Types of Consonant Sounds Acquired by a Malaysian Bilingual Child

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Abstract
Child language acquisition is a field of research that generates intense interest and yet can be so debatable, particularly, in specific areas of acquisition. Debates abound suggesting that biological endowment (Chomsky, 1957, Pinker, 1994) is the reason that enabled language acquisition while others (Vygotsky, 1986) believe that it is the environmental support which the child gets, besides his cognitive development. Where sounds precede words in acquisition, it has also been argued that children acquire vowels prior to consonants whilst naming words are more frequently articulated than action words. Nonetheless, from close observations of one Malaysian child, this study provides the vocalisations made by a child who had been brought up in a multilingual setting. This paper will show evidence of the acquisition of consonant sounds which are illustrated in the vocalisations he had made from the time he was born until age 12 months. Analysis of data will indicate that vowel sounds were acquired first but they were limited to only a few which were hypothesised to be easy to produce. In discussing the issue on the acquisition of consonants, this study also argues that only consonant sounds which are easier to develop are produced first. The findings of this study further suggest that the maturation of the vocal tract and the changes it incurs may have an impact on the child's ability to produce certain consonant sounds, some of which require more effort to produce as they are comparatively difficult. By difficult it is meant experiencing certain obstructions involving the lips and muscles. Some aspects of the data analysis seem to support the findings of previous studies while some displayed dissimilarities which will be discussed in the paper.

Key terms: bilingual child, consonant sounds, prelinguistic

Introduction

Most infants go through similar phases in the process of acquiring language and among these, many have also been identified through research as having the ability to perceive and distinguish the different sounds which they hear around them from as early as aged three to four months (Eimas, Siqueland, Jusczyk, Vigorito, 1971; Jusczyk & Derrah, 1987; Crystal, 1997). Infants amaze the research world, for they seem to acquire language speaking skills with little difficulty.

One aspect of child development is seen in their ability to use language although other aspects of child development encompass the various change and development seen through their physique, cognition, emotion, intellect and knowledge of the world. Nonetheless, instead of focussing on these aspects of child development, their linguistic development is the one that interests many people including psychologists, medical doctors, teachers, and parents . All children are unique individuals who are born to unique parents in unique environments with diverse influences that have originated from diverse cultures, yet available studies and their reports tend to provide documentation of the linguistic abilities of western children only. This, invariably, serves as the only model for Asian parents to gauge the linguistic development of their children. Although not totally wrong, there are bound to be differences. Thus, parents who are not well versed in the literature may be unaware that some differences in the child's linguistic development are acceptable. In some instances, a child who happens to acquire language earlier and talk faster than his peers is viewed as if he is more advanced than another. The flip side of the coin also applies when a child is found to be significantly slower than his peers in picking up language and talk. In that sense, his linguistic development may be attributed to some negative aspects of his environment or other possible factors.

Despite what researchers say and how much studies reveal about language acquisition, no one specific child's development is exactly the same as another's. Thus, no one particular report looking at child language development is ever the same as another even though the subject concerns language acquisition. To date, there is a common yardstick available which can be used to gauge the progress of a child's linguistic development and abilities but there will always be some variations in the development. The child who can talk earlier is no less intelligent than the one who talks later, hence, child language acquisition should not just be about how early or late speech is but should also encompass identification of the various aspects of language acquisition like the production of consonants, vowels, or even the combination of both vowel and consonant sounds. In fact, research into language acquisition should also incorporate observation of the types of consonants and vowels acquired by children from different linguistic backgrounds and systems in addition to looking at how easy or difficult these sounds could be in terms of articulation.

Aim of study

In sharing the vocalisations extracted from one bilingual child, this paper specifically concentrates on the acquisition of consonant sounds which were identified in the vocalisations of the child from the babbling stage. The bilingual child was brought up by multilingual speaking parents who chose to use the one parent one language model with him and in so doing, chose to speak Mandarin and English with him from birth. Hence, the main research questions were:

(1) When did consonant sounds appear in the child's babbling?
(2) What type of consonant sounds were accomplished by the child?

Background of the study

The subject is a Malaysian Chinese male, LH, who was raised in the city of Petaling Jaya, located in the Klang valley of multicultural Malaysia. The parents were past their forties when they had him. Being professionals, they were fluent in English and Malay. However, of different educational and dialectal backgrounds, the father was also fluent in Mandarin and Cantonese while the mother spoke some Mandarin and is a native speaker of Penang Hokkien. The subject of this study is the third and last child of the family and in particular, was spoken to, by the father and other surrounding adults, in Mandarin while English was used by the mother. The child has two elder brothers.

Methodology

Vocalisations refer to the different types of sounds made by the child and whenever these were heard, they were manually recorded into a diary. Diaries (Ingram, 1989) were used in this study to facilitate collection as initial attempts to tape record and video record the occurrences of the vocalisations were tampered with by the elder brothers who played with the recordings and then damaged the tape when recording was going on. This had led to difficulties for the researcher, hence, to ensure that spontaneous data is captured quickly, the researcher resorted to using the diary. For the purpose of documenting the articulations of the child as and when they occurred, diaries were placed in several locations in the house: the bedroom, living room, kitchen and one in the mother's handbag. Each and every vocalisation that occurred in the presence of the researcher was spontaneously recorded. However, any ambiguous or unclear sounds were not documented. In this study, no specific schedule for collection of data was noted as the researcher was also the mother of the child. Recording of data into diaries followed the romanised symbols and these were placed inside sharp brackets like < > (see Cook, 1997, p. 59). For the purpose of analysis which attempts to discuss the occurrences of vowels and consonants, normal International Phonetic Alphabets (IPA) selected from those stated in the Cambridge Learner's Dictionary (1992) were used to transcribe the vocalisations. These were placed inside square brackets like [ ] (see Cook, 1997, p. 59).

Explanation of Consonant Sounds

Consonant sounds are defined as those speech sounds made by our vocal organs either by partially or completely blocking the breath streams from our lips. "The consonants of English are produced by impeding or cutting off a stream of air expelled from the lungs as it passes through the throat and mouth, sometimes diverting it through the nose" (Devilliers and Devilliers, 1978) . Consonant sounds are produced as a result of the various movements caused by the tongue, teeth and lips (Holzman, 1997). Many researchers (Holzman 1997; Foster-Cohen 1999) suggest that initial consonant sounds are often those linked to our labials or lips.

The languages of the world amount to more than 5,000 and this means that every language has its own distinct sounds and one reliable or convenient way of looking at these sounds is in the manner and place of articulation since 'letters in the alphabet do not uniquely correspond to sounds" (Baron, 1992).

Foster-Cohen (1999, p. 23) suggests that specific consonant sounds such as those made by the labials are probably articulated by a child much earlier than others simply because the child models these sounds after those whom he has seen and heard talking to him. As mothers or other adults speak to the child face to face, it was suggested that the child had access to viewing the making of these sounds right before his face. Consequently, the child imitates and reproduces these sounds much earlier than other sounds. This implies that the child's caregivers or other participants involved in the environment have an impact on the kinds of sounds which are likely to be vocalised by the child. This is argued by Foster-Cohen who says, "the child's speech forms have been modelled after what he hears and sees" (Foster-Cohen 1999, p. 25).

Evans-Morris (1998) also states that consonant sounds are more apparent during play and she claims that this occurs because the child is only capable of making such sounds at such a young age. Hence, it is deduced that the child's acquisition of consonant sounds can only occur when there is interaction with others, implying too, that what the child sees, the child imitates when the time is right. In other words, a child is only able to imitate the phrases he has heard when he is cognitively developed and when he has heard the same phrases a few times.

In supporting what Foster-Cohen (1998) claims, Evans–Morris (1998) also elaborates that the child's articulation of consonant sounds tends to develop from a pattern that commences with pursing the lips together like the making of labial sounds of [m], [p], [b]. She adds that these productions of labial sounds would then expand to become other types of consonant sounds that would then start from the front tongue position such as those sounds beginning with [t], [d] and [n]. Subsequently, the child moves on to create sounds that use the position at the back of the tongue, thus producing sounds like [k], [g] and [ŋ]. At the latter stage, the child would then acquire the other sounds like [s], [z], [l] and [r] which can only be articulated later because these sounds require a higher level of physical coordination.

Most researchers agree that labials are articulated more frequently and the reason is probably because labials and sibilants (fricatives) do not involve too many movements of the upper articulators (DeBoysson-Bardies, 1999). Further, seen as being easier sounds to produce, such articulations were also seen as the result of the mirror effect created by the mother who is thought to be frequently talking while interacting with the child. Hence, it was inevitable that many children were found to be producing sounds that begin with labials such as [m], [b], [f], [v] (DeBoysson-Bardies, 1999, p. 85) earlier.

Babbling and Consonant Sounds

Babbling is a phase of vocalisation where babies produce mere sounds which may carry no specific meaning although some researchers insist that babbling follows a certain structure linguistically (see Foster-Cohen, 1999). Babbling sounds appear to have been created through the combination of consonant and vowel sounds. This ability of babies to combine both consonant and vowel sounds has been treated as a skill which can only be acquired through the child's maturation process. Cognitively speaking, as the child becomes older, his brain also becomes more developed, suggesting that his knowledge of the world around him has also become more advanced. Parallel to that growth is the development of his physical body as well as his internal system like his speech making organs, tongue muscles, teeth and so on. As a result of such developments, most babies gain the ability to create slightly more difficult sounds and this ability builds up as they grew older and stronger. Based on this, it can be construed that sounds that were made by babies were based on the notion of ease or difficulty (Holzman, 1997; and Godson, 2004) and developed from the front of the mouth to the back of the mouth (Evans-Morris, 1998) since the sound-making abilities of babies have been attributed to the development of their vocal apparatus (Holzman, 1997, Godson, 2004).

During the babbling stage, various sounds are produced and Evans-Morris (1998) mentions that short sounds are easier to make than long sounds because the former requires less control of the child's breathing. She illustrates this by suggesting that [*bah-bah-bah*] is much easier to produce than [*bah-dah-gah*] since the latter consists of three different consonant beginnings like [b], [d] and [g] which are deemed as difficult sounds because of the way they are produced by the vocal tract. Comparatively, the former [*bah-bah-bah*], seems easier because it uses only one consonant sound [b].

Fromkin, et. al. (2003, 2007) also noted that about 95% of the world's most common consonant sounds are produced during the babbling stage. Within that 95% of the world's most common consonant sounds, 12 of them (Holzman, 1997) have been described as 'the most frequently vocalised consonants common in the world's languages'. This implies that the 12 consonant sounds can be detected in the sounds of most languages of the world. These 12 consonant sounds are illustrated in table 1.

Table 1: Holzman's List of 12 Frequent Consonants

Frequent Stops	Nasals	Glide	Liquids
[d] (voiced - more frequent)	[m]	[w]	[r] (less frequent)
[b] (voiced - more frequent)	[n]		[l] (less frequent)
[t] (unvoiced)	[ŋ]		
[g] (voiced - more frequent)			
[[k] (unvoiced)			
[p] (unvoiced)			

(Holzman, 1997, p. 65)

Of the 12 most frequently vocalised consonants provided in table1, 6 are stops: [d], [b], [t], [g], [k], and [p], 2 are nasals: [m] and [n], and 1 is a glide: [l]. Out of these 12 most vocalised consonants, the nasal [ŋ] has been identified as a consonant sound that was less frequently articulated in the context of this study because it was a sound that was deemed to be difficult to produce, in particular when it serves as the first sound of a vocalisation. Of the 6 stops identified by Holzman (1997, p. 65), consonants such as [d], [b] and [g] have been described as the most frequently articulated and she justifies this by saying that "the more frequently used consonants are easier for infants to produce". In other words, the ones most articulated by the child are the ones which are easier for the child to produce. Nevertheless, Holzman (ibid.) did not rationalise why the ones more frequently articulated are seen as the easier ones. It is assumed that the ease identified by Holzman is linked to the formation of the vocal organ that exists in the child's system. It seems acceptable that when the child is young, some organs are not developed yet and so a younger child is only capable of producing sounds that are easier to create because his vocal ability is restricted. Similarly, as the child becomes more developed with age, he also gains more vocal abilities which include producing more difficult sounds.

The 12 frequently vocalised consonants (Holzman, 1997, p. 65) can be further grouped under the manner of articulation. Thus, the consonants produced would develop from [p] first, followed by [d] and then [b] before producing them together with [g], [t], [k] and [m]. This description is tabulated in table 2 below.

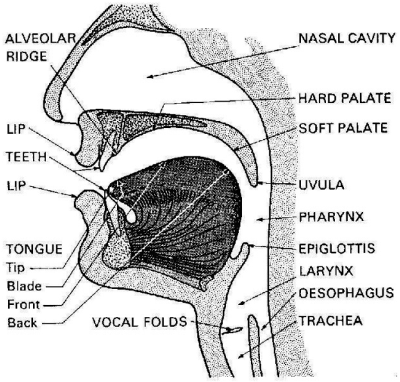
Table 2: Holzman's Commonly Acquired Stops and Their Manner of Articulation

	Consonants of English	Manner of Articulation	Place of Articulation
1	[p]	Bilabial	uses lips
2	[d]	Alveolar	uses tongue/ridge
3	[b]	Bilabial	uses lips
4	[g]	Velar	uses velum
5	[t]	Alveolar	uses tongue/ridge
6	[k	Velar	uses the velum
7	[m]	Bilabial	uses lips

(Holzman, 1997: 65)

Since the manner of vocalisations is linked to the vocal organ, it is thus apt to provide a figure to highlight the exact places of articulation. Figure 1 below displays the place of articulation for certain consonant sounds.

Figure 1: The Vocal Tract adapted from http://www.abdn.ac.uk/langling/resources/midsagsectionbw.jpg



Studies that focussed on the acquisition of consonant sounds suggest that consonant sounds are "more likely to be first used correctly at the beginnings of words", and that "final consonants emerge later and during the second year (Crystal, 1997:242). It was also mentioned that consonants like [p], [b], [k], [n], [f], [d], [g], [m] and [h] are commonly used at the initial stage. Of these, it is claimed that only the first 5 would develop into words. Crystal (ibid.) did not justify why. It is rationalised that this is linked to the child's ability to articulate sounds at certain stages of development. Based on the observations of what infants and children can or cannot do, it is thus justified to say that a developing child can only accomplish the easier tasks first before more difficult ones can be accomplished and this applies to sound acquisition too.

Commonly Acquired Consonant Sounds:

DeBoysson-Bardies (1999) proposes that young children appear to combine certain consonant sounds with certain vowel sounds. He advocates that to introduce occlusives and nasal vowel sounds such as [a:] and [e] and so on, young children tend to combine them with consonant sounds like [p], [b], [t], [d] and [m]. He also adds that velar consonants like [g] or [k], preferred by some children, may also be included. The various consonant sounds and their places of articulation are provided in table 3 for presentation.

Table 3: English Consonants and Their Places of Articulation

Bilabial	[p]	[b]	[m]				
Labiodental	[f]	[v]					
Interdental	[θ]	[ð]					
Alveolar	[t]	[d]	[n]	[s]	[z]	[l]	[r]
Palatal	[ʃ]	[ʒ]	[tʃ]	[dʒ]			
Velar	[k]	[g]	[ŋ]				
Glottal	[h]						

(From Fromkin, Rodman and Hyams, 2003:243)

English Consonant Sounds

English consonant sounds are determined by the shape of the resonance cavity and are often described by their place of articulation (see Figure 1). Based on the data acquired from the Malaysian child, it was found that the child had made a number of vocalisations from birth to around 12 months of age. Data is restricted to this age because beyond this the vocalisations resembled words and also conveyed specific meanings, although not consistently. The child's vocalisations indicate that the velar, glottal, bilabial, palatal and alveolar consonant sounds were accomplished at different ages. Table 4 below provides the overview of the acquisition which can be traced to the vocalisations made by the child. These were then compressed into table 4 for the benefit of identifying the type of consonant sounds which the child had produced and at what age these were accomplished. A discussion of the respective consonant sounds acquired by the subject follows below.

Table 4: LH"s Sequence of Consonant sounds articulated by the subject

velar	glottal	bilabial	palatal	alveolar
3 months **[ŋ]**	3 months **[h]**	3 months **[m]**	7 months **[j]**	10 months **[t]**
10 months **[k]**		7 months **[p]**		11 months **[n]**
10 months **[g]**		10 months **[b]**		11 months **[d]**

(Kuang, 2007)

From the data presented above, it can be seen that the between the ages of three (3) to eleven (11) months, the bilingual child had managed to articulate five (5) types of consonant sounds namely: a) Velar, b) Glottal, c) Bilabial, d) Palatal and e) Alveolar. When these were compared to Holzman's (1997) provisions projected in table 2 above, it is noticed that there are differences in the intervals or period of acquisition. This is shown in table 5 below.

Table 5: Illustration of LH"s Age and Acquisition of Consonants

	Age	Vocalisations	Consonants	Manner of Articulation	Place of Articulation
1	3 months	*<meu>*	[m]	Bilabial	uses lips
2	7 months	*<p>*	[p]	Bilabial	uses lips
3	10 months	*<buh, buh, buh>*	[b]	Bilabial	uses lips
4	10 months	*<te te>*	[t]	Alveolar	uses tongue/ridge
5	10 months	*<ka-ka>*	[k]	Velar	uses the velum
6	10 months	*<grrgh, grrgh>*	[g]	Alveolar	uses tongue/ridge
7	11 months	*<di, di, di>*	[d]	Alveolar	uses tongue/ridge

(Kuang, 2007)

Data shown above suggests that the [m] bilabial was the easiest sound to make since it was accomplished at the young age of three months whereas the most difficult sound to make was [d] which was acquired at age eleven months. Holzman (1997) had suggested that acquisition of these consonant sounds are progressive, that is building upwards on the scale from easy to difficult and from what has been exhibited by data, it is thus obvious that the findings of this study do not match the sequence of acquisition suggested by Holzman (1997), who proposes that acquisition develops from consonants [p], [d], [b], [g], [t] [k] and then to [m].. The findings of this study hence, suggest that the subject's pattern of acquisition may have been different due to the linguistic environment he was placed in coupled with the language input he had received from the surrounding adults and siblings. The section below further discusses the acquisition of these consonant sounds.

The Velar Consonant Sound [ŋ]:

- When the child was three months old, he began to coo the sound of *<angoo>*. Dissected into the components of [a:+ŋ+gu:], it is deduced that the child had acquired the ability to articulate the consonant sound of [ŋ] (n+g) as a medial (middle) sound. In the vocalisation of *<angoo>* , the [ŋ] sound is described as a velar (see table 4) because the sound is produced when the back of the tongue is raised in order to touch the velum or soft palate (Fromkin, Rodman and Hyams, 2003:243). Holzman (1997) has indicated that it is one of the most difficult sounds to produce especially as an initial sound. Although this ability may have surfaced at the age of three months, the [ŋ] velar sound is seldom utilised by the subject as data indicate. Table 6 below shows a list of the vocalisations which contained the [ŋ] consonant.

Table 6: LH"s Development of the [ŋ] Consonant Sound

Nos.	Transcribed Sounds	Articulated Sounds	Age
1	[aːŋːguː]	<*angoo*>	3 months
2	[ŋk] [ŋk]	<*ngk! ngk!*> as Chinese baby language for clearing bowels	11 months 6 days
3	[ŋɔːŋ] [ŋɔːŋ]	<*ngong! ngong!*>	11 months 15 days
4	[hŋ] [hŋ]	<*hng! hng!*>	11 months 21 days

From the data, it can be seen that the [ŋ] sound does not dominate the other sounds which had been vocalised by the child. It is also evident that while the sound in (1) <*angoo*> contains [ŋ] as a middle sound, the sound in (2) and (3) display the [ŋ] consonant sound as an initial sound. The sound in (4) <*hng! hng!*> highlights that [ŋ] was produced as a final sound.

The Glottal Consonant Sound [h]

The [h] consonant is not one of Holzman's (1997) frequent consonants although it comes under Fromkin et.al.'s (2003:243) description of consonants. The [h] consonant is described as a glottal sound and it is usually associated with the sounds common in words such as <house>, <hair> and <hat>. A look at the data as seen in the cry made by the subject when he was six months old suggests that it was not the type of cry which was severe and evoked any pain or discomfort experienced by the child. The subject seems to be using the sound of <*hek! hek*!> as a way of getting attention. The sound could be differentiated from those that implied pain or discomfort because it was often articulated by the child as "sound" only, without tears. The minute the child was picked up, the, child stopped producing the sound.

Close observations of the child further indicate that at six months old, the child was capable of sitting up on his own, unaided. At the same time, he was also on a diet of solid foods and also had two front lower teeth. The physical descriptions are given to endorse the argument that when maturation takes place, certain physical changes occur and it is these changes which enable the child to vocalise certain sounds. Further, it was hypothesised that at six months of age, the child's oral cavity would have been more developed. As the shape of his vocal organ develops to become more adult-like (see Foster-Cohen, 1999; Godson, 2004), the child would also be able to vocalise new sounds which may have been difficult earlier. These changes, evidenced by the child's change in physique, also prepared him for a more varied group of sounds (see Holzman, 1999, p. 63-65; Foster-Cohen, 1999, p. 22-23).

The consonant sound of [h] was not utilised frequently by LH. Data show that it was not as frequently articulated and it also faded into the background and ultimately the [h] consonant disappeared. This occurrence is supported by the explanation offered by Foster-Cohen (1999) who says that certain sounds articulated by the young child may be contentless (meaningless) and since it did not convey any meaning for the child, it was not used very much by the subject. It was probably articulated because the child had discovered it and found it easy to produce since it did not require any elaborate movements (Holzman, 1997). Although the [h] consonant appeared at six months of age and then disappeared after that, it resurfaced when the child was eleven months of age. This came in the form of the nasal vocalisation of <*hng*! *hng*>.

Table 7 below illustrates the development of the [h] consonant sound acquired by LH between birth and 12 months. Some sounds may have appeared in previous tables.

Table 7: LH"s Development of the [h] Consonant Sound

Nos.	Sound	Age
1	*<hek! hek!>*	6 months
2	*<hng! hng!>*	11 months
3	*<hng! hng!>*	11 months 21 days

Only three vocalisations made use of [h] as a consonant sound. The minimal data indicate that the [h] consonant was used only as a first syllable sound. Based on this, it can be said that although LH had managed to articulate the [h] consonant sound, it was one that was used less frequently. The following section discusses the subsequent acquisition of [j].

The Palatal Consonant Sound [j]

In phonetics, the sound of words which begins with the [y] consonant such as <yes>, <young> or <you> is represented by the phoneme [j]. This sound is classified as a palatal sound since it is through the process of putting the tongue against the middle palate and allowing air to pass through the constricted passageway that such a sound is produced. Like the previous consonant sound of [h], the [j] consonant sound is not listed in Holzman's (1997) proposed frequent consonants but it appears in Fromkin et al's (2003, p. 243) table presented above.

From the data, the production of the [j] consonant sound was identified in the vocalisations of <*yeh! yeh*!> which was articulated in single syllables while in a good mood. The fact that LH articulated this sound implies that he has discovered a combination pattern for his vocalisation and this was made up of the [j] consonant which was then combined with the vowel [e], resulting in the sound of <*yeh! yeh*!>. Needless to say, that as a sound which does not seem to convey any specific meaning at the point of articulation, it was thus deemed a meaningless sound. However, if one looks at the possible evolvement of this sound into an adult word, it is possible that LH may have articulated this sound in preparation for an adult word which is based on the Chinese word of <*yeh-yeh*>, a kinship term which means grandfather.

The second sound articulated by LH which contains the [j] consonant sound is the sound of <*yee*> that was articulated by LH when about 11 months old. <*Yee*> is a Mandarin word which means <fish>. Data shows that LH had produced this when 11 months and 21 days old. This vocalisation was captured when he was trying to respond to his male caretaker's statement of <*lai, wo mern chi kan yee*> which means <come, let us go and see fish> in Mandarin. This aspect of LH's ability to articulate <*yee*> is deemed as an indication of maturity and development which enabled the child to combine the [j] consonant sound with the [ɪ] vowel to develop <yee>. Besides the two vocalisations of <*yee*> and <*yeh! yeh*!>, another babbling sound which consist of the [j] consonant sound was the sound of <*yeh, yeh, ya*!>, accomplished when the child was 11 months and 15 days old..

The three examples of <*yee*>, <*yeh! yeh!*> and <*yeh, yeh, ya!*> mentioned above illustrate LH's ability to articulate the [j] consonant sound implies that the [j] consonant is achievable based on the maturation of cognitive and vocal apparatus. However, it is not his favourite sound and this could be attributed to the difficulty of the position of one's tongue or parts of the mouth (see Evans-Morris 1998; and Godson, 2004) which LH may have encountered.

In looking at the child's utterances, one can never be certain why certain sounds are possible in the child's acquisition process. The uncertainty is further compounded because the child cannot explain the phenomenon to us and as a researcher, one has no means of getting into the internal system of the child to verify matters. At best, one can try to broach possibilities and hypotheses. Crystal (1997) and Vygotsky (1978, 1986) attribute part of the child's speech–making abilities to the adults surrounding him such that the child is motivated by the surrounding adults and that he models his articulations after them. However, , it would seem that the case of the [j] consonant sound factor discussed here is not so. It is argued that the infrequency of the [j] sound in LH's vocalisations is not due to a lack of adult input nor because he was not motivated since there are many words from Mandarin and English which contain the [j] sound, whether as an initial or medial sound. In that sense, the limited vocalisations using the [j] consonant can be attributed to the fact that it was a difficult sound to produce.

The Bilabial Consonant Sound [m]

It is interesting to note that [m] was acquired first of the three bilabial stops of [p], [b], and [m]. The consonant [m] has been classified as one of the three bilabial sounds most infants are capable of producing (Evans-Morris, 1998; Foster-Cohen, 1999; DeBoysson-Bardies, 1999). In the section discussed above, it was mentioned that LH showed the ability to make his lips into the shape of the <m> sound at age six months. With the vocalisation of the sound <*meu*> at three months and his lip formation of [m] at six months, it is assumed that this has helped to open the way for LH to use the [m] consonant sound more avidly.

Though the sound of <*meu*> was produced at age 3 months, it was discontinued until three months later (at age six months) when LH re-enacted the phenomenon of the lip-formation. At six months of age, not only did LH develop the lip pattern which resembled the [m] consonant, he also used it in a buzzing manner like <*mmmmm*>.

More tangible evidence of this ability emerged when LH was seven months old and this is seen in the babbling sounds produced out of enjoyment. The [m] consonant sounds will be discussed in the sequence they were produced according to age.

Table 8: LH"s Development of the [m] Consonant Sound

Nos.	Sound	Age
1	<*meu*>	3 months
2	<mm>	6 months
3	longer <mmmmm>	7 months
4	<*memmmmm*>	7 months
5	<*mem-mem*>	7 months
6	<*marm-marm*>	8 months
7	<*mem-mem*>	8 months
8	<*marm-marm*> relates this to food	9 months
9	<*mm bu-buh*>	10 months
10	<*marm-marm*> relates this to "food, play objects"	11 months
11	<*mar-ma*> relates this to any man, or Y, the female caretaker	11 months
12	<*mar-mee*> relates this as reference for his mother	11 months

13	*<mak>*	11 months 6 days
14	*<mmmmmmm>*	11 months 6 days
15	*<mch! mch!>*	11 months 21 days
16	*<ma-mee>*	11 months 21 days
17	*<ma-ma>*	11 months 25 days
18	<*may*> refers to moon	12 months

Key:

< >	Sounds or words articulated by subject
[ ]	Sounds analysed using the IPA and consonants prescribed by Holzman, (1997) and Fromkin, et. al. (2003).

Reference to the data above suggests that the [m] consonant is an easier sound to articulate, compared to the other consonant sounds. It is thus hypothesised because the [m] consonant sound seems to be the child's favourite having produced more of it than others like the consonant sounds of [ŋ] and [h] which had been articulated at an earlier age. In addition, the [m] bilabial sound also seemed to persist in many vocalisations made by LH between the age of seven and twelve months.

The Bilabial Consonant Sound [p]

At seven months old, LH was observed to be making reduplicated sounds. Simultaneously, he was also producing sounds which were initiated by the bilabial sound of [p]. The first time LH attempted the [p] sound was when he was on his own in his crib. The enunciation of the [p] sound became more evident when the child was nine months of age, saying [p] as in <*perh*!>, where the air gushes out from the lips.

By 10 months, LH had developed a single utterance of two syllables comprising the [p] sound as in <*ah pa! ah pa! ah pa*!>. At certain intervals, the <*ah pa*> may turn to <*ah ba*>. Observations of the child reveal that the sound was articulated when the child was in a good mood. This implies that the sound was produced as a result of enjoyment, probably due to his discovery of and experimentation with the consonant sounds of [b] and [p]. It was further detected that as the child articulated <p!>, he would simultaneously switch the articulation to a babbling sound like <*pa, pa, pa*>. This occurrence is categorised as the child's reduplications. Table 9 below shows a list of the [p] consonant sounds articulated.

Table 9: LH's Development of the [p] Consonant Sound

Nos.	Sound	Age
*1	<p>	7 months
*2	<p>	9 months
*3	*<ah pa! ah pa! ah pa! ah pa!>*	10 months
*4	*<pa! pa! pa!>*	10 months
*5	<*pa*!> as a reference to papa which means father	10 months plus
*6	*<pa pa pa pa pa>*	10 months plus
*7	<*pa pa*> as in father	11 months
8	<*pe*!>	11 months
*9	<*papa*> may refer to father, brother, or the male caretaker, S.	11 months

*10	<*ba- pu!*>	11 months
11	<*ba-pu!*>	11 months 25 days

Key:

< >	Sounds or words articulated by subject
[ ]	Sounds or words inserted with IPA symbols as well as consonants recommended by Holzman (1997) and Fromkin, et al (2003).
*	Sounds which are repeated.

Analysis of the data suggests that the [p] consonant sound is not a favourite sound of the child when compared to the productions of the [m] bilabial sound. Further, despite a total accumulation of eleven (11) sounds which consist of the [p] consonant sound, it can be seen that most of them were repetitive as indicated by the asterisk sign *. Of these eleven vocalisations, nine (9) were repeated sounds with <p> being repeated twice, <*pa*> repeated six times and the sound <*ba-pu*> repeated twice. Due to its minimal usage, it is deduced that the [p] consonant sound is less frequently articulated as sounds because it is more difficult to generate than the [m] consonant sound.

The Bilabial Consonant Sound [b]

It is evident that the consonant sound that featured most prominently and thus, is/was used more frequently (see Holzman, 1997) by the child is the bilabial sound of the [b] consonant. The development of the [b] consonant sound started when LH was 10 months old as he began to create the unintelligible babbling sound of <*buh! buh! buh! buh!*> This was followed very quickly in sequence by the sound of <*ah ba!*>. LH then created various other combinations which are shown in Table 10 below.

Table 10: LH"s Development of the [b] Consonant Sound

Nos.	**Sound**	**Age**
1	<*buh! buh! buh! buh!*>	10 months
2	<*ah ba*>	10 months
3	<*beh! beh! beh! beh! beh!*>	10 months
4	<*mm beh-beh*>	10 months
5	<*bu-buh!*>	10 months
6	<*mm bu-buh!*>	10 months
*7	<*bu-ek!] [bu-ek!*>	10 months
8	<*ah bu,bu,bu*!>	10 months
*9	<*bu-ek!*> with bubbles forming in mouth	10 months
10	<*berk*!> used as a reference to the animals such as dinosaurs, butterfly and cat on his milk bottle.	10 months plus
*11	<*berk*!> used as a reference to animals flying in the sky	11 months
12	<*bork! bork!*> used as a reference to books	11 months
13	<*ba-pu*> no recognisable meaning	11 months
14	<*bek*!>	11 months
*15	<*bark*!>	11 months
16	<*be, be, be!*>	11 months

17	<*bard*!> referring to water in his milk bottle	11 months 15 days
18	<*bourgh! bourgh! bourgh*!> with bubbles as if referring to his book of animals	11 months 15 days
19	<*beh! beh-eh!*>	11 months 15 days
20	<*buh! buh-eh!*>	11 months 15 days
21	<*beh-eh!*>	11 months 15 days
22	<*burh!*> <*burh!*>	11 months 15 days
23	<*beh! beh! beh! bab! bab!*> when holding a toy and figuring out how it works	11 months 15 days
24	<*beh-eh!*> when he sees that mom is home	11 months 15 days
*25	<*berk! Berk!*> on opening the drawer and on seeing many objects inside	11 months 25 days
26	<*ba-bab,bab,bab,bab!*>	11 months 25 days
27	<*ba, ba, bo!*>	11 months 25 days
*28	<*ba…pu!*> <*ba…pu!*>	11 months 25 days
29	<*bek!*> may mean any four legged animal	11 months 25 days
*30	<*bark!*> may mean any four legged animal	12 months
*31.	<*bork!*> is used to refer to the birds	12 months

Key:

< >	Sounds or words articulated by subject
[ ]	Sounds analysed using the IPA and consonants prescribed by Holzman (1997) and Fromkin and et al (2003, 2007).
*	Sounds which are repeated

The data above illustrate the child's ability to vocalise the [b] sound after the [m] and [p] consonant and this occurrence indicates that the [b] consonant sound is the most difficult of the three to be produced since it was acquired last. There are hypothetical reasons for this ability.

First, such a development signifies that LH's vocal tract including the muscles that enabled sounds to be made had developed more than before as compared to the time when he was newly born. As he developed, so too has his this internal organ meant for producing sounds. When this change takes place, not only were difficult sounds more achievable for the child, it also enabled the child to produce a variety of combinations such as combining the consonants with various vowels. Second, as his vocal organs developed, it also became more conducive for him to produce not just labial, bilabial sounds than other consonant speech sounds. This assumption was based on the high frequency of production of these sounds. Moreover, of the bilabial sounds, it appears that the bilabial nasal was acquired first, as seen in the [m] consonant sound. LH then continued to acquire the bilabial [p] consonant sound before acquiring the bilabial [b] consonant sound. Evidence of this is recorded in the respective tables. This phenomenon appears to support Evans-Morris' (1998) claim about the acquisition of consonants moving from easy to difficult.

The Velar Consonant Sounds

Velar consonants are deemed to be difficult sounds to produce and in the context of this study, the child managed to display them by the age of ten months. They are discussed in sequence of acquisition.

[k] Consonant Sound

At the age of ten months, LH demonstrated the ability to make the velar sound [k]. In articulating this sound which is traced to the vocalisation of <*ka-ka*> which is used when addressing his elder brother, it seems that LH was on the verge of articulating adult-like words. The reason for saying this is because the sound coincides with the sound of <*ker-ker*> which means elder brother in Mandarin. This occurrence is the child's first manifestation in articulating a Mandarin word. After the sound of <*ka-ka*> was articulated at the age of ten months, no further development of the [k] consonant sound was detected until a month later. At the age of eleven months, the [k] consonant sound was utilised as a last syllable sound in the vocalisations of <*bu-ek*>, <*bark*>, <*berk*>, <*bek*> and <*ngk! ngk*!>. Despite these sounds, it is hypothesised that the [k] consonant sound was not LH's favourite as the sound was less frequently used. This occurrence can be attributed to a number of reasons, one of which is the insufficient input from adults. Another reason could be because the [k] consonant is a difficult sound to produce at this age. .

[g] Consonant Sound

Just as the [k] consonant sound is deemed to be a difficult one to produce (Godson, 2004) because it had emerged late in LH's development (i.e. at 10 months), it was similarly deduced that the [g] consonant sound is difficult to generate as it only emerged when the child was ten months old. The first of the [g] sounds was heard as a growling sound in the form of <*grr…gorg!*> and it seems to be the only piece of evidence of the [g] sound being vocalised. Although in general the [g] consonant sound is less emphasised when articulated as a single syllable sound, an attempt made by the writer indicates that the [g] consonant sound becomes less prominent when it is accompanied by the [rr] sound.

The Alveolar Sounds of [t], [n] and [d]

Fromkin, Rodman and Hymans (2003, p. 243) indicate that there are generally seven alveolar sounds. In the context of this study, it appears that the child was only able to produce three of them namely the [t], [n] and [d] consonant sounds. The section below looks at the consonant sound of [t].

[t] Consonant Sound

This consonant sound was first heard when LH, aged ten months, had vocalised <*te, te, te*> as a babbling sound. From this sound, it seems that the child can combine the [t] consonant with the [e] vowel sound to create the reduplicated sound of <*te, te, te*>. The vocalisation of <te, te, te> is just one instance illustrating the acquisition of the [t] consonant. Of the three alveolar sounds articulated, the [t] consonant seemed the easiest to acquire because it was acquired first. Nonetheless, only one vocalisation was detected.

[n] Consonant Sound

The [n] consonant sound was acquired when LH was aged eleven months old and this was traced to the babbling sound of <*ne, ne, ne, ah!*> which was quite evidently, a fun word, as LH would verbalise this when playing on his own. Table 11 shows the compilation of the sounds beginning with [n].

Table 11: Samples of the [n] Consonant Sounds

Nos.	Sound	Age
*1	*<ne, ne, ne, ah!>*	11 months
*2	*<ne-ne>*	12 months
3	*<na-na>* for banana	12 months

Key:

< >	Sounds or words articulated by subject
[ ]	Sounds or words inserted with IPA phonetics as well as consonants recommended by Holzman (1997) and Fromkin and et. al. (2003).
*	Sounds which are repeated

It would seem that a very small sample of the vocalisations containing the [n] consonant sound was captured. Due to this limited number, it is thus deduced that LH did not find this a favourite sound and it is possibly so because it was difficult for him to produce. In addition, it could have been due to a lack of language input. Although the [n] consonant was not listed in DeBoysson-Bardies' (1999) and Evans-Morris (1998)'s description of 'frequently acquired consonants' it is one of Holzman's (1997) frequent consonants. The limited data show that the [n] consonant sound was articulated when combined with the vowel sounds [e] and [a:] only.

[d] Consonant Sound

Based on the data, it hypothesised that the [d] consonant is the most difficult of the three alveolar sounds and that it also required time to develop the ability to produce it. It is possible that the child needed time for the vocal organ as well as certain muscles to mature in order to accommodate the pressure that may accompany such articulations. Consequently, it can be seen that the child was only able to articulate the consonant sound of [d] after the previous consonant sounds of [m], [p] and [b]. Thus, by the time LH was making vocalisations containing the [d] consonant sound, it was also hypothesised that he was experiencing the kind of maturation suggested by Piaget (1955) and Holzman (1997). In this particular case study, LH was 11 months old when first observed to produce the sounds of <di, di, di> followed by the sound of <*dutch, dutch*> and then <*detch! detch*!> as illustrated in table 12 below.

Table 12: LH's Development of the [d] Consonant Sound

Nos.	Sound	Age
*1	*<di, di, di!>*	11 months
2	*<dutch! dutch!>*	11 months
*3	*<di, di, di>*	11 months 21 days
*4	*<detch! detch!>*	11 months 25 days
*5	*<detch! detch, arh! detch!>*	11 months 26 days

Key:

< >	Sounds or words articulated by subject
[ ]	Sounds or words inserted with IPA phonetics as well as consonants recommended by Holzman (1997) and Fromkin and et al (2003, 2007).
*	Sounds which are repeated

The vocalisations which contained the [d] consonant sounds shown above are not prolific. It is possible that it is a difficult consonant to produce and in addition, productions may have been restrained by a lack of adult language input. It seems that the [d] consonant sound was combined with three other vowels to create variations.

Consonant Clusters

A consonant cluster is a string of sounds, that is, when two or more consonants appear in a row within a single word. In the study of linguistics, a consonant cluster is used when referring to pronunciation only and not spelling (Trask, 1997:52). In this study, it is evident that even before reaching his first birthday, LH had shown the ability to articulate some consonant clusters. Table 13 shows a list of the vocalisations that consist of the various consonant clusters articulated by the subject from the age of 11 months.

Table 13: LH's Development of Consonant Clusters

Nos.	Sound	Age	Cluster combination
1	<*hng! hng!*>	11 months	[hŋ]
2	<*grr-gorg! grr-gorg*!>	11 months 15 days	[grr]
3	<*hng! hng!*>	11 months 21 days	[hŋ]
4	<*mch! mch!*>	11 months 21 days	[mtʃ]
5	<*nyeh, nyeh!*>	11 months 21 days	[ny]
6	<*hmm…*>	11 months 21 days	[hmm]
7	<*ngk! ngk!*>	11 months 25 days	[ŋk]

Key:

< >	Sounds or words articulated by subject
[ ]	Sounds or words being analysed with IPA and consonants prescribed by Holzman 1997 and Fromkin et.al.(2003, 2007)

From the set of data shown, it seems obvious that consonant clusters could only be accomplished when the child was about to turn into a toddler, that is, just on the verge of being a year old. The attainment of consonant clusters was only possible by the subject when aged between 11 months to 11 months and 25 days. Based on the list of data, it appears that consonant clusters either appear at the beginning or at the end of the vocalisations he had made.

Conclusion

This paper has attempted to show the types of consonant sounds acquired by a bilingual child. From this process tracing his simultaneous acquisition of Mandarin and English, some aspects of the acquisition focusing on consonant sounds were demonstrated. Using the vocalisations that had been captured between the age of three to eleven months, data was displayed to show that the sequence of consonant acquisition had developed based on the hypothesis of relative ease/difficulty of production. Such an ability is only possible when the child is both physically and mentally ready.

From the various vocalisations recorded and shown in the tables, it can be said that the child who had been exposed to two languages from birth clearly demonstrates his ability to articulate consonant sounds which were combined with vowel sounds. In arguing that it could only materialize on the continuum of easy to difficult, evidence was substantiated by the frequency of vocalizations made by the child as well as the age at which these were vocalised. It was proposed that the more frequent the sound and the earlier the sound emerged, the easier it was to produce such a sound, irrespective of whether it was the initial, medial or final sound in the vocalisation. The less frequent the sound and the later the age such sounds occur, the more difficult it is to produce the sound. The supporting reasons were linked to Crystal's (1997) claim of child favourites when specific sounds were used more often and also to the propositions of Holzman (1997), Evan-Morris (1998), Foster-Cohen (1999), DeBoysson-Bardies (1999), Crystal (1997), Fromkin, et al. (2003, 2007), and Godson (2004) who all agree that the more frequent and the earlier the sound is seen, the easier it is, for the child to produce and vice versa.

Physical growth is related to mental and cognitive growth. As the child grew older, he also acquired more knowledge of the world which he lives in, and simultaneously, his ability to understand how sounds are produced and related to other things becomes more attainable. However, such an internal process is one that could not be physically assessed. Thus, one could only hypothesise the workings of the mental faculty through the analysis of the child's vocalisations which were seen through the stages of growth. In the earlier days of development, the sounds produced appeared to be created with 'easy sounds' while subsequent productions showed that they were not only more varied but also more advanced in difficulty. The phenomenon was identified by the researcher through some of her own attempts at making these sounds while it was also attributed to the fact that some sounds were only attainable when the vocal organ is more developed. The child's physical development was also seen as a contributory factor and it appears that the vocalisation of certain consonant sounds correspond with the development of LH's vocal organs which in turn, it is hypothesised, had facilitated his ability to produce certain speech sounds (see Godson, 2004) and this seems to also coincide with his age.

Analysis suggests that the child's acquisition of consonant sounds did not follow the list as listed and indexed in Holzman's (1997) twelve 'frequent consonants'. Nonetheless, to some extent, the child's pattern of consonant acquisition did support the list of consonants suggested by Fromkin et al. (2003, 2007). In this study, acquisition of consonant sounds also developed into consonant clusters.

It is thus concluded that of the 6 consonants, 2 nasals and 1 glide (see Fromkin et. al. (2003), Crystal, 1997 and DeBoysson-Bardies, 1999) which were said to be the most common in children's utterances, the ones acquired by the bilingual child of this study ranged from velar, glottal, bilabial, palatal to alveolar and it surfaced between the ages of three to eleven months of age. Further, of all the consonant sounds which had been articulated and used by the child in combination with vowels, it was obvious that these had developed from mostly babbling sounds. Based on the list of vocalisations, it was deduced that the <b> consonant sound was most favoured by the child and this was followed by the <m>, <p> and <d> consonant sounds. Other consonant sounds were also articulated and used from time to time but they were not as prevalent as the others mentioned above. In addition, it could be said that between birth and the age of eleven months, some consonant clusters were also attainable and they ranged from the sounds of [hŋ] as seen in sounds like <hng>, [ŋk] as seen in sounds like <ngk ngk!>, [grr] as seen in sounds like <grrrgh,grrrgh>, [mtʃ] as seen in sounds like <Mch!>, [ny] as seen in sounds like <nyeh nyeh!> to [hmm] as seen in sounds like <hmm!>. Table 14 below displays the sequence and order in terms of age in vocalising the consonant sounds while table 15 illustrates the acquisition of consonant clusters.

Table 14: The Acquisition Order of Consonants

Consonants	[h]	[m]	[p]	[j]	[b]	[t]	[k]	[d]	[g]	[n]
Age in months	3	3	7	7	10	10	10	11	11	11

Table 15: The Acquisition order of Consonant Clusters

Consonant clusters	<ŋ>	<hŋ>	<ŋk>	<grr>	<tʃ>	<mtʃ>	<ny>	<hmm>.
Age in months	3	11	11	11	11	11	11	11

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