Development of Tense and Aspect in a Japanese-English Bilingual

Akiyo Fukatsu

Abstract

　この研究の目的は、日英同時バイリンガル児による動詞形態素の習得において言語間交差的影響が見られるかを明らかにすることである。バイリンガリズム研究では、複数の言語がどのように習得され、こころの中に表象されているのかが問題となってきた。これまでの研究でも、日英バイリンガル児における動詞形態素の習得について扱われているが、動詞形態素が用いられる動詞の種類の観点から言語間の影響を調査することはなされていない。そこで、本研究ではアスペクト仮説（Andersen & Shirai, 1994）に基づき、日英同時バイリンガル児の1歳から2歳までの発話を分析した。結果、バイリンガル児の各言語における動詞形態素の使用は言語特有の傾向が見られ、定型発達のモノリンガル児の言語使用から大きく逸脱したような発話は見られなかった。このことから、日英バイリンガル児の動詞形態素の獲得は、形態素と共起する動詞の種類の観点からも、独立的な発達をしていることが示唆された。

Key Words: language acquisition, verbal morphology, Aspect Hypothesis, bilingualism, Separate Development Hypothesis

1. Introduction

The present study aims to investigate the developmental pattern of verbal morphology in a Japanese-English bilingual child from the view of tense and aspect. Although the concept of temporality and aspectuality exists in most languages, how they are realised in the linguistic system varies significantly from language to language. Japanese verbal morphemes are well known for marking a range of aspectuality. In addition to the need to acquire two systems for tense and aspect, the differences between these systems make learning even more complex. Whether bilinguals can develop the multiple linguistic systems without confusion is the question which this present study tries to answer.

2. Background

2.1 The history of bilingual first acquisition studies

This section overviews two major theories about the bilingual first language acquisition (BFLA), namely, the Unitary Language System Hypothesis (ULSH) and the Separate Development Hypothesis (SDH). The early studies in BFLA claimed that children did not seem to differentiate between the languages to which they were exposed (Volterra & Taeschner, 1978; Lindolm and Padilla, 1978; Redlinger & Park, 1980). Based on the mixing rate of languages in children's speech production, they concluded that at the early stage children cannot discriminate one language from another (ULSH).

However, later studies questioned the validity of using mixing rate as evidence for children's inability to discriminate between languages. They further examined the circumstances when such mixing occurs, finding that the mixing derives from other factors such as children's language dominance and individual preference (Genesee, Nicoladis & Paradis, 1995; Köppe, 1996). With such counterevidence, the SDH was proposed.

However, recent studies focus on the residual interaction of the two languages while admitting the general independence of the two languages in bilingual development. Such interaction between the languages is called the crosslinguistic influence or CLI for short (Hulk & Müller, 2000; Paradis & Navarro, 2003; Serratrice, Sorace & Paoli, 2004). Yet, such interaction is subtle and occurs under certain conditions (e.g., pragmatic-syntactic interface according to Hulk & Müller, 2000), and thus this interaction may not always be observable.

2.2 Acquisition of verbal morphology

There is a difference between English and Japanese in the order of the development of verbal morphology in monolingual children. Brown (1973) divided the developmental path of English-speaking children into five stages. The characteristic speech at Stage I is telegraphic speech such as the omission of function words and the use of bare verbs. In the early stage, children do not have fully developed morpho-syntactic knowledge and thus drop the morphemes that encode morpho-syntactic relations. At Stage II, they start producing grammatical morphemes. Children acquire the progressive morpheme relatively early, which is followed by the irregular past. The production of the regular past takes time to stabilise, and it is generally not acquired until Stage V.

Japanese-acquiring children are known to start producing the verbal morphemes quite early because it is an agglutinative language and verbs must emerge with some morpheme. According to Clancy (1985), children acquiring Japanese start producing verbal morphemes before the mean length of utterances (MLU) reaches two, and the past -*ta* appears first in children's utterances. After that, the non-past -*ru* and the progressive -*tei-ru* PROG-NPAST emerge.

SDH is generally supported by the studies on the acquisition of verbal morphology in Japanese-English bilinguals. Since the acquisition of Japanese past precedes English regular past, Mishina-Mori (2002) hypothesised that if ULSH was correct, the acquisition of the Japanese past would accelerate the acquisition of the English regular past. However, the natural speech data of two Japanese-English bilinguals did not exhibit such acceleration. Mishina-Mori (2015) investigated the age at which the past tense morpheme emerged and at which children started referring to remote past. The development of each language in the bilingual children followed the typical language development observed in monolingual peers of each language.

2.3 Aspect Hypothesis

The developmental order exists not only in grammatical morphemes, but also in aspectuality of the verbs to which verbal morphemes attach. This order of emergence has been proposed in the discussion over the relationship between children's use of verbal morphology and their cognitive limitations. Antinucci and Miller (1976) analysed the natural speech data of Italian and English monolinguals, and found that the past tense morpheme was produced always with telic verbs. Given these results, they suggested that children's use of verbal morphemes is restricted to 'here and now' due to their limited cognitive capacity. Weist et al. (1984) then criticised this hypothesis, arguing that, 1) children can use the past tense to refer to the events dissociated from the present moment, and 2) children's use of past tense was not restricted to telic verbs.

To bridge the gap between these studies, Andersen and Shirai (1994) proposed the Aspect Hypothesis (AH), which speculates that the development of verb morphemes in language learners are generally guided (but not restricted) by lexical aspect [1] . Presupposing the input-driven acquisition, they conjecture that children discover the prototypical meaning of verbal morphemes and start using these morphemes with verbs of which meaning matches that prototypical meaning, eventually extending the use to other verbs. More specifically, the past tense morpheme indicates the ending of an event, and thus it emerges with verbs in the order of Achievement → Accomplishment → Activity → State. The progressive morpheme, on the other hand, indicates the duration of an event, so the emergence of the order should be Activity → Accomplishment → Achievement. The state verbs are not expected to emerge in the progressive form, but this assumption is not applicable to all languages.

Although AH supposes that there should be a universal order for lexical aspect to occur with certain verbal morphemes, there is language-specific development. Shirai (1994) and Shirai and Andersen (1995) examined English-acquiring children with AH. Children's use of regular past *-ed* corresponded to AH, but the use of progressive *-ing* was less consistent; at early stages of development, it was produced not only with activity verbs but also with achievement verbs that

have iterative meaning such as *jumping*. Studying AH on Japanese-acquiring children, Shirai (1998) found that children used *-ta* with state verbs from the early stage of development, and that they also went through a stage where they were apt to use progressive *-tei-ru* PROG-NPAST with achievement verbs, many of which have resultative meaning when in the progressive form.

There is one preceding study which investigated bilingual development using AH. Luk and Shirai's (2018) study collected data from three simultaneous Cantonese-English bilinguals. Analysing data of past (perfective for Cantonese) and progressive tense forms, they revealed that: 1) the development of verb morphology in bilingual children was less consistent with AH compared to their monolingual peers; 2) an earlier developing language accelerated the acquisition of the later developing language.

2.4 Research question

AH predicts the developmental path with four types of verbs, so it is expected to help inspect whether the development of the two languages shows any interaction. Although the preceding studies on the acquisition of verbal morphology in Japanese-English bilingual children concluded that two languages did not influence one another, analysis regarding lexical aspect might elicit an interaction between the two languages. Therefore, the research question of the present study is 'Does the development of verb morphemes in each language correspond to the patterns found in AH related studies on monolingual children (Shirai, 1994; Shirai, 1998; Shirai & Andersen, 1995)?'

To answer this question, the present study targets English regular past *-ed*, English progressive *-ing*, Japanese past *-ta*, Japanese progressive *-tei-ru* PROG-NPAST and Japanese completive *-chat-ta* COMPL-PAST. Although Japanese completive does not have a translation equivalent in English, it was included in the analysis to aggregate the data. Given the monolingual studies of AH, the following predictions can be made for the case in which the bilingual child displays independent development of the two languages: 1) Japanese past appears with state verbs from the early stage of development; 2) Japanese progressive undergoes the stage where it is used with achievement verbs; 3) English past shows a great fit with AH, with development advancing from Achievement, Accomplishment, Activity and to State; 4) English progressive first appears with either activity verbs or achievement verbs with iterative meaning.

3. Method
3.1 Participant

Spontaneous speech data of a Japanese English bilingual child Naoki (pseudonym) was extracted from Falls Church Bilingual Corpus (Ota, 1998) on CHILDES (MacWhinney, 2000). Naoki's parents were both native speakers of Japanese who lived in northern Virginia, U.S.A. at the

time of recording. The language spoken at home was Japanese, but Naoki had an exposure to English at an English-speaking local day care centre which he started attending from one year old (Nagai, 2017).

3.2 Data

The speech data was available from 1;7 to 2;7. The recording sessions were held at Naoki's family residence at intervals of two to three weeks except for when the family was not available. Each session lasted about twenty to thirty minutes, and the order of recording of English and Japanese was alternated every time. Naoki interacted with three researchers, two of them native speakers of English, and one native speaker of Japanese. Although the recordings were usually conducted by the researchers, Naoki's parents also occasionally participated in the sessions. The session at 1;11.10[2] was recorded by the parents.

Although the number of the target forms produced was limited, this does not necessarily indicate that Naoki showed a delay in the development of each language. The ratio of morphemes to an utterance is often used to estimate the developmental stage of a child, and it is called the mean length of utterances (MLU). In Nagai (2017), which analysed Naoki's production of pronouns, his MLU in each language was calculated and compared to his monolingual peers. She reported that Naoki's English did not fall behind his monolingual peers, and that he even displayed faster development in some respects. Figure 1 shows Naoki's MLU extracted from Nagai (2017, pp. 45–46). According to Nagai (2017), MLU was not counted for some files because these files did not include the sufficient number of utterances.

3.3 Procedure

For analysis, verbs were classified into four types based on a procedure proposed by Shirai
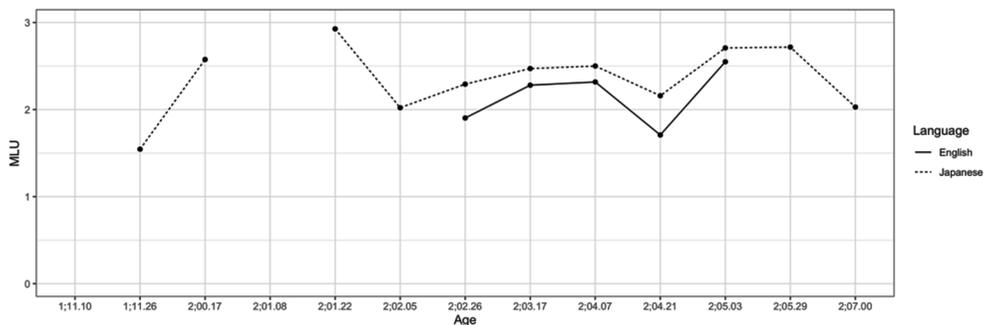

Figure 1 MLU of Japanese and English in Naoki at each time interval

(1991, pp. 16–17)[34]. After classifying the verbs, the type and token of verbs in the target forms were counted. Following Brown (1973), self-repetition such as *atta atta* (*atta* exist-PAST) was counted as one. Exclamatory sentences and fixed phrases with target morphemes were excluded from analysis as the participant might memorise these phrases as chunks (e.g. *yatta* do-PAST "I did it!" and *I got it*). Ambiguous utterances such as *kata-chatta kata?*-COMPL-PAST were usually excluded, but erroneous utterances such as *hashiri-te-ru* (*hashit-te-ru* run-PROG-NPAST) were included in the analysis if the intended forms were identifiable from the context. Mixed utterances were also included if the utterances contained the target morphemes (e.g., *this kami kaita* "I drew this paper [=picture]").

Imitative utterances were excluded, but the utterances identical to the interlocutors' immediate utterances were included if they seemed to exert communicative effects (e.g., when the child used the same word as a response to a question posed by the interlocutors). One of the reasons for this procedure is that Naoki's speech data was limited in quantity, so the strict elimination caused problems for analysis. The other reason is that children's repetition is limited to what they can say in their own natural speech, thus projecting their language ability (Bloom, Hoold & Lightbown, 1974).

Therefore, in the present study some of repetition were included if these repeated utterances appear to have communicative intentions. However, imitations that contained errors (e.g., After the experimenter said "you got it", a child repeated the interlocutor's utterance, saying "you got it", instead of "I got it") were excluded. It should be noted that although a few delayed imitations were found and excluded from analysis, there may still be some delayed imitations in the data because they were difficult to identify.

4. Results

4.1 Productivity of the target morphemes

Before showing the results of analysis using AH, this section examines whether Naoki produced the target morphemes productively. One of the investigations was to count the number of unique verbs that were produced with each target morpheme during the whole recording period. If Naoki's use of the target morphemes was unproductive, the type of verbs that he inflected with each morpheme would not vary. The results were as follows. In English, Naoki produced 48 unique verbs regardless of aspect and word form. Among them, the number of unique verbs that appeared with the past tense morpheme was 1, and that of verbs with the progressive morpheme was 12. In Japanese, Naoki produced 84 unique verbs in total. The number of unique verbs that appeared with the progressive morpheme was 10, that of verbs in the past form was 26, and that of verbs with the completive morpheme was 21. These results show that in both languages, Naoki produced the target

morphemes with a variety of verbs. Although there was only a single lexical item that appeared in the English regular past, this limited variety is most likely because it is acquired late in general.

Next, the type and token frequency of all verbs that Naoki produced in English and Japanese were counted for each lexical aspect (Table 1). In the production of the target morphemes, not all categories were observed. However, Table 1 shows that all four categories appeared in Naoki's utterances. This result suggests that the absence of morphemes is not due to the bias in the type of verbs that Naoki remembered. Taken together, it is suggested that the developmental patterns found in the present study were not solely a result of chunk learning or the bias in his vocabulary.
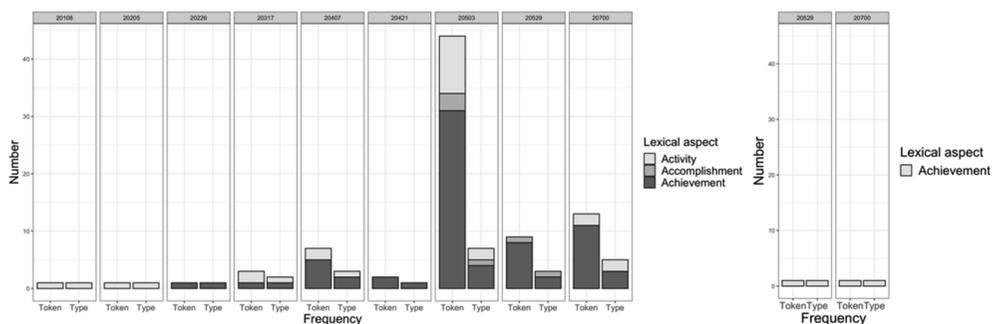
Table 1 Type and token frequency of verbs counted by aspect. Token frequency is shown in parentheses

Aspect	Language	Type (Token)	Example
State	English	8 (54)	*like*, *think*, *want*
	Japanese	9 (192)	*aru* 'exist', *mieru* 'can see', *dekiru* 'can do'
Activity	English	20 (445)	*push*, *swim*, *play*
	Japanese	22 (123)	*osu* 'push', *matsu* 'wait', *mawaru* 'spin'
Accomplishment	English	8 (35)	*make*, *bring*, *eat*
	Japanese	7 (36)	*tsukuru* 'make', *kaku* 'draw', *taberu* 'eat'
Achievement	English	17 (288)	*put*, *break*, *go*
	Japanese	47 (169)	*oku* 'put', *kowareru* 'break', *iku* 'go'

4.2 Development of verb morphology in English

The development of English verbal morphology in Naoki partly followed the prediction of AH, but some deviations were also found. Figure 2 shows the type and token frequency of lexical aspect that Naoki produced in the progressive form *-ing* and the past form *-ed*.

The progressive form *-ing* first emerged at 2;01.08, which was with an activity verb, *running*. The order of emergence of lexical aspect for the progressive form was Activity → Accomplishment → Achievement, following AH. In terms of frequency, achievement verbs had the highest frequency both in type and token per age, whereas activity verbs did not. Although these frequencies may seem to indicate that Naoki produced achievement verbs in the progressive form most productively, hence contradicting AH, the use of activity verbs in the progressive form is not necessarily unproductive. Given the whole data, the type frequency of activity verbs in this form is 6, whereas that of achievement verbs is 5. Therefore, although achievement verbs might appear to be produced most productively in the progressive form, the fact is that activity verbs had the most variety in type throughout the recording period, which suggests that Naoki's production is not

Figure 2 The type and token frequency of English verbs that Naoki produced in the progressive form (left) and the past form (right)

extremely deviated from AH. The example is as follows:

(1) CHI[5]:   I'm **going** there.
     %act: Takes the box to the drawing table.
     EXP: Okay.   (02;04.21)

Another apparent deviation found was that Naoki produced *crash* in the progressive form. This is a highly punctual verb and is categorised as an achievement verb, and thus its use in the progressive form was not predicted by AH.

On the other hand, the past form was observed only twice, at 2;04.21 and 2;05.29. At both times, Naoki produced *crash* in the past form, which corresponds AH. Although the type and token frequency of achievement verbs in the past form is low, the verb *crash* appeared in the different forms as explained above. Therefore, the productive use of achievement verbs as well as the order of emergence predicted by AH is likely to be observed when more data are collected.

(2) EXP: Can't go to the car wash?
     CHI: Yes.
     CHI: I **crashed**.
     %act: squeezes the fire engine into the car wash.   (02;05.03)

In summary, the aspects that corresponded to the AH were that 1) the order of emergence followed AH, 2) state verbs never appeared in the progressive form, and 3) the first verb type that appeared in the past form was an achievement verb. The deviant use of non-iterative achievement verbs in the progressive form is discussed in Section 5.4.

4.3 Development of verb morphology in Japanese

The results of Japanese were less consistent with AH compared to English. The past form especially had the most variety in category and lexical items, which made the pattern less distinctive.

-tei-ru PROG-NPAST first appeared at 2;01.08 and it was with an achievement verb (Figure 3). The progressive form appeared only with activity verbs and achievement verbs. In terms of the time of emergence, Naoki's production follows AH in that Naoki produced activity verbs first, and went through a period when he produced achievement verbs afterwards. Although his production deviated from AH in that achievement verbs preceded accomplishment verbs, the production of accomplishment verbs is not frequent in monolingual children as well, and both type and token frequency of accomplishment verbs in the target forms is generally 1 or 2 throughout the recording period (Shirai & Andersen, 1998). Therefore, this deviation is not crucial. The example of Naoki's utterance is as follows.

(3) FAT: *Kore*   *wa*   *boryuumu*   *da*   *yo.*
            This   TOP   volume   COP   FP
            (This is for changing the volume.)

     FAT: *Ima*   *oto*   *de-nai*   *kedo*   *na.*
            Now   sound   come.out-NEG   but   FP
            (The sound does not play now, though.)

     CHI: ***Mawat-te-ru****.*
            Spin-PROG-NPAST
   ([It is] spinning.)   (01;11.10)

The past form first appeared with a state verb as in *atta* exist-PAST at 1;11.05 (Figure 4). The order of emergence for the past form was State → Accomplishment → Achievement → Activity, which is not congruent with AH. Considering the type and token frequency, the state verbs had a high token frequency, but the type frequency at each age is 1 or 2. Given that the frequency of the state verbs was highest in the first half of the whole recording period but decrease in the latter half, Naoki's use of the state verbs at the beginning may have been due to chunk learning. Therefore, although the preceding literature on the monolingual peers also reported the early production of the state verbs in the past form, this pattern does not necessarily indicate deviation from AH. Regarding activity verbs, the token frequency is remarkably high at 2;03.17, but the type frequency at the same age is 2. On the other hand, achievement verbs had relatively the same amount of token frequency with the type frequency. Taken together, Naoki's production is congruent with AH in that the production of achievement verbs in the past form is most productive. The example of the production
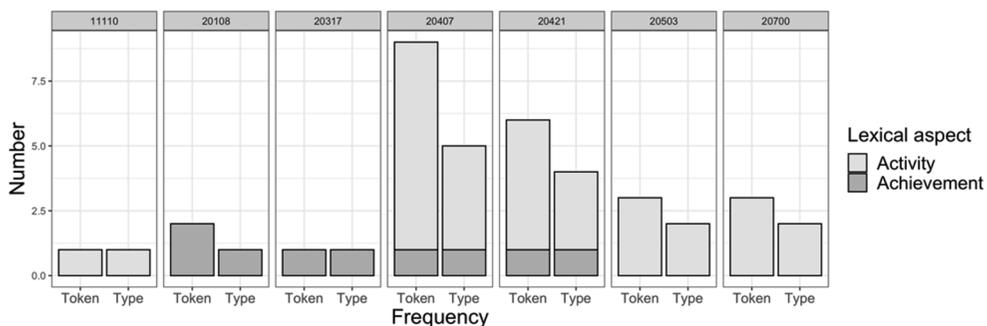
Figure 3 The type and token frequency of Japanese verbs that Naoki produced in the progressive form
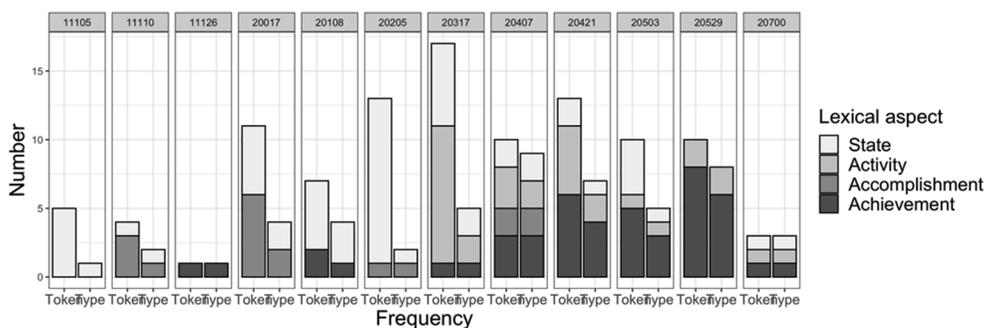
Figure 4 The type and token frequency of Japanese verbs that Naoki produced in the past form
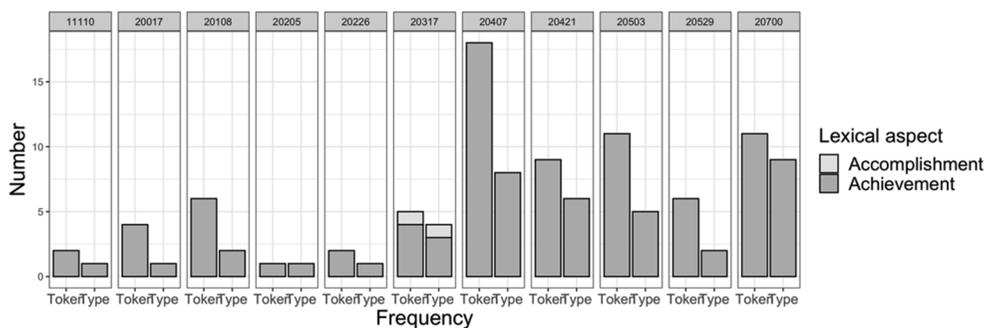
Figure 5 The type and token frequency of Japanese verbs that Naoki produced in the completive form

is shown below:

(4)　MIT:　　*Kore*　　　*dare?*

This　　　who

(Who is this?)

%act:　　shows CHI a computer graphic drawing of Ampamman

CHI:　　*Ampamman*　　　*desu*

Ampamman　　　COP

(It's Ampamman.)

MIT:　　*Ampamman*　　　*da*　　*ne.*

Ampamman　　　COP　　FP

(Yes, it is Ampamman.)

CHI:　　*Papa*　　**tsukut-ta**.

Daddy　　make-PAST

(Daddy made [the computer graphic drawing].)　　(2;00.17)

In addition to the past form and the progressive form, the completive *-chat-ta* COMPL-PAST was also analysed. Figure 5 shows the type and token of verbs that were produced in the *chatta*-form. Most of the verbs produced in the *chatta*-form were achievement verbs, and the onset of the emergence of *-chatta* was 1;11.10. Although an accomplishment verb was produced at 2;03.17, both its type and token frequency were 1. On the other hand, the type and token frequency of accomplishment verbs increased steadily. Hence, it is suggested that Naoki produced achievement verbs most productively in the completive form. One of the examples is *koware-chat-ta* break-COMPL-PAST:

(5)　%sit: the eighth sign post is broken

MIT:　　*Doo*　　*shi-ta*　　　　*no,*　　*kore.*

How　　suru-PAST　　　FP　　this

(What did you do with this [=sign post]?)

CHI:　　*Kono* [=*kore*?]　　　**koware-chat-ta**.

This　　　　　　break-COMPL-PAST

(This is broken.)　　　　　　　　　(2;04.21)

5. Discussion

5.1 The predictions of AH

The present study investigated the development of verbal morphology of a Japanese-English bilingual child in light of lexical aspect. The research question is whether the development of verbal morphemes in the bilingual child follows the patterns found in the monolingual peers, with respect to AH. Although AH speculates on the universal order of emergence regarding lexical aspect, it has been reported that there are language-specific tendencies. Hence, there are two metrics to consider when interpreting results; that is, 1) whether the development of a child deviates from AH, and 2) whether such deviation is also found in monolingual development. Even if development deviates from AH, it is not considered atypical if the same deviation has been observed in monolingual peers.

AH predicts that the use of past/perfective will start with achievement, then extending to Accomplishment, Activity and State; in the case of progressive, the order is Accomplishment, Activity and Achievement. Table 2 shows the order of emergence in Naoki.

Table 2 the order in which each verb type appeared with the target morphemes in Naoki's speech

Language	Morpheme	Order of emergence
English	*-ing*	Activity → Achievement → Accomplishment
	-ed	Achievement
Japanese	*-teiru*	Activity → Achievement
	-ta	State → Accomplishment → Achievement → Activity

The predictions listed in Section 2.4 and its correspondence with the results are shown below:

1) Japanese past appears with state verbs from the early stage of development. → YES

2) Japanese progressive undergoes the stage where it is used with achievement verbs. →YES

3) English past shows a great fit with AH, development advancing from Achievement, Accomplishment, Activity and to State. →??

4) English progressive first appears with either activity verbs or achievement verbs with iterative meaning. →YES

Among the four items, three were confirmed in the present study. 3) was not attested because throughout the whole session, Naoki produced English regular past only twice. This is likely because the English regular past is generally not acquired until Stage V, MLU 3.75–4.50 (Brown,

1973), and the recording period ended when Naoki was at 2;07. According to Nagai (2017), which also analysed Naoki's data, Naoki's MLU was 2.5 at 2;05.03 [6]. Hence, it is not odd that his production of the English regular past was limited.

5.2 The development of -*chat-ta*

Additionally, the present study also included -*chat-ta* COMPL-PAST for analysis with AH, and the tendency to prefer a certain verb type was most evident in -*chat-ta*. This morpheme was mostly produced with achievement verbs throughout the recording period, and the number in type of verbs increased stably over time. -*chat-ta* is a shortened form of the past tense of -*te-shima-u* CONN-COMPL-NPAST, and in adult speech, it expresses completive aspect and a sense of regret or disappointment (Teramura, 1984).

One of the possible reasons why Naoki's use of -*chat-ta* was restricted to achievement verbs is that the aspectual meaning of -*chat-ta* was more perceivable to him. The meaning of Japanese past is not restricted to past, and it can encode non-finiteness such as when it is used in the conditional (e.g., *mayot-tara rennraku shi-te-ne mayot*-COND contact *shi*-CONN-FP 'Contact me if you get lost') and the imperative (e.g., *kaet-ta, kaet-ta! kaet*-PAST *kaet*-PAST 'Get out of here!') sentence. Hence, the telicity of -*chat-ta* may be more salient for a child than the past tense -*ta*.

5.3 Translation equivalents differing in aspectuality

Another interesting finding is that Naoki did not produce the translation equivalents with the translationally equivalent verbal morpheme. There were two sets of translation equivalents (*go-iku* and *come-kuru*) observed in Naoki's utterances, and the English verbs were produced in the progressive form, whereas the Japanese verbs were in the past form. For comparison, the verbs from both languages were categorised into achievement verbs but *go* and *come* behave more like activity or accomplishment verbs. In fact, Shirai (1991) reported that for English-acquiring children, *come* was the first achievement verb to use with the progressive morpheme. Such discrepancy in the aspectuality of translation equivalents could have caused cross-linguistic interaction between languages, but Naoki used different morphemes for these verbs depending on the language.

5.4 Apparent sign of CLI?

Regarding the deviation that neither fit into 3) nor 4), Naoki produced non-iterative achievement verbs (i.e. *crash* and *fall down*) in the progressive form in English, which was not reported in the monolingual study (Shirai & Andersen, 1994). Non-iterative achievement verbs in Japanese can have a resultative meaning in the progressive form, but in English they can only refer to the preliminary stage of an event (e.g., 'I'm coming!'). If non-iterative achievement in English

is used in the progressive form to refer to the 'here and now' situation, this production can be considered as the result of CLI. However, the contexts concerning such productions suggest that Naoki used them to refer to the preliminary stage of an event.

6) CHI: **Crashing**!
   sit%: The car turns over on the slope.   (2;04.21)

7) CHI: Tower **falling down**.
   %Act: <after> Blows down the new tower.   (2;04.07)

In both situations, Naoki was playing with toy vehicles. In 1), Naoki produced *crashing* and then he turns the car over on the slope. In 2), Naoki said that the tower was *falling down* and then destroyed the tower by blowing on it. What is common between these two cases is that his use of the verbs is followed by his action. Therefore, it was concluded that his use of achievement verbs in the progressive form was not due to CLI.

6. Conclusion

The present study aimed to investigate the developmental path that a Japanese-English bilingual child undergoes based on AH, which speculates that the acquisition of verb morphology is generally guided by the inherent aspect of verbs. The analysis revealed that the verbal morphology in a bilingual child developed in the way comparable to the verbal morphology in monolingual peers in each language, suggesting independent development. The results of *-chat-ta* COMPL-PAST exhibits a child's preference toward achievement verbs of which the aspectuality corresponds to the prototypical meaning of the past tense morpheme. The discrimination of translation equivalents is additional evidence that the two languages did not affect one another. Naoki's use of non-iterative achievement verbs in the progressive form was also examined, and it was confirmed not to be the result of CLI.

However, it should be noted that although in the present study CLI was not observed, it seems likely to occur under certain conditions. Nishi and Shirai (2019) studied L2 learners of Japanese with different L1s and reported that L2 learners had difficulty rejecting the L1 aspectual structures when such a structure concerns discrepancy between L1 and L2 in lexical aspect. In case of Naoki, given the number of verbs which he produced in the two languages, he is relatively balanced or possibly more dominant in Japanese, which may be the reason why he did not display such interaction. Therefore, it may yield an interesting result to analyse the data of English-dominant bilingual children.

7. Limitations and future direction

This study had two limitations. One limitation is the limited sample size. In the present study, it was not possible to find access to the data of more than one Japanese-English bilingual child. In addition, the recording ended when Naoki was at 2;7, and the corpora did not contain enough data to estimate Naoki's developmental path to the full extent. Due to this small sample size, it is difficult to estimate whether the obtained results can be generalised to bilingual development in general. However, the analysis based on the type and token frequency and the number of unique verbs per morpheme suggests that the observed patterns were not merely derived from Naoki's idiosyncratic use, and that more distinct patterns that are congruent with AH are expected to be detected with additional data.

Another limitation was the classification of verbs. Some verbs have ambiguous meaning, and the aspect which they encode change depending on the syntactic structure. In addition, the boundary of categories differs across languages such as *sit* and *suwar-u* suwar-NPAST. The treatment of such a gap across languages and morphemes needs reconsideration in future work.

Notes

[1] The Aspect Hypothesis bases their categorisation on Vendler's (1957) four categories of lexical aspect.

[2] The digits after the decimal point indicate the days. Since the recording took place once every two weeks, it is necessary to refer to the date for identifying each session.

[3] The aspectual meaning of some verbs such as *sit*, *wear*, and *stand* was ambiguous, and classification differed between the languages. In English, these verbs have stative meaning in the progressive form and are generally considered a type of state verbs (cf. Comrie, 1976), whereas in Japanese, they do not really mean a stative condition and thus are often considered as change-of-state-verbs (Newman & Yamaguchi, 2002; Kudo, 2014). In such cases, Japanese verbs were categorised into Achievement, whereas English verbs were categorised into Activity. Other translation equivalents such as *know* (State) and *shir-u* know-NPAST (Change-of-state) were also classified into different categories.

[4] The raw data of all verbs, the appendix of verb classification for verbs which Naoki produced in the target morphemes and the actual values of MLU in both languages can be found at https://osf.io/hwrz5/?view_only=735f5f9ef3224c678d5422601fed8583.

[5] Abbreviations used in the example utterances are as follows: CHI…child, FAT…father, EXP…experimenter, %act... activity, %sit… situation.

[6] The MLU for 2;07 was not calculated because the number of Naoki's utterances was not enough. Hence, here the latest MLU available is shown.

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