014, p. 74). Instead of calling delayed more accurate probing, it is better to think of it as providing more insight about content interpretation of language input, while immediate provides more information on lexical and morphosyntactictic knowledge. It is also worth noting that by taking into account the number of words repeated correctly, it shows the differences between a child who fails to verbatim repeat a sentence because they failed to remember one word and a child who is unable to repeat most of the sentence.

Clinically, SR has a variety of implications. Sentence repetition skills may pose as potential markers for language impairment, as demonstrated in a study by Conti-Ramsden, Botting, & Faragher (2001), which found sentence repetition as the most useful indicator of SLI in older children. Ebert, 2014 also found that SR performance distinguishes children with SLI from typically developing peers and Leclercq et al. 2014 found the task as the most efficient tool for diagnosing language impairment. Including those discussed above, SR has been used in an array of situations to probe the underlying mechanisms: Devescovi & Caselli (2007) used the task to link verbal working memory with sentence repetition; Ebert used SR to compare memory span and MLU; Rummer, Schwegge, & Martin (2013) used the task to compare auditory
memory and written memory; Stokes et al. (2006) assessed working memory with SR performance. Sentence repetition has also been used to evaluate and discriminate specific grammatical profiles, including children with language disorders (e.g., Leclercq et al., 2014; Devescovi & Caselli, 2007). It is possible for one to reach the conclusion that the SR will continue to be a most promising candidate as a clinical marker for SLI in the languages it has yet to be tested (e.g., Archibald & Joanisse 2009; Conti-Ramsden et al. 2001).

The Current Study

This current study focused on the relationship between semantics and language processing skills in young Cantonese-English sequential bilingual children who are in their first years of English exposure. The dataset was collected by Dr. Pui Fong Kan as a part of her study. I am responsible for analyzing this dataset. The current study implemented a SR task in both languages, as well as vocabulary tasks in both languages. This study asked: (1) How do sequential bilingual children repeat sentences in L1 and in L2?; Do they have better performance in L1 (i.e., their stronger language L1) than that in L2 ? (2) Are there any relationships between children’s the sentence processing skills and their vocabulary skills in Cantonese and in English?

I hypothesized that children will be able to repeat sentences in L1 and L2, and because they have had a longer exposure in L1, I predicted that their first language will show better results. I also hypothesized that vocabulary within each language will affect sentence repetition performance. As the task has been successfully implemented in many languages, I believed the participants will be able to repeat the sentences in both languages because they are speaking both languages regularly. The modality effect likely plays a role here. I believe the vocabulary scores will affect performance as semantics has been shown to play a role in monolingual sentence
recall (e.g. Polišenská et al., 2014; Alloway, 2007; Rummer & Engelkamp, 2003; Schweeppe et al., 2011) and a higher accuracy rate in the recall of words over nonwords has been observed (e.g. Coady & Evans, 2008; Estes et al., 2007; Hoff et al., 2008; Hulme et al., 1991; Saint-Aubin & Poirier, 2000; Walker & Hulme, 1999; Romani et al., 2008) (as cited by Polišenská et al. 2014).

**Methods**

**Participants**

Participants were 50 bilingual preschool-aged children who have been exposed to Cantonese (L1) at home from birth, and English (L2) at school. Our participants were recruited at a Head Start program in San Francisco. They were comprised of 23 male and 27 female participants, with ages ranging between 38-65 months, with a mean age of 52.5 months (SD = 6.59). According to the parent and teacher reports, all participants spoke Cantonese as their first language and started to learn English only when they started preschool. It is worth mentioned that the participants likely had some exposure to English prior to beginning the preschool program through experiences such as listening to the radio, watching television, going to movies, and conversation with older siblings, etc. On average, participants had 14.2 months of classroom English exposure (SD = 8 months). In the preschool program, the majority of the teachers and staff were Cantonese and English bilinguals, while some teachers were monolingual English speakers.
Measures

In order to determine the effect that L1 has on L2, different measures were used to assess and compare language skills in both languages. Expressive and receptive vocabulary was measured in both languages through picture naming and picture identification tasks.

**Vocabulary measures.** Two tasks were used to assess vocabulary: picture naming and picture identification. The tasks were administered in four individual testing sessions (two Cantonese, two English) on four different days. Within each task, the language of administration was counterbalanced across participants. The picture naming task and the picture identification were administered in a random order. One hundred and three nouns were used in picture naming and ninety different nouns were used for picture identification; no test items were repeated across the two tasks. The items include nouns, verbs, and adjectives. These items were selected from different categories (food, animals, clothing, action etc) based on the words lists from Bates-MacArthur Communicative Development Inventory (MCDI; Fenson et al., 1993) and from Chinese Communicative Development Inventory – Cantonese version (CCDI-C; Tardif, Fletcher, Liang, & Kaciroti, 2009). These selected items were identified as being generally consistent with the experience of young Cantonese-English bilingual children (cf., Kan & Kohnert, 2005). The pictures used to represent the selected items were from *Art Explosion Photo Objects 150,000* (Nova Development, 2004) and Microsoft images. The tests were administered to one participant at a time, in a quiet classroom in the Head Start preschool. The examiners were trained research assistants who are native speakers of Cantonese or English.

The picture naming task was used to measure expressive vocabulary in Cantonese and in English. The participants were shown the picture stimuli individually and asked to verbalize the name of the object. When a picture was shown, the examiner would ask the participant “What is
it?’ for English sessions, and “呢個係乜野呀？” in the Cantonese sessions. If the child did not respond within 10 seconds, they were given a no response. The total number of pictures named in each language was recorded. Alternative productions reflecting dialectal variations were accepted as correct.

In order to test receptive vocabulary, a picture identification task was used. The participants were shown a picture of each target noun along with three foils: one similar in form, one similar in meaning, and one unrelated to the target. All four pictures, of equal size, were presented at one time on a single 8 ½” x 11” sheet. The participants were instructed to look at the picture and then point to a named item. For each picture sheet, the participant was told, “Show me ___” for English tests, or, “邊個係 ___ ” for Cantonese tests. If the child did not respond within 10 seconds, they were given no response. The total number of pictures identified in each language was recorded. Alternative productions reflecting dialectal variations were accepted as correct.

**Sentence repetition task.** The participants’ language processing skills were measured by the sentence repetition task, performed in both Cantonese and in English. The test was adapted from the sentence repetition task by Devescovi & Caselli (2007). This task was composed of two similar tests, one in English and one in Cantonese. Each test was made up of 26 sentences in varying degrees of complexity. For a complete list of the sentences used and their associated complexity levels, see Appendix A. In English, both content words (modifiers, verbs, and nouns) and function words (definite articles and prepositions) were used in this test, focusing on key grammatical developments in L1 and L2. In order to control for the effect of vocabulary on sentence repetition, words selected were familiar words to young Cantonese-English bilinguals. All nouns were selected from early acquired words (such as ‘boy’ and ‘park’) in both
languages. Verbs were composed from early acquired concepts (such as ‘to eat’ and ‘to cry’) and later acquired concepts (such as ‘to be’ and other auxiliary verbs) in both languages. In the English sentences, the verbs were conjugated in one of the following tenses: 3rd person singular, 3rd person plural, 1st person plural, present progressive -ing, past tense -ed, plural -s. Verbs were preceded with at least one of the following: nouns, modifiers, auxiliary verbs, and pronouns.

The levels of sentence complexity were determined by the number of arguments, found in each sentence. We considered an argument to be an expression or a syntactic element that helps complete the meaning of the subject and the predicate. The test began with the easier sentences and the complexity of the sentences progressed, becoming more difficult until the final level was reached. Level one was comprised of a subject and a predicate; each subsequent level contained this basic structure plus the addition of an argument for each increase in level. For examples of complexity levels, see Table 1. The number of sentences per complexity level was consistent across the tests in both languages: eight sentences in level one, eight sentences in level two, eight sentences in level three and two sentences in level four. The number of morphemes per level was in each language was similar as well. In Cantonese the number of morphemes per complexity levels (1-4) were as follows: 46, 49, 71, 23. In English morphemes per complexity levels (1-4) were slightly lower: 40, 45, 69, 22.
Table 1. Sentence Complexity Levels in English

<table>
<thead>
<tr>
<th>Sentence Level</th>
<th>Example Sentences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1</td>
<td>The balloon is big; The bird is pretty</td>
</tr>
<tr>
<td>Level 2</td>
<td>The turtle walks slowly; The girl opens the window</td>
</tr>
<tr>
<td>Level 3</td>
<td>The dog chases the cat; My brother is in the room</td>
</tr>
<tr>
<td>Level 4</td>
<td>The dog the girl likes is chasing the cat; The boy wearing a hat has broken the bowl</td>
</tr>
</tbody>
</table>

In each language, the sentence repetition task was administered by trained Cantonese-English bilingual research assistants in a quiet room in the Head Start Center in two different sessions on two different days. The test examiner began by reading the first sentence on the test form to the participant. The examiner waited up to 10 seconds for the participant to respond, and if no response was given, the examiner was allowed to repeat the sentence only once. The examiner manually transcribed the oral response produced by participant in real time, including errors and other critical details (e.g., such as unintelligibility or mumbling). If the sentence was read twice the, participant was given the score of “no response”. The examiner presented the sentences in sequential order so as to ensure the complexity of the sentences was consistent. The tests were administered 1 to 3 days apart, depending on each child’s availability.

**Scoring and Coding**

Scoring and coding were completed in the lab in Boulder after the data were collected in San Francisco. The focus of this study was on percent morphemes correct for both languages. Morphemes are the smallest meaningful units of speech, and are language specific (see
introduction for further explanation). In Cantonese, each character is considered a morpheme, as each character holds a piece of semantic information. Therefore, we considered each morpheme a possible point. In English, each possible morpheme, bound and free, was considered as a possible point. Accordingly, a morpheme count based on the transcriptions from the scoring sheet was completed for every word for each participant in both languages. A key of the total number of morphemes for each sentence was created for each language by myself, and was confirmed by the lab coordinator. After counting the correct morphemes, I totaled the number of correct morphemes in three different contexts: per sentence, per complexity level, and the test in its’ entirety. A Cantonese English bilingual lab member translated and assisted in interpreting comments when necessary.

For the sentence repetition task in English, using the score-sheets transcribed by the trained test examiners, I manually counted and recorded the morphemes correctly produced by each participant for each sentence, writing the score next to the sentence to allow for totaling the morphemes in different ways. Correct repetition of a morpheme was given a point. When scoring the Cantonese task sheets, the morphemes were counted as a correct production if there were no comments, or the characters transcribed match that of the sentence verbatim. If characters were crossed out or had a symbol written beneath them, they were considered incorrect. If the examiner did not make any marks other than the participants information on the score-sheet (date of birth, etc.), the responses were considered correct. This assumption was made possible because as score of ‘no response’ was given if the participant did not respond. If the participant did not produce a target morpheme, or produced the wrong morpheme, they were not given any points for that respective morpheme. Within each participant, consistent articulation errors that did not affect intelligibility were treated as a correct production, as this aspect of analysis is
probing for deeper language insight. No points were lost for adding words. The morpheme totals for each sentence were counted twice in a row on one day, and recounted on a separate occasion before scoring.

For each individual, sentence morpheme totals were then summed by complexity level to analyze the effect of language complexity on repetition abilities. This was done for all four levels in both languages by adding the totals from the respective sentences for each level. The complexity-level sums were then divided by the number of morphemes possible for each respective level in order to obtain the percent-correct per level for each participant. The individual complexity-level percent-correct was then averaged, per level, to find the mean percent-correct in both languages. I then calculated a total score (the morpheme sum) in both languages for each participant by adding the sentence totals. Each test was summed twice to ensure correct totals. To find the percent-correct for the individual participants, the participant’s summed score for each test was divided by the possible number of morphemes for each respective test version. The percent-correct by each participant was summed and then averaged to find the mean percent-correct for each language. A different research assistant in the lab performed a reliability check for both languages by counting the morphological errors of 10 randomly selected participants (20% of the data). Results show that both raters have reached 94% agreement.

**Results**

**Receptive and Expressive Vocabulary in L1 and in L2**

Participants successfully completed the expressive and receptive vocabulary tasks in each language. See Table 2 for a summary of vocabulary scores. Vocabulary seemed to play a role in sentence repetition abilities with data across all participants displaying that their language with
higher expressive and receptive vocabulary abilities, is also the language with the higher sentence repetition abilities. Repeated measures ANOVA was used to analyze the expressive and receptive vocabulary scores. Results showed that there was a mean effect of language on children’s expressive vocabulary \([F(1, 49) = 20.07, p < .001]\) and receptive vocabulary, \([F(1, 49) = 24.55, p < .001]\). The results suggest that children had stronger expressive and receptive vocabulary in Cantonese than that in English.

Table 2. Vocabulary Task Scores and Data

<table>
<thead>
<tr>
<th></th>
<th>Cantonese (L1)</th>
<th>English (L2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Picture Naming (in words)</td>
<td>50.35 (21.83)</td>
<td>35.06 (25.58)</td>
</tr>
<tr>
<td>Picture Identification (in words)</td>
<td>60.5 (15.65)</td>
<td>51.71 (19.87)</td>
</tr>
</tbody>
</table>

Note: The numbers listed above are vocab Mean (SD) in words.

Sentence Repetition Scores in L1 and in L2

Table 3 summarizes children’s sentence repetition performance in Cantonese (L1) and English (L2). Overall, young sequential bilingual children appeared to be able to repeat sentences in both languages. Repeated measures in ANOVA were used to analyze children’s performance in the sentence repetition tasks, with language and complexity as independent variables. Results showed that children appeared to have better performance in their first language. As a group, children had better performance when sentences were presented in
Cantonese and had higher scores in shorter sentences than longer sentences. Results showed there was a main effect of language \([F(1, 49) = 35.29, p < .001]\) and a main effect of complexity, \([F(3, 147) = 152.09, p < .001]\) on children’s sentence repetition performance. Multiple comparisons shows that children had better SR performance in Cantonese than that in English \((p < .001)\). Multiple comparisons also showed that children had stronger performance repeating shorter sentences than longer sentences \((\text{Level 1} > \text{Level 2}, p < .05; \text{Level 2} > \text{Level 3}, p < .001, \text{Level 3} > \text{Level 4}, p < .05)\). Participant scores decreased as the complexity levels increased (see Figure 1). This trend was consistent in both languages, and the participants with stronger sentence repetition abilities in L1, repeatedly had a stronger sentence repetition abilities in L2.

| Table 3. Percent correct of target morphemes in L1 and L2 by sentence complexity level |
|---------------------------------|---------------|---------------|---------------|---------------|---------------|
| Language (L1) | PCC Level 1 | PCC Level 2 | PCC Level 3 | PCC Level 4 |
| Cantonese (L1) | 78.78% (SD = 16) | 72.78% (SD = 18) | 56.79% (SD = 25) | 41.91% (SD = 8) |
| English (L2) | 67.10% (SD = 14) | 67.11% (SD = 16) | 45.10% (SD = 21) | 28.73% (SD = 6) |

*Note. A consistent trend of better performance in L1 across all levels of sentence difficulty can be observed.*

In Cantonese: level one had a mean of 36 out of 46 morphemes resulting in 78.78% correct \((\text{SD} = 16)\); level two had a mean of 36 out of 49 morphemes resulting in 72.78% correct \((\text{SD} = 18)\); level three had a mean of 40 out of 71 totaling to 56.79% correct morphemes \((\text{SD} = 25)\); level four had a mean of 10 morphemes out of 23 creating 41.91% correct \((\text{SD} = 8)\). In English: level one had a mean of 27 out of 40 morphemes totaling to 67.1% correct \((\text{SD} = 14)\); level two had a mean of 30 morphemes out of 45, 67.1% correct \((\text{SD} = 16)\); level three had a mean of 31 out of 69 morphemes, or 45.1% correct \((\text{SD} = 21)\); level four had a mean of 6 morphemes out of 22, totaling to 28.73% correct \((\text{SD} = 6)\).
Figure 1. Morpheme totals across four complexity levels. Comparing L1 & L2

Note. On the Y axis, the percent correct of the morpheme totals; On the X axis, the sentence complexity levels. The blue bar is the average score for participant’s Cantonese tests; the orange bar is the average score for participant’s English tests.

Relationships between Vocabulary and Sentence Repetition in L1 and in L2

When comparing the data from the picture naming and picture identification vocabulary tasks with the sentence repetition task, a strong correlation can be found, shown in Table 4. Looking at the percent correct in sentence repetition L1, we see that this ability has a high correlation with the participant’s expressive and receptive vocabulary, as well as their ability to repeat sentences in L2. Similarly, the percent correct in sentence repetition L2 has a high correlation with expressive and receptive vocabulary skills in L2. Percent correct in sentence repetition L2 also shows a unique correlation with picture naming and picture identification in
L1. Further analysis of the data shows that expressive vocabulary in L2 correlates with receptive vocabulary in L1 and L2. Receptive vocabulary in L1 correlates with L2, again showing a connection between the two language skills. Within each language, expressive and receptive vocabulary skills correlate strongly with each other.

Table 4. Correlation between vocabulary skills and sentence repetition

<table>
<thead>
<tr>
<th>% SR L1</th>
<th>% SR L2</th>
<th>Picture Naming L1</th>
<th>Picture Naming L2</th>
<th>Picture Identification L1</th>
<th>Picture Identification L2</th>
</tr>
</thead>
<tbody>
<tr>
<td>.61**</td>
<td>--</td>
<td>.35*</td>
<td>.53**</td>
<td>.59**</td>
<td>.83**</td>
</tr>
<tr>
<td>.6**</td>
<td>.35*</td>
<td>0.24</td>
<td>.59**</td>
<td>.83**</td>
<td></td>
</tr>
<tr>
<td>0.08</td>
<td>.7**</td>
<td>0.24</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>.41**</td>
<td>.38*</td>
<td></td>
<td>.59**</td>
<td>.83**</td>
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</tr>
<tr>
<td>0.24</td>
<td>.68**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. ** = significantly correlated; * = some correlation; %SRL1 = percent correct in L1; %SRL2 = percent correct in L2; There are significant correlations between: SR performance in L1 and L2; SR performance in L1 with picture naming abilities in L1; SR performance in L1 and picture identification abilities in L1; SR performance in L2 and picture naming abilities in L2; There is some correlation between: SR performance in L2 and picture naming in L1; SR performance in L2 and picture naming abilities in L2; SR performance in L2 and picture identification in L1.

A pattern is observed between the two languages, showing that the L1 skills correlate with L2 skills. The participants’ vocabulary in each language seems to be related to how well they process sentences in L1 and L2. These findings suggest that it is imperative that the first language be supported, along with the second language, in order to help develop the second language through the strong correlation of high L1 & L2 scores observed in the data.
Discussion

This study addressed the language skills of young sequential Cantonese-English bilingual children through a sentence repetition task: (1) How do sequential bilingual children repeat sentences in L1 and in L2?; Do they have better performance in L1 (i.e., their stronger language L1) than that in L2? (2) Are there any relationships between children’s sentence processing skills and their vocabulary skills in Cantonese and in English? Results show that children repeat sentences in both languages, and that there is a higher level of accuracy in their first language (L1). Results also displayed strong correlations between vocabulary skills and sentence processing skills within languages, showing that higher vocabulary scores in L1 resulted in higher SR performance in L1, likewise for L2. There were also correlations across languages, though skills in L1 were not affected by the vocabulary skills in L2. This study offers further interpretation to what the sentence repetition task assess and its’ potential use for the sequential bilingual population.

Processing Sentences in L1 and in L2

When addressing how the participants repeated sentences, results showed that Cantonese-English bilingual children were able to repeat sentences in both languages across all the complexity levels. However, their performance was better in Cantonese than English. Furthermore, their accuracy in SR productions decreased as the complexity levels increased in both L1 and L2. Regardless of this pattern, participants consistently scored higher in L1 than L2 in all complexity levels, demonstrating that they have better performance in L1, their stronger language. The ability of bilingual children to repeat sentences in both languages in consistent with other bilingual studies (e.g., Thordarottir & Brandeker, 2013; Ebert, 2014; Westman et al., 2008). Because sequential bilinguals have had more language exposure in one language, it is not
surprising they score higher in the language they have more experience with. Sequential bilinguals use the rules learned in L1, and typically learn L2 at a faster rate (Vihman, 1999; Conboy and Thal, 2006; Goldberg, Paradis, & Crago, 2008; Gawlitzek-Maiwalk & Tracy, 1996; Kan & Kohnert 2005, 2008; Kohnert & Danahy, 2007) (as cited by Kohnert et al. 2010) explaining why the participants were able to repeat sentences in L2 with relatively high performance rates.

**Vocabulary Skills and SR Performance in L1 and in L2**

The results in this study show that there were correlations between participants’ vocabulary and sentence recall performance within and across languages. The findings suggest that children who have stronger vocabulary in L1 also have stronger sentence repetition performance in L2 and vice versa. There was also a connection between high L1 vocabulary and L1 SR performance. There is a clear implication that semantics has a significant role in sentence repetition performance in young bilingual Cantonese-English bilingual children. Evidence of this can be found in the correlation of vocabulary scores with sentence repetition performance. The role of semantics in sentence recall has been noted in monolingual language profiles by Polišenská et al. (2014), Alloway (2007), and Rummer & Engelkamp (2003). This study is the first to look at the role of semantics in SR performance in a young sequential bilingual population, thus adding a new language profile to the argument that semantics plays an important role in SR. The results are in disagreement with the findings of Rummer and Engelkamp (2003), which suggest that semantics has a limited role in SR performance. Further disagreement is found in Conboy & Thal’s (2006) study comparing young simultaneous bilingual’s grammatical abilities using the MacArthur-Bates Communicative Development Inventories in both languages. Their results demonstrated weak evidence for across language lexical-grammatical relationships,
even if a child had more exposure in one language than the other. Devescovi et al. (2005) found that lexical-grammatical associations changed between these different types of task presentations, thus other types of presentation need to be observed in young sequential bilinguals in order to fully understand what this task can measure in this population.

**Clinical Implications**

The current findings in this study suggest that L1, as well as L2, needs to be supported throughout L2 exposure. Because our results have a strong correlation between L1 vocabulary scores and both L1 and L2 SR performance, we have gathered that a better understanding of a first language assists in the understanding of a second language. The correlations between L2 vocabulary score and L2 SR suggests that having a stronger understanding of the lexicon in the second language improves the understanding, and therefore repetition, of sentences in L2. This is in line with Turnbull & Justice (2008) and Thordardottir et al. (1997). This study also suggests that L2 should continue to be supported during this important time of language growth. With further testing, there is a potential for the SR task to be employed as a clinical marker for young sequential bilinguals.

As discussed by Yu (2013), the outcomes of language impairments in bilingual children can have a distressing effect on the family. Many families are instructed to stop using L1 at home, causing a dilemma for the family and the child. One of the many negative factors in this situation is that the child is no longer receiving rich language samples in L1. This study shows that the clinical suggestion of discontinuing L1 in the home is an unsupported diagnosis, as L1 needs to be supported for L2 growth. Outside of future use as a clinical marker, this task has demonstrated here that clinicians should support L1, regardless of L2 skills.
Limitations

These conclusions place further emphasis on the need of further bilingual testing in order to determine how the task can be applied clinically. Further investigation on task presentation must be concluded before determining SR eligibility as a clinical marker for SLI in this group of speakers, along with its ability to reflect language skills, as McDade, Simpson, and Lamb (1982) found that delayed SR presentation seemed to reflect language skills more than immediate presentation in monolingual children. Polisenska et al 2014, explains that when examining semantics, delayed repetition is more suitable for testing and when examining lexical phonology and morphosyntax, immediate presentations are more appropriate (p 67), showing that a change in presentation may have brought us to a different finding on the role of semantics in recall. This study did not compare scores between children who have been shown to be typically developing (the control group) and children with disordered language (the experimental group), an important aspect to look at. This study created the platform for these aspects to be observed. Although these findings have strong implications of what the SR task measures and how it can be used, further investigation into bilingual language processing skills needs to be conducted before it can be used a clinical marker in this population.
Conclusion

Many factors play a role in sentence repetition, including various internal and external factors, such as memory, and cognitive abilities (Westman et al. 2008; Turnbull & Justice, 2008; Vicari et al. 2000). Using a sentence repetition task along with vocabulary measures, this study examined Cantonese-English bilingual children’s sentence processing in both languages. This was the first study use SR and vocabulary tasks to compare semantics and sentence processing skills. The results show a strong relationship between the vocabulary in L1 and the processing of sentences within and across L1 and L2. These results imply that L1 should continue to be supported through L2 development in order to gain language skills in both languages. The data and results from this study may aid in further research in the task’s ability to be used as a clinical marker of language impairment for this young sequential bilinguals. This study did not compare scores between children who have been shown to be typically developing (the control group) and children with disordered language (the experimental group), an important aspect to look at and a suggested next step in this area of research.
References


Appendix

Appendix A. English sentence repetition task

Level 1:
1. The balloon is big
2. The bird is pretty
3. The mouse is small
4. The boy is walking
5. The girls have left
6. The children are sleeping
7. The girls are running
8. The boy is still crying

Level 2:
9. The horse runs fast
10. The turtle walks slowly
11. The girl opens the window
12. The dog chases the cat
13. The boy eats the apple
14. We go to the park
15. My brother is in the room
16. The children play outside

Level 3:
17. The boy is polishing the shoes very hard
18. The girl is telling a story very loudly
19. The girl has washed the shirt very quickly
20. We give the books to them
21. The girl puts the doll in the bed
22. The boy brings the cake to me
23. A girl was hit by the boy
24. A dog was kicked by the cat

Level 4:
25. The boy wearing a hat has broken the bowl
26. The dog the girl likes is chasing the cat