The Maintenance and Use of BA and BEI Constructions in Bilinguals

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Abstract

This study examines the use of BA and BEI constructions for school-aged children. It investigates how the age of acquisition, gender, and parental language input affect the syntactic productivity skills for bilinguals. The combination of Peppa Pig video clips and priming tasks is used in the conversation sessions with seven bilingual children. This study provides solid information on bilingualism, demonstrating the code-switching skills of bilingual children between two distinct syntactic systems of Mandarin and English. Bilingual children can gain valuable experience in heritage learning as well as their second language (L2) learning in this study. The key findings of this study suggest that gender and age of acquisition influence BA and BEI usage in bilinguals, including parental language input and exposure to one language. Additionally, this study provides unique insights into bilinguals' syntactic productivity in BA and BEI constructions and aligns with cognitive science themes in terms of executive control, working memory, and mental representation of language switching for bilinguals. Future studies can explore the implications in the syntactic performances of BA and BEI constructions in bilinguals with and without language impairments (LI).

Keywords: syntactic priming, bilingualism, Mandarin, BA and BEI constructions

Introduction

Heritage Language (HL) Learning & Foreign Language Anxiety (FLA)

A Chinese heritage language (CHL) refers to the Chinese language spoken at home by individuals with Chinese ancestry. Heritage language (HL) learners are individuals with a familial or cultural connection to a non-dominant language, learning that language within a migration context (Zhou & Liu, 2025). Chinese heritage language (CHL) learners are students who speak Chinese and English (He, 2006).

Participation in HL programs provides bilingual children with structured learning opportunities to enhance their Mandarin proficiency. This study aims to help bilingual children practise code-switching skills between Mandarin and English. It intends to identify their comprehension of the first language (L1) and the second language (L2). This thesis examines how school-aged children can maintain BA and BEI constructions in Mandarin and process translations from English to Mandarin and vice versa.

Emotional and psychological factors are crucial for bilingual children to maintain their L1. Xiao & Wong (2014) detect that FLA is an emotional and psychological factor in HL learning. In addition to linguistic challenges, FLA refers to a complex interplay of self-perceptions, beliefs, and emotions related to language learning. It is difficult for bilingual children to maintain balanced exposure at home and school. So, FLA is inevitable for bilinguals to experience and learn English as their second language.

Multiple past studies defined FLA and showed that second-generation bilingual children have language-related anxiety rather than enjoyment. Recent studies emphasize the

importance of enjoyment in language learning. Zhou & Liu (2025) indicate that HL learners often face greater emotional and psychological burdens.

Research Questions

This study examines how Mandarin-English bilingual children acquire and maintain BA and BEI constructions, focusing on the interaction of age of acquisition (AoA), parental input, and gender. By using priming and translation tasks, this work addresses the following questions.

RQ_1: How does the age of acquisition affect the syntactic productivity of bilingual children in BA and BEI constructions?

RQ_2: How do parental language input and gender influence the syntactic productivity of bilingual children in BA and BEI constructions?

Significance of the Study

This thesis examines how parental language input, gender, and age of acquisition (AoA) factors influence bilingual children in BA and BEI constructions. This research encourages future syntactic priming studies on speech productivity skills for children with or without LI in BA and BEI constructions.

Future studies can investigate the usage patterns of BA and BEI constructions among high school teenagers with or without LI. Future results can compare the significance of current implications. The future aim of this research is to identify the differences in results between these two groups and highlight the errors in their speech, disruption of speech rates, and comprehension of prompts among bilinguals in future studies.

Literature Review

This literature review first explores the themes of bilingualism, priming studies, and BA and BEI constructions in Mandarin. Additionally, it introduces the age of acquisition in child second language (SLA) and fine-grained microstructure narrative analysis. Finally, it integrates SLA theories to strengthen the connections among the previous literature.

Bilingualism and Priming Studies

Bilingualism and Language Dominance

Saville-Troike (2012) states that simultaneous bi/multilingualism is the acquisition of more than one language during early childhood. Thordardottir (2019) found that simultaneous bilinguals aged three to five who had spent 40% of their time since birth scored within normal range monolingual limits in both syntactic priming, vocabulary, and grammar in that language. Sequential bi/multilingualism refers to learning an additional language after L1 by a group of learners. Van Dijk et al. (2022) state that bilingual children can have a dominant and a weaker language. Bilingual children are confident and proficient in their dominant language. Bilingualism falls along a continuum (Yow & Li, 2015).

The literature on structural priming suggests that speakers start with a functional level of representation. Ji et al. (2023) argue that linguistic expressions encoded in the object and direct object, which map to the specific structure of the prime sentence. Bilingual children make mistakes during their L1 acquisition in Mandarin, as well as in the L2 learning process. Syntactic priming is a cognitive phenomenon in which people who are exposed to priming and exposed to a particular sentence structure are more likely to use the same structure in other types of speech. Syntactic priming is effective for bilingual children in producing BEI constructions rather than BA constructions. Syntactic priming can elicit syntactic structures of

BA and BEI constructions in bilingual children. This study has established a foundation for discussing sequential and simultaneous bilingualism to determine whether the syntactic priming study is effective for them in producing BEI constructions.

Syntactic and Structural Priming Studies

Ji et al. (2023) argue that bilingual children perform worse on BA constructions than on BEI constructions. Researchers suggest that the visual-world paradigm shows children and adults assign thematic roles differently between BA and BEI constructions. BA and BEI constructions appear more frequently in the perfective aspect than in the imperfective aspect.

Syntactic priming occurs when a speaker reuses a heard or produced construction either in BA or BEI. This phenomenon is used in experimental paradigms to elicit linguistic structures. Syntactic priming is effective for passive constructions, which consist of elicited imitation. Syntactic productivity occurs when children hear a new verb presented in one variant of the argument structure but produce it in the alternate argument structure (D.-B. Hsu, 2009).

Research indicates that young children persist in previously encountered structures, reinforcing their syntactic knowledge over time (D.-B. Hsu, 2009). It aims to identify patterns in whether bilingual children continue to use syntactic BA and BEI constructions to produce more creative syntactic sentences. Hsu (2009) suggests that structural priming helps children internalise BA and BEI construction patterns. This persistence supports the notion that children develop syntactic rules beyond only lexical memorisation (D.-B. Hsu, 2009). HL learning can reduce anxiety in bilingual children and foster positive learning environments.

This study builds on Hsu (2009) by applying priming tasks to a Canadian heritage bilingual population.

BA & BEI Constructions

BA and BEI constructions are unique syntactic markers in Mandarin, distinct from English and other Indo-European languages. In Mandarin, BA occurs in transitive active sentences to describe how an object is carried (Xu, 2012). BEI is a passive and less frequent construction in Mandarin.

BA Constructions

Mandarin-speaking children can form BA constructions as early as two years old (Deng et al., 2018). Ji et al. (2023) argued that the noun phrase after BA means the entity is affected in the BA construction.

Examples

1.

Laohu yao-le e'yu

Tiger. Bite-PFV crocodile

The tiger bit the crocodile.

2.

Laohu BA- e'yu yao-le.

Tiger. BA- crocodile bite-PFV.

The tiger bit the crocodile.

Deng et al.'s (2018) studies indicate that girls frequently use BA constructions in imperatives to convey unactualized events, while boys use them less frequently. Children mainly use BA constructions to describe past events.

In the context of a comprehension task, when the first argument of a sentence takes an agent role in their language, Ji et al. (2023) argue that Mandarin-speaking children can associate the noun phrase with the agent. Researchers suggest that word order is a more reliable cue than morphological markers such as the passive (en in English) and (BA in Mandarin)). Future studies might collect online processing data, such as eye gaze patterns, that can reveal how children arrive at the correct interpretation.

BEI Constructions and Conflicting Perspectives

Guo & Chow (2013) state that BEI construction has undergone a semantic shift in the linguistic history of BEI. The significant linguistic change was prominent in the May 4th movement in 1919, igniting grammatical changes in Chinese that departed from a slow and natural course and became more rapid and revolutionary. Language contact is a minor factor in variation. Guo & Chow (2013) have adopted a guideline based on the assumption that a higher frequency of being passive in positive or natural situations of contact with English. Guo & Chow (2013) state that the passive marker BEI, which describes something as unpleasant or undesirable, produces harmful effects.

Early studies addressed the debate on the age of acquisition of BEI constructions for Mandarin-speaking children. Ji et al. (2023) hold differing perspectives on determining the age of acquisition for Mandarin children in BEI constructions.

BEI constructions are challenging for bilingual children to learn at an early age. Mandarin children aged four to five make errors in BA and BEI constructions (D.-B. Hsu, 2018). Ji et al. (2023) state that children aged five often misinterpret BEI constructions as active sentences, which causes comprehension errors. In contrast, Deng et al. (2018) disagree with aspects of BEI construction acquisition. From their perspectives, the exact age at which children acquire BEI constructions, the aspectual differences between BA and BEI constructions, and the role of adult input in shaping acquisition patterns are examined.

Example

1. Lao hu BEI- e'yu yao-le.

   Tiger. BEI- crocodile bite-PFV.

   The tiger was bitten by the crocodile.

These conflicting perspectives highlight the complex feature of BEI construction and suggest a research gap for further studies on how bilingual exposure influences comprehension.

Children comprehended the passive BEI construction less accurately than the SVO or BA construction. The statistical analysis detected a significant effect of BEI constructions. It states that comprehension of BEI construction for bilingual children was worse than that of SVO sentences. Children were better at comprehending shorter sentences than longer ones (Ji et al., 2023). Understanding BA and BEI constructions is critical for bilingual children to find the components of sentences in Mandarin and then code-switch the meaning into English and vice versa. This shows BA and BEI are two unique syntactic markers in Mandarin rather than English, in order to strengthen L1 heritage learning in bilinguals.

Second Language Acquisition (SLA)

Age of Acquisition (AoA) in Child SLA

Age of acquisition (AoA) refers to the age at which an individual first learns a particular word, concept, or skill. Bylund et al. (2021) studies on AoA are interesting but controversial. The debate has focused on the ultimate cause of age effects (biopsychosocial). AoA and bilingualism account for the subtle non-native features in ultimate attainment and the near nativeness of adult L2 learners. Researchers demonstrate why learners achieve proficiency in native monolingual language competencies. Cognitivism argues that age-related entrenchment of L1 and the frequent use of two languages help explain why native L2 competence and behaviours are not attained. These studies suggest that less L1 knowledge can support maintaining native L2 proficiency.

Singleton & Leśniewska (2023) found the maturational effect at nine, according to a grammatical judgement test of English syntax. A sudden drop in the learning rate for L2 syntax close to eighteen. It shows that age differences can constrain the various stages of development by different maturational windows.

Bylund et al. (2021) state that the extreme situation of total L1 loss offers the prospect of such attainment. The L1 loss brings native L2 attainment. Bylund et al. (2021) show that international adoptees have forgotten their childhood L1 and attained native proficiency in the L2. Immigrant children do not attain native-like L2 proficiency because L1 interferes with L2 in their minds. It claims that a lexical deficit in bilinguals often overlooks the impact of the AoA relative to L1 activation and proficiency. AoA becomes a factor in this study,

affecting the bilinguals' language exposure and language proficiency. The results from sequential and simultaneous participant groups reflect their age of acquisition.

Motivation and Self-Regulation in Bilinguals

Oliver & Azkarai (2017) suggest that children can develop self-regulation skills as they grow, allowing them to engage more effectively in learning activities. Older children tend to have higher motivation, which leads them to engage with learning tasks only when they perceive them as valuable experience. In contrast, younger children tend to make more omission errors in their translations. This study aims to enhance bilinguals' motivation and attention on priming tasks and activities.

Interlanguage (IL) & Error Analysis

Bilingual children make errors in the intermediate states of L1 and L2 acquisition. IL is a continuum shaped by linguistic, social, and developmental factors (Robinson & Ellis, 2008).

IL affects bilingual children's linguistic performance by multiple factors. SLA examines IL to L1 and L2 norms while analyzing individual differences in language acquisition (Robinson & Ellis, 2008). An objective of SLA is to understand how L2 is learned and used (Robinson & Ellis, 2008).

Linguists and psychologists identify three states in L1 and L2 acquisition, including an initial state, an intermediate state, and a final state (Saville-Troike, 2012). The initial state of L1 acquisition is the foundational knowledge of L1 language structures. In contrast, the initial state of L2 acquisition is the initial knowledge of L2 structures. In both L1 and L2 intermediate states, it develops the child's grammar. Children can produce utterances at a

maturational level in the intermediate state of L1 and L2 acquisition. The final state in L1 acquisition is when learners have fully acquired their L1.

Error analysis plays a crucial role in understanding IL. Errors reflect active attempts to process and internalize L2 structures (Robinson & Ellis, 2008). L2 acquisition requires more conscious effort than L1 acquisition. Errors are inevitable during learning processes, and they provide insights into developmental progress.

Building upon the knowledge of the SLA theories, Saville-Troike (2012) suggests the contrastive analysis (CA) approach, examining how L1 influences L2 learning. This approach assumes that language transfer is a critical factor in IL development, while L1 structures can either facilitate or even interfere with L2 acquisition. The following section discusses contrastive analysis and the language transfer problem.

Saville-Troike (2012) suggests that L1 influences the speech production of L2, whether the sentences are grammatical or not. Saville-Troike's studies examine how English structure can interfere with Mandarin acquisition.

Contrastive Analysis (CA) & Language Transfer

Saville-Troike (2012) states that the contrastive analysis (CA) approach examines similarities and differences in L1 acquisition and L2 acquisition. Language transfer relates to the influence of L1 and L2 learning.

The CA approach assumes positive transfer occurs when L1 structures facilitate L2 acquisition (Robinson & Ellis, 2008). The shared grammatical structures between L1 and L2 motivate learners to acquire L2 easily. In contrast, Robinson & Ellis (2008) suggest that negative transfer (interference) can also occur when L1 structures conflict with L2, leading to

grammatical errors. Systematic differences in L1 backgrounds from certain kinds of L1/L2 configuration influence qualitative linguistic features in the IL. These patterns show how L1 cognition transfer interacts with L2, either facilitating or hindering L2 development (Robinson & Ellis, 2008).

Relevance to Speech-Language Pathology

Fine-grained microstructure analysis monitors child language development and identifies children with LI. Hao et al. (2018) suggest that Mandarin-speaking children with LI produce fewer BA and BEI constructions. Mandarin-speaking children with LI exhibit production difficulties in BA construction sentences. Future research should examine how different narrative tasks affect syntactic performance and investigate speech disruption rates among children with LI (Hao et al., 2018).

Methodology

Qualitative Analysis

The current study determines whether school-aged children can still process code-switching with BA and BEI constructions in Mandarin when hearing English sentences and vice versa. The significance of this study is that it strengthens their L1 language, which may support their L2 learning.

This section describes how data were collected and analyzed. Then, it combines with research studies and follows the results and discussion. Incorporating grammaticality and priming activities, this study aims to identify how their Mandarin productivity skills are maintained.

These findings show that older children have produced more BA and BEI construction sentences than younger children. The current study connects to the first research question of how the age of acquisition affects the syntactic productivity of bilingual children in BA and BEI constructions.

The gender of bilingual children and parental language input factors also show that greater amount of Mandarin exposure and higher homework help rates lead to better performance in BA and BEI constructions. Priming sentence analysis demonstrates bilingual children can translate English sentences for BA and BEI construction sentences, including audio information from video clips, prompts, and pictures. The analysis connects to the second research question of how parental language input and gender influence the syntactic productivity of bilingual children in BA and BEI constructions.

Methods

This section introduces a qualitative methodological approach to analyzing primary speech recording data from Mandarin and English bilingual children aged 6-11 attending schools in Canada. This research received approval from the Research Ethics Board Committee in the Department of Linguistics.

Data Collection

It describes the methods of speech data collection to evaluate how the research questions can bring insight into the characteristics of the speech data.

ELAN is a software used for segmenting and transcribing audio and video data. Spontaneous speech data captures the natural use of BA and BEI constructions in real-time interactions, minimising the influence of formal instruction. The locations were close to the

home addresses of the individual bilingual children. The conversation sessions took place at the public libraries. The current study has stored all files on the hard drive of an encrypted computer and secure institutional storage.

Transcription Process

This study employed ELAN to transcribe speech data from a Yeti microphone connected to a Mac computer. The researcher used Video Memos to record individual data during individual sessions.

ELAN is used to transcribe speech files saved on a Mac computer. All media files were converted into WAV files using Audacity software before transcription. After converting the WAV files, the second step is to create three hierarchical groups of independent tiers: the speech data of each participant, which includes the prompts, and the speech data from the video clips. The objective is to differentiate the factors that affect the syntactic productivity skills of bilinguals and identify error patterns.

Participants

These three age groups of bilingual children had consistent exposure to Mandarin and attended elementary schools in Canada. Seven bilingual children (four girls and three boys) participated in the conversation sessions.

During the recruitment, the researcher prepared Mandarin and English documents, consent forms, questionnaires, information letters to parents, recruitment posters, and assent scripts.

Note. All participant names are anonymized to protect confidentiality.

Materials/Stimuli

Cognitive framing, a type of cognitive bias, is where the audio and visual information in Peppa Pig video clips can significantly impact bilingual children's perception and choices. The use of materials and stimuli in the presentation slides can influence bilingual children's decisions and judgement on creating BA and BEI constructions in Mandarin. Materials and stimuli are essential for creating an inclusive environment between children and the researcher. Priming activities and video clips can help bilingual children focus on translating sentences from their L1 to L2 and vice versa.

Through a series of child-focused elicitation and priming exercises, the researcher has recruited elementary school children (aged 6-11) who attended either a Chinese immersion school, an English school with classes or an English school with no exposure to Mandarin. Bilingual children should have less than one year of schooling in Canada.

Following these video-focused elicitations, a short priming exercise is ready where children hear recorded BA and BEI constructions (five-second dubbed Peppa Pig clips). Finally, I provided activities to elicit more BEI or BA constructions (bringing prompts – What am I doing?). Child: (You are putting the pencil on the table.)

Parents should complete concise questionnaires after being permitted to record their children's speech data. They choose between an English and a Mandarin version of the questionnaires. These questionnaires contextualized data and findings. Parents are expected to accompany their children during the sessions and are reminded not to answer with their children. (Table 2. Questionnaire, 2025).

Procedure

Each participant engaged in a structured conversation task where they described pictures and answered open-ended questions. Data were analyzed using thematic analysis. Transcripts were first reviewed and coded manually based on three categories: (1) correct use of BA and BEI constructions, (2) error types (e.g., word order mistakes, omission), and (3) syntactic complexity. To protect participant confidentiality, all names were anonymized, and the researcher stored the speech recording files on her school's OneDrive.

Research Design

This research study measures the usage of BA and BEI by bilingual children to find patterns that can reflect which group has a higher production rate for acquiring BA and BEI. The research design first addresses the research question: age of acquisition distributions of the seven bilingual children. Secondly, research question two aims to explore how the gender and parental language input affect the usage of the BA and BEI construction for Mandarin-English bilingual children.

This research design rationale is related to cognitive psychology theories, which help children engage in the process of learning L1, L2, and practicing code-switching skills. Code-switching is the practice of alternating between two or more languages during a conversation or a single speech event. Bilingual children need to encode, interpret, and associate words from two languages with a common concept of the world, which requires more advanced representation because the connections between the words exist at a higher or more abstract level than the connection between a particular word and its meaning (Bialystok & Martin, 2004)

Part I provides English contexts of the video clips and asks bilingual children to translate English sentences into Mandarin. English is the language that all bilingual children mainly use at school. Mandarin is the language that all bilingual children mainly use at home. Videos provide foreign language learners with simultaneous visual and aural stimuli, which can fill in for any lack of comprehension resulting from listening alone (C.-K. Hsu et al., 2013). In Part I, the objective is to find the number of BA and BEI construction sentences accurately and determine whether the number of sentences is over or under the expected amount.

Part II provides Mandarin contexts from the video clips and asks bilingual children to translate Mandarin sentences into English. However, the researcher has disrupted the order of video clips in Part I. Bilingual children watched a new order of Peppa Pig video clips in Mandarin under the same context as Part I. All the children have gained repeated practice in code-switching skills from Part I and formed a habitual learning experience. These processes of acquiring and solidifying behaviours through repeated practice led to their behaviours becoming automatic without conscious thought.

Part III provides Mandarin priming for BA and BEI construction sentences from the video clips. This section examines the children's phonological awareness of the Mandarin sounds for BA and BEI. It examines whether their learning of BA and BEI sentences from Parts I and II is effective.

Part IV provides picture tasks; it aims to encourage bilingual children to stay with the researcher using prompts (What am I doing right now? and can you describe what is happening?). Bilingual children can produce either BA or BEI construction sentences when

answering the questions from the prompts. By responding to the video stimulus in audio, visual, and oral information, this activity aims to validate and reinforce the children's awareness of using BA and BEI constructions.

Results

Syntactic Productivity of BA and BEI Constructions in Bilingual Children

It compares the frequencies and complexities of individual speech recordings in BA and BEI constructions. This study summarizes the key findings in BA and BEI constructions. It links to the objectives to argue whether the age of acquisition affects the syntactic productivity of bilingual children in BA and BEI constructions. The results analyze the use of BA and BEI constructions of school-aged bilingual children.

Bilingual children can be aware of translating English passive sentences with BEI construction sentences due to the effect of language transfer and the existence of IL. From the video clips, this sentence demonstrates a passive meaning. For instance, when bilingual children hear a passive English sentence, "Miss Rabbit has tripped over one of Richard's toys." Over half of the bilingual children can create sentences with BEI constructions. Older bilingual children can produce more complete and grammatically correct BEI constructions compared to younger bilingual children, who can generate the BEI constructions with incorrect word order.

Accordingly, another example is "The fish is eaten by Hello Kitty" in the picture task activity. Bilingual children can identify the agent and patient in this sentence in Mandarin and English by listening to the researcher's elicitation and explanations. From English to Chinese translations, Guo & Chow (2013) state that the "by + N" structure in English passives is

invariantly translated automatically into Chinese BEI passives. BEI constructions have demonstrated how language contact occurs between English and Mandarin. Bilinguals' use of BEI constructions can show the meaning of language contact in the past.

Bilinguals have learned what was happening, and two of them have been in Canada for less than one year, so they could not code-switch the BEI construction sentences directly from watching the English video clips. It shows that the amount of English exposure bilingual children gain can affect their English proficiency and productivity skills.

Syntactic Concepts in Mandarin and English

Mary has come to Canada for only two months. She can translate more nouns than verbs from Mandarin to English. Setoh et al. (2021) state that bilinguals should demonstrate a noun bias in both languages. A verb-privileged language refers to a language where verbs carry more syntactic weight and flexibility in sentence structure, often influencing word order.

Mandarin is a verb-privileged language due to its flexible argument structure and emphasis on verb-result constructions. Verb requires understanding the arguments (e.g., nouns) that verbs can take, in addition to relations between agents and objects (Setoh et al., 2021). Mandarin lacks grammatical and morphological cues such as determiners and tense markers that help infants distinguish between nouns and verbs. Verb-privileged languages tend to hinder verb learning as infants use semantic or positional information from adjacent nouns to acquire novel verb meanings (Setoh et al., 2021). (Table 3. Verbs in Mandarin in Part I and Part II Activities, 2025) (Table 4. Verbs in English in Part I and Part II Activities, 2025).

Mandarin and English sentences have distinct nouns and verbs. To understand how lexical acquisition develops in bilinguals as bilingualism grows and outnumbers monolinguals. Bilinguals should demonstrate a noun bias in both languages (Setoh et al., 2021). (Table 5. Count of Subjects in Mandarin in Part I and Part II Activities, 2025) (Table 6. Count of Subjects in English in Part I and Part II Activities, 2025).

Modality, Perfective and Imperfective Sentences

Grammaticality analysis contains error patterns among seven individual bilinguals, demonstrating transfer effects between L1 and L2 and assessing the use of aspect markers in Mandarin and English.

Modality is closely related to tense and aspect. Modality refers to the particular way in which something exists and is experienced. Researchers brought this dimension by examining the aspectual properties of BA and BEI constructions.

In grammar, perfective refers to a verb that views an action or event as a complete whole, without focusing on its internal temporal structure or duration. It presents the action as a single, completed event. The imperfective is a grammatical aspect used to describe actions or states that are ongoing, habitual, repeated, or viewed without reference to completion. In linguistics, an aspect marker is a grammatical or lexical element (e.g., an auxiliary verb) that modifies a verb to indicate how an action extends over time.

Perfective BA sentences are less frequent than expected because BA sentences express unactualized events: irrealis sentences account for child BA sentences (91 out of 116) in the Tong corpus (Deng et al., 2018). Deng et al. (2018) state that irrealis sentences can depict future events, those in the scope of modal auxiliaries, and those in the form of

negatives, yes-no questions, conditionals, and imperatives. While using fewer imperative sentences than adults, children used irrealis BA sentences to express that they would do something soon.

Perfective BA sentences are all realis, while adults rarely use perfective BA sentences as irrealis conditional clauses, future perfective sentences, and yes-no questions (Deng et al., 2018). This data analyzes linguistic features in Mandarin and English to argue why both constructions appear more frequently in perfective than imperfective aspects in child speech.

Semantic Errors and Aspect Marker Use in School Attendees vs. Non-Attendees

Younger boys (David &Tom) have made semantic errors when translating sentences from English to Mandarin. Housen (2000) states that L2 learners would deal with the inherent semantic aspect of the verb and use verb morphemes in a way that coincides with the claims of the Aspect Hypothesis. Morphological categories (English: -ed and -ing) do not emerge in IL with all verbs or in all contexts (Housen, 2000).

Younger boys and girls create a different structure based on their experience of other structures. Carlson & Meltzoff (2008) state that inhibitory control over attentional resources develops more rapidly in children with extensive bilingual experiences. One younger girl, Selena, who attended Chinese language schools, sometimes assumed that additional context did not occur in the original sentence. She was confident in speaking both her L1 and L2, which suggests heritage language learning programs can develop bilinguals' self-esteem and improve their self-confidence. In contrast, one girl who did not attend the heritage language learning demonstrated less confidence when translating English to Mandarin because she had been in Canada for less than a year.

Bilinguals have consistent exposure in Canada and can demonstrate an outstanding usage of aspects in the perfective tense. For other bilinguals with non-consistent exposure in Canada, it is difficult for them to produce complete sentences with the SVO order. In linguistics, aspect markers are grammatical or lexical elements that indicate how an event unfolds over time. They differ from tense, which means the time of an event relative to the moment of speaking, by focusing on the internal temporal structure or duration of the event. Hao et al. (2018) state that Mandarin allows the omission of aspect marking (perfective aspect "le/guo" and progressive aspect "zai/zhe") in addition to the lack of complex conjugation systems, making it a language with richer morphosyntactic features.

More mature language learners tend to use aspect markers of time in narratives (Hao et al., 2018). One or two bilingual children have experienced language attrition because their L1 learning process is not solid, resulting in incorrect word order errors. This study investigates whether these bilingual children are decreasing their proficiency in Mandarin. It reinforces the importance of promoting heritage language learning programs for these bilinguals to attend after-school programs to consolidate the concepts of L1.

Subject Specification

Children tended to maintain the sentence structure of original English sentences in their Mandarin translations. Girls can produce more BA constructions than boys. When subjects are specified, children use BEI constructions to express passive actions: (Ex. Miss Rabbit has tripped over one of Richard's toys. Children who use BEI constructions tend to translate passive sentences into the correct passive sentence structures, which shows their comprehension of BEI constructions. In other words, subject specification influenced the use

of BA and BEI constructions, and children were less likely to produce BA and BEI constructions.

Relevance to Cognitive Science

Five BA construction and five BEI construction sentences occurred in the video clips of Part I and Part II. The frequency of BA constructions for bilingual children is lower than for BEI constructions. In other words, the boys in this group did not produce BA constructions but BEI constructions. Syntactic priming demonstrates implicit learning mechanisms and suggests that bilingual children rely on cognitive representations of prior structures to guide subsequent production. Except for the youngest participant, every child participant can translate one BEI construction sentence, and two bilingual children (Alice and Mary) have produced more BA constructions.

In Part II, all the children have learned the background of the stories in the Peppa Pig video clips because they practiced code-switching skills in Part I. Morales et al. (2013) state that cognitive functioning is entailed by the experience. Experience follows from intensive practice in a particular process. The frequencies of use in BA and BEI constructions are increasing compared to the results from Part I. Parts I and II aim to enhance bilingual children's comprehension and production skills in two languages. This exercise of speaking two or more languages on a daily basis is another experience that has been shown to produce changes in cognitive performance (Morales et al., 2013).

Part III aims to evaluate the phonological awareness of bilingual children. The result shows all children who have maintained and recognized the sounds of BA and BEI, two syntactic markers. One younger boy, Tom, hears the sound of BA as the sound of BU. Tom

has been in Canada for two years; his data might suggest that IL errors already exist when learning Mandarin and English during the critical period of learning both languages. Tom was truly sure about what he had heard, the BU sound rather than the BA sound. This shows how this participant's mental representation of two languages and the existence of IL make it difficult for him to distinguish the correct sound of BA from the two languages. Future research can explore the topics of interference of IL phonological errors in Mandarin and English for bilingual children.

In Part IV, the priming pictures and interaction between children and the researcher are crucial to the results of children's linguistic performance. Among these seven bilingual children's interactions, the most creative sentence is from Selena, which is a combination of Mandarin and English. Hughes et al. (2006) state that it is inter-sentential code-switching, where one person may incorporate words or phrases from a combination of English and another language. The context of the sentence is related to a cartoon character, a puppy that ate fish. From the traditional thinking of people, puppies can only eat bones. Her sentence's structure, in which the name of the puppy is in English, and the rest of the sentence is in Mandarin, shows the combination of two languages to deliver an innovative message. Code-switching becomes a social, cultural, and linguistic tool that allows Selena to integrate her experiences of two languages and two cultures into a cohesive whole. A variety of cognitively demanding experiences modulate brain development and cognitive functioning. The exercise of speaking two languages is another experience that is related to cognitive performance. Morales (2013) states that working memory is central to a wide variety of cognitive abilities and predicts essential cognitive and academic outcomes in children. The early acquisition of

literacy, numeracy skills, later language achievement, and math achievement depend heavily on working memory (Morales et al., 2013). Selena is a simultaneous bilingual, who has spoken both languages since birth. It also affects bilinguals' flexibility in working memory, attainment of major features, and representations of two languages in their minds.

Patterns of Language Transfer Errors by the Age of Acquisition (AoA)

Age of acquisition affects the syntactic productivity for bilingual children in BA and BEI constructions, as well as the gender in combination with parental language exposure and interactions. (Table 1. Summary of Participants' BA and BEI Constructions, 2025). The results show that syntactic priming is effective for bilingual children in producing BEI constructions in Part I to Part IV activities.

In Part I, one girl, Mary, with her strong Mandarin proficiency, translates adequately in BA constructions, in contrast to younger boys who struggle to translate English sentences into Mandarin with BA constructions. Bialystok & Martin (2004) suggest that children with a weak knowledge of one of their L1 or L2 did not exhibit the same cognitive advantages as did children who were more balanced bilinguals.

Mary's data has the lowest frequency of translating the BA and BEI sentences into English because she did not have consistent English exposure in Canada; She has been here for only two months. As opposed to David's data, he had come to Canada for only six months, and he is one year older than Mary. The results can predict the age of acquisition, and a balance of both Mandarin and English exposure can lead to better linguistic performance of bilingual children for this activity.

The other older girl, Alice, cannot produce the same as Mary did because Alice had been in Canada for three years and studied at the school with only English instruction. A particular language exposure can affect the maintenance and use of BA and BEI constructions for bilingual children who speak Mandarin and English.

Additionally, older kids tend to have a comprehensive understanding of the audio information comparable to that of younger ages. Evidence has supported the view that both languages are active in the mind to some extent during both comprehension and production (Morales et al., 2013). The modification to cognitive functioning follows from intensive practice in a particular process entailed by the experience. Bilingualism leads to experience-induced cognitive change, which is likely based on the need to monitor attention to the target language in the context of joint activation of the other language. Morales et al. (2013) suggest the bilingual advantage might not function through executive functioning.

Discussion

The results revealed that girls outperformed in following the prompts to produce BA constructions when giving directives or expressing actions. Overall, girls translated the BA constructions into the correct word order. However, boys generally translated declarative sentences without using BA. Additionally, boys translated the interrogative sentences in English into the declarative BA constructions in Mandarin. Boys have verb omission and incorrect word order errors compared to how girls produce BA sentences.

Older girls demonstrated higher Mandarin proficiency. Younger girls (Angel &Selena) and boys (Tom &David) struggled to produce complex sentence structures and omitted

certain parts of sentences. The age of acquisition of Mandarin and English for bilingual children makes bilinguals aware of the use of sentence structure to a certain degree.

Semantic errors can occur in sentences of BA constructions for younger boys and girls. The semantic structure of a bilingual might be more hierarchical than that of a monolingual, and the process of constructing this structure could enhance children's representational processes (Bialystok & Martin, 2004). Younger boys omitted verbs or entire parts of sentences during the conversation session. One younger boy has come to Canada for six months, and his English proficiency level is not high enough for him to understand the contexts in the video clips. He had been anxious to code-switch from Mandarin to English contexts, as English is a foreign language which is unfamiliar to him. Foreign language anxiety can negatively affect cognitive functions involved in language processing. Anxiety can increase cognitive load, meaning learners expend more mental effort to perform tasks, leading to errors or reduced accuracy for their linguistic performance. This suggests foreign language anxiety impacts bilingual children's the cognitive processing of two languages in bilinguals.

With oral encouragement to observe his performance, he can watch the video clips, gather the visual information that will help him frame his answer to the use of BA constructions. For instance, the video sentence stated, "That is where I put it". The structure of this sentence is complicated for younger boys and girls; they couldn't code-switch the entire meaning of the audio sentences completely and adequately in Mandarin with BA constructions. Bilingual children with low English proficiency and limited English exposure

could affect their ability to translate BA constructions. Simple structure sentences in two languages are appropriate for bilinguals to practice code-switching skills.

Specifically, one younger boy translated the sentence, and its meaning did not align semantically with the original sentence but reflected his understanding of the locality of the action. This sentence lacks subject and object components, and he had omission errors. The younger girl translated this sentence; its meaning was associated with what she had seen and gathered the visual information she got from the video clips. “My ticket is on my head”. The younger girl’s sentence contains a subject and an object. In contrast, girls can produce BA constructions with more complete sentence structures than boys. Boys have made omission errors in code-switching in this sentence. It shows that the gender and AoA affect their linguistic performances in BA and BEI constructions.

Practical Implications

It encourages language educators and speech-language pathologists to explore how bilingual children can have omission errors and inaccuracies in their BA and BEI constructions. Language educators can use elicitation to guide bilinguals to practice code-switching from English to Mandarin. Speech-Language Pathologists can organize information from bilingual children with LI without providing therapy sessions for targeted bilinguals.

Limitations

This study is exploratory; results should be validated with larger and more diverse samples across developmental stages. This study has a small sample size. It has limited generalizability and determines that Chinese heritage language learners in Canada have

similar linguistic performance. The chosen stimuli are familiar to the bilingual children, and biases can occur during the interview and data transcription processes. Bilingual children might be familiar with the content of video clips, which may influence their linguistic performance on BA and BEI constructions. All bilinguals reside in Canada, so regional and socioeconomic limitations can occur in this study, and it lacks statistical analysis for a sample test.

Future Research

It aims to detect how bilingual children use BA and BEI constructions orally. Hao et al. (2018) show that Mandarin-speaking children with LI exhibit comprehension difficulties in producing BA constructions. This study shows girls are more likely to produce BA constructions than boys. Additionally, this research can expand the scope of examining developmental language disorders of diverse groups regarding the use of BA and Bei constructions.

Final Remarks

In conclusion, this research contributes to the understanding of bilingual cognitive development by demonstrating how age, gender, language exposure, and parental input factors influence bilinguals' syntactic productivity skills and their code-switching skills. Bilingual children can maintain their Mandarin proficiency through the four tasks in BA and BEI constructions, including their code-switching skills from Mandarin and English.

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Appendix A

Table 1.

Summary of Participants' BA and BEI Constructions

Production sentence/ video sentence	Jack	Alice	Angel	Selena	Tom	Mary	David
Part I	1BA/5BA 2BEI/5BEI	4BA/5BA 1BEI/5BEI	0BA/5BA 0BEI/5BEI	0BA/5BA 1BEI/5BEI	0BA/5BA 1BEI/5BEI	7BA/5BA 1BEI/5BEI	0BA/5BA 1BEI/5BEI
Part II	4BA/4BA 5BEI/5BEI	4BA/4BA 5BEI/4BEI	4BA/4BA 3BEI/5BEI	4BA/4BA 5BEI/5BEI	4BA/4BA 5BEI/5BEI	2BA/4BA 0BEI/5BEI	3BA/4BA 1BEI/5BEI
Part III	3BA/3BA 2BEI/3BEI	2BA/3BA 2BEI/3BEI	2BA/3BA 2BEI/3BEI	2BA/3BA 1BEI/3BEI	2BA/3BA 1BEI/3BEI	2BA/3BA 3BEI/3BEI	3BA/3BA 2BEI/3BEI
Part IV	5BA 6BEI	1BA 6BEI	0BA 1BEI	4BA 6BEI	1BA 3BEI	5BA 5BEI	3BA 7BEI

Table 2.

Questionnaire

Name of Child	Year of Birth	Language at Home	Chinese Language School Program	Bilingual at Birth	Age of Acquisition in Learning English	Age of Acquisition in Learning Mandarin	Parents Homework Help Frequencies	Parenting Language Instruction for Homework	Language Conversation with the Child	Parent's Language Use at Home	Parent's Language Use at Work	Evaluation of Parent's Mandarin Proficiency	Evaluation of Parent's English Proficiency
Jack	2013	Mandarin	yes (4years)	no	after 5 years old	2-3 years old	4-5 times/week	Mandarin	Mandarin	Mandarin	Mandarin	not proficient	not proficient
Mary	2016	Mandarin and English	no	yes	since birth	since birth	2-3 times/week	Mandarin and English(same)	Mandarin	Mandarin	Mandarin and English	fluently proficient	somewhat proficient
Tom	2015	Mandarin	no	no	after 5 years old	0-1 years old	0-1 times/week	Mandarin	Mandarin	Mandarin	Mandarin and English	somewhat proficient	not proficient
David	2015	Mandarin	no	no	3-4 years old	0-1 years old	4-5 times/week	Mandarin	Mandarin	Mandarin	Mandarin and English	proficient	not proficient
Alice	2013	Mandarin and English	no	no	5 years old	0-1 years old	0-1times/week	Mandarin	Mandarin	Mandarin	English	fluently proficient	somewhat proficient
Angel	2018	Mandarin and English	no	no	2-4years old	0-1years old	0-1times/week	Mandarin	Mandarin	Mandarin	English	fluently proficient	somewhat proficient
Selena	2018	Mandarin and English	yes (all the time)	yes	3-4 years old	0-1years old	0-1times/week	Mandarin and English(same)	Mandarin and English	Mandarin and English	English	proficient	proficient

Appendix B

Figure 1.

Verbs in Mandarin in Part I and Part II Activities

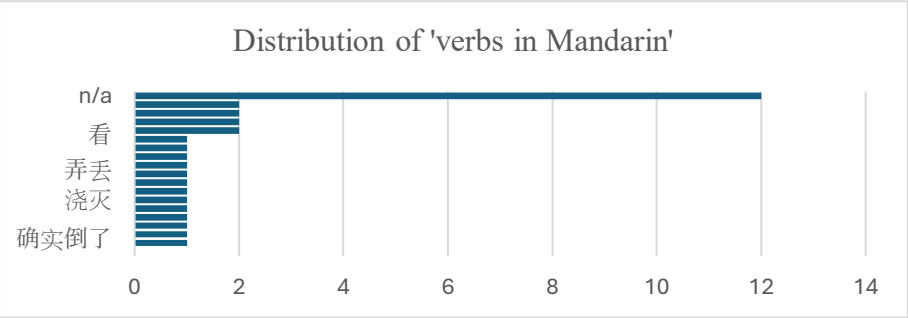

Figure 2.

Verbs in English in Part I and Part II Activities

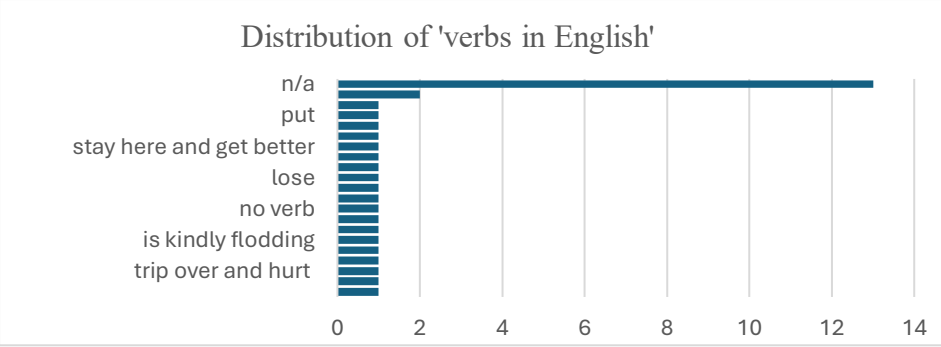

Figure 3.

Count of Subjects in Mandarin in Part I and Part II Activities

Distinct Count of 'Subjects in Mandarin'

Distinct Count of Subjects in Mandarin
10

Figure 4.

Count of Subjects in English in Part I and Part II Activities

Distinct Count of 'Subjects in English'

Distinct Count of Subjects in English
13