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Input Multiplicity and the Robustness of Phonological Categories in Child L2 Phonology Acquisition

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Abstract

This study looks at L2 English acquisition by Hong Kong (HK) Cantonese children when various varieties are present. Specifically, it targets youngsters exposed to Filipino-accented English (FE) from live-in housekeepers in addition to the school and community input encompassing HK, UK, and US varieties. Results show that kindergarteners aged 4;6-6, and 1st year secondary school students aged 11-14 who had received/ were still receiving FE significantly outperformed age-matched controls, who never received such input, on perception tasks targeting FE plosives /p, t, k/ and fricatives /f, v/. The two groups do not differ in the other three varieties. Yet, participants' performance on FE is significantly worse than that of native FE speakers. This casts doubts on the nature of informants' acquisition of this variety. This paper argues that participants' limited input from only one/ two Filipino housekeeper(s), which contrasts with the diverse input they obtained from various sources for the other varieties, impedes the development of robust categories essential for the processing of novel FE speech.

Abundant research shows that even adults are able to acquire aspects of an L2 phonology given sufficient amount of input, though this is mediated by factors such as age, length of residence, etc. (Piske, MacKay & Flege, 2001). Many of these studies made quite the misguided assumption that the target language (TL) represents only one variety (Bohn & Bundgaard-Nielsen, 2009; Leather, 2003), which is often taken to be the so called "standard" including General American and Received Pronunciation. Accordingly, little is known about L2 speech learning in the context of input multiplicity where numerous varieties exist alongside inter-speaker variations. Against this backdrop, this study investigates the nature of child L2 phonology acquisition under the influence of multiple varieties in Hong Kong (HK). It focuses specifically on the acquisition of a rather under-studied variety, Filipino English (FE), by children who are exposed to it from early on.

The remainder of this paper will provide a brief overview of the current knowledge of L2 phonology acquisition. It will then discuss the context of the study and the study design. Next, findings will be presented with discussions to follow. The paper will conclude by highlighting the insufficiency of the claim that acquisition takes place upon exposure, and the necessity to scrutinize the nature of input a learner receives in relation to the diversity present in/ absent from it.[*]

L2 PHONOLOGY ACQUISITION

As the ever growing interest in *New Sounds* suggests, L2 speech learning is a vibrant area of study. One of the key findings of L2 speech research is that acquisition of L2 segmental and suprasegmental features from both perception and production perspectives are possible given sufficient exposure to input (see Hyltenstam & Abrahamsson, 2012; also Hansen Edwards & Zampini, 2008; Muñoz & Singleton, 2011). For instance, Flege and Liu (2001) found that Chinese immigrants to the US are able to acquire English word final voicing contrast that is absent in their L1. This is not only true for school-aged participants, but also for some adults who the authors speculate to have been immersed in an input rich environment. Similarly, Bongaerts, Mennen and van der Slik (2000) were able to show that advanced learners of L2 Dutch from a diverse L1 background are able to pass as natives/ near native speakers of Dutch in

[*] I'd like to thank the audience of New Sounds 2013 for their comments on the presentation from which this paper is built on.

global accent measurements. However, the majority of these studies have not tackled the issue of input multiplicity, i.e. the diversity present in the actual input, e.g. dialect variation. They often implicitly assume the TL to be a monolithic entity representing a single norm, usually the standard and/ or institutional variety. This assumption is unwarranted, not only due to the unprecedented social and geographic mobility hence contact among speakers of different languages (Chambers, 2002), but also to variation within native-speaking contexts (see e.g. Foulkes & Docherty, 2006; Hughes et al., 2012). Though a related line of inquiry in first dialect acquisition is of increasing interest (e.g. Chambers, 1992; 2005; Payne, 1980; Siegel, 2010), dialect acquisition in SLA remains under-researched.

Input multiplicity has obvious implications for assessment, e.g. when learners are evaluated according to the standard instead of the actual variety to which they are exposed (Pearson et al., 2009). Studying input multiplicity can potentially shed light on L2 speech learning theories as well if it turns out to be the case that existing accounts are inadequate in explaining acquisition in these situations. The present study explores these issues by looking into multiple L2 variety exposure. It aims to find out what actually happens when young learners are exposed to multiple English varieties as an L2.

THE CONTEXT

English, as one of HK's official languages, is compulsory from primary school. Students receive institutional input for this L2 (e.g. British or American English) from various teachers who are either native-speaking English teachers/ NETs (Bolton, 2002) from inner-circle countries (Kachru, 2005) or local speakers of the well-established HK variety (Setter, Wong & Chan 2010). These varieties are also present in the media.

In addition to the institution input, many children are exposed to English from live-in housekeepers/ foreign domestic helpers (FDHs) from countries like the Philippines and Indonesia. In households where both parents work during the day, FDHs are children's main caregivers providing their main and initial source of English input. In the present study, the FDHs were FE speakers who did not speak the community language, Cantonese. English is thus the household language. Before starting primary school, children receive all their English input from Filipino-FDHs apart from some input from the media. FE is marked by the

substitutions of [p, b] for /f, v/ and non-aspiration of /p, t, k/ in onsets (see Table 1).[1],[2]

Table 1. Segmental contrasts between Filipino and HK English

	FE (Bautista, 2000; Tayao, 2008)	**HK English** (Bolton & Kwok, 1990; Hung, 2002; *inter alia*)
#_ (/p/, /t/, /k/)	not aspirated	aspirated
/f/, /v/	/f/ realized as [p], /v/ as [b]	/f/ realized as [f], /v/ as [v]/ [w]

Notwithstanding their significant presence and their occasional status as auxiliary English teachers (Constable, 2007; McArthur, 2002), FDHs' role in the L2 English learning of children is understudied (Crebo, 2003). This study addresses the gap by focusing on participants' acquisition of FE alongside HK-, UK-, US- English.

The presence of these FDHs offers a window on the acquisition of a variety different from the institutional and local varieties by young learners still within the purported critical period for the acquisition of phonology.

THE STUDY

The study focused on five English sounds instantiated differently in FE than in all other varieties present in HK. These are the labio-dental fricatives /f, v/ and the voiceless plosives /p, t, k/ as noted above. Two perception tasks were used to tap into children's FE phonological competence.

Participants

Data collection took place between 2010 and 2011 in four kindergartens with comparable curricula and two English-medium secondary schools in HK.[3] The friend-of-friend approach was also used to gather data. Kindergarteners rather than pre-school children were selected due to their

[1] FE is an umbrella term describing a range of variations, as noted in Tayao's (2008) lectal continuum, which considers basilect, mesolect and acrolect. The recordings used in the present study (see below) were confirmed to be representative of the FE present in HK by three Filipino FDHs in HK.

[2] It should be noted that the [p, b] originated from /f, v/ are acoustically different from the [p, b] resulting from the unapsiration of /p, t, k/. However, since acoustic details are not the foci here, this issue will not be commented on further.

[3] In English-medium schools, all subjects are taught in English apart from Chinese and Chinese history.

additional but minimal exposure to other varieties of English. Secondary rather than primary school students were selected for the second group as the FDH vs. institutional exposure situation is partially reversed compared to the kindergarteners'. The sample comprised 31 final-year kindergarteners aged 4;6 to 6, and 29 first-year secondary students aged 11 to 14. All were still receiving or had heard FE at some point as their main source of English input. 20 kindergarteners aged 4;0 to 5;11 and 14 secondary students aged 11 to 13 who had not received such input were included as controls. The controls received English input only from the institutional source (e.g. British and American English) and the media alongside HK English in and outside school. The estimated amount of English exposure all study participants received from various sources is shown in Table 2.[4] These present the participant subgroups: two Filipino-FDH groups (kindergarteners and secondary students) and two control groups without Filipino-FDH exposure (kindergarteners and secondary students).

All participants were ethnic HK-Chinese from middle class families. They reported using Cantonese exclusively with their parents and most of the time with their peers. Kindergarten and secondary students in the Filipino-FDH group used English at home with Filipino FDHs. At the time of testing, the youngest kindergarteners could have received up to 5000 hours of FE input and the secondary students at least 8000 hours. The proportion of FDH input reduces over time once children start school. The rightmost column in table 2 also represents the English exposure for the two control sub-groups. Although the present study did not control for additional exposure via the media and classmates, it is likely that informants had had some exposure to inner-circle varieties and HK English from these sources.

Table 2. Estimated input amount for learners from different sources

Period	**Source of input**	
	Filipino FDHs	Institutional
Pre-school	35 - 45 hours per week	Rare
Kindergarten	30 hours per week	4 hours per week
Primary school	20 - 30 hours per week	4.5 - 30 hours (depending on medium of instruction)
Secondary school	~15 – 25 hours per week	30 hours per week

[4] Based on school curricula and on assumed and observed interaction patterns between FDHs and children.

The Tasks

The 94 informants participated in two perception tasks: a picture choosing task and a sound discrimination (AX^3) task, details of which are given below.

Perception Tasks. In the *picture choosing task*, participants listened to recorded English words spoken in the four accents: Filipino, HK, British English (Received Pronunciation) and American (General American),[5] with the target onsets /f/, /v/, /p/, /t/, /k/. Participants selected the picture from a set of three which represented the word they heard. The option of "not included"/ "don't know" was available in case the participant thought the word they heard corresponded to none of the pictures. All words were instantiated in the pictures in actuality. Five words with five different onsets were used, yielding 25 tokens. There were 13 distracters involving words not containing the target onsets. They were included to prevent participants from identifying the true purpose of task - to test perceptual knowledge of the target sounds. Vowels of various features were included (e.g. [+high] /i/ vs [+low] /æ/) to follow the target onsets and to minimize the possibility of results being affected by the quality of the following vowel. Mainly monosyllabic words were used to minimize phonetic/ co-articulatory effects, such as reduction in aspiration, consonant devoicing.[6]

Pictures for potential confusion pairs were included in the same set wherever possible, e.g. *fan, pan*. Not all sets, however, contained confusion pairs because some words do not form a perfect confusion pair or form pairs that fell outside participants' lexicons especially kindergarteners'. Other minimal pairs or close minimal pairs were included in such cases. Participants were asked to indicate whether there was any word in the set that they did not know after completing the task and these were excluded. Words were played to each participant who then marked their answers on a sheet containing pictures corresponding to each pre-recorded clip.

The *sound discrimination (AX^3) task* probes further into participants' phonological knowledge of FE. In this task, two FE stimuli were aligned with the first stimulus (A) remaining constant while the second in the pair

[5] Experimental and control participants should only differ with respect to Filipino English. This hypothesis was tested by including words spoken in the other three accents to which all groups were exposed.

[6] See Leung and Young-Scholten (2013) for more details about the research instrument.

(X) was either the same as or different from A, and participants had to say which was the case. Two FE sounds, e.g. [f], and [v] were contrasted with [p], and [b], while unaspirated [p], [t], [k] were contrasted with [b], [d], [g] for their similar VOTs as opposed to aspirated [p^h], [t^h], [k^h]. Nonce words were used when there was no perfect minimal pair. For instance, the bracketed portion of *gee(se)* is not pronounced resulting in a nonce word. Since the purpose of the task was to test participants' ability to discern the sound, the knowledge of the actual word used (be it real or nonce) can be ignored (Strange & Shafer, 2008). (1) is an example of a block:

(1) *Fan, Fan (AA); Fan, Fan (AA); Fan, Pan (AB*)

Two same or different sounds separated by 1500 milliseconds were played in blocks of three (hence AX^3) in randomized order to avoid systematic answering (e.g. for AA, AX, AA), and each block was separated from the next by 3000ms. Participants indicated whether they perceived the stimuli as the same or different. Cases where differences depending on exposure to FE were noticed indicate that informants possess a mental representation for these phonemes. Three different AX contrasts were used for each of the five onsets, yielding 15 blocks of tokens (see footnote 6).

Preparation of Materials. FE and HK English words in the picture choosing task were recorded with an Olympus WS-series recorder by a female Filipino-FDH working in HK, and a female HK speaker of English whose accent was typical. The RP and GenAm words were taken from *Cambridge Dictionary Online* (Heacock, 1999). The same FE speaker also recorded the sound discrimination AX^3 task. Pictures were obtained from the internet and determined to be unambiguous illustrations of the words in the task. Pictures which might have aroused extreme emotions were avoided.

RESULTS

Table 3 shows the average of correct responses made by participants out of all test items in the first task. Two-way ANOVAs (Filipino-FDH exposure and school group) were run for the test scores (excluding the 13 distracters) of the four respective accents. Significant results (i.e. $p \leqq 0.05$) are found only with the FE set for the two factors Filipino-FDH exposure ($F= 7.394$, $p= 0.008$, $\eta_p{}^2= 0.078$, *medium effect size*) and school group ($F=$

8.125, p= 0.005, η_p^2= 0.085, medium effect size). School group is also a significant factor for the scores of the British set (*F= 25.557, p= 0.000, η_p^2= 0.223, large effect size*) but Filipino-FDH exposure is not (*F= 0.003, p= 0.955*). The F values in all the other sets are not significant with either of the factors. No interaction between the two independent variables is observed in any of the sets. Table 3 in combination with the F values shows that participants with Filipino-FDH exposure perform significantly better than those in the control group on the Filipino set. Their performances do not differ significantly in the other sets. These seem to suggest that participants in the experimental group who had been exposed to FE have acquired this variety. At the same time, similar to the controls who were exposed to HK, UK, and US varieties they too have acquired these varieties for which they have had contact via institutional means. Yet, it is noteworthy that their performance in FE appears to be quite inferior, only averaging at the 60s region, compared to other varieties that they have also acquired, all of which yielded an average score of/ close to the 90s.

Table 3. Group means in the picture-choosing task

Groups	**Accents of the stimuli**			
	Filipino	**Hong Kong**	**British**	**American**
Kindergarteners with F-FDH (n=31)	68.98 (12.50)	90.66 (6.04)	86.11 (7.85)	94.48 (5.78)
Kindergarteners without F-FDH (n=20)	62.77 (12.49)	89.29 (7.80)	88.34 (6.53)	93.18 (6.02)
Secondary students with F-FDH (n=29)	62.54 (10.47)	89.50 (5.55)	95.07 (5.01)	95.50 (5.54)
Secondary students without F-FDH (n=14)	54.72 (11.54)	89.82 (8.13)	92.37 (7.80)	94.09 (4.49)

Standard deviations are given in parentheses.

The group means for the AX^3 sound discrimination task shown in Table 4 indicate participants' average scores of all target FE sounds that actually differ. On a par with the picture choosing task, a two-way ANOVA with the same independent variables (Filipino-FDH exposure and school group) was run for the target in this task. The group differences for the target Filipino sounds in AX^3 are significant with respect to both independent factors (Filipino-FDH exposure: *F=5.332, p=0.023, η_p^2= 0.056, marginal medium effect size*; school group: *F=10.934, p=0.001, η_p^2= 0.108, medium effect size*). Since the data for the foil were not normally distributed, the two independent variables, *School group* and *Filipino-FDH exposure* used in the previous analyses were aggregated into one variable

School group x Filipino-FDH exposure so as to conduct the non-parametric alternative instead of an ANOVA.[7] Such an analysis shows that the disparities between the foils are not statistically significant with $p = 0.351$ in the Kruskal–Wallis test. Follow-up multiple Mann–Whitney U tests revealed no statistically significant differences between the averages for individual groups in the foil. This rules out the possibility that participants with F-FDH exposure are simply generally better at tackling the AX^3 task than the control subgroups. If it was the case that participants in the experimental group are more apt at the task, they would have also performed significantly better in the trials with foils. There is also no interaction effect observed between the two independent variables in either set. The means in conjunction with the inferential statistics indicate that the experimental group distinguishes target FE sounds better than the control.

Table 4. Group means in the sound discrimination AX^3 task

Groups	Target	Foil
Kindergarteners with F-FDH (n=31)	46.00 (18.96)	98.61 (2.39)
Kindergarteners without F-FDH (n=20)	34.92 (15.47)	99.16 (1.49)
Secondary students with F-FDH (n=29)	57.01 (19.40)	98.33 (2.93)
Secondary students without F-FDH (n=14)	50.47 (19.16)	99.23 (1.99)

Standard deviations are given in parentheses.

Table 5. Mean rank table for the foil in the sound discrimination AX^3 task

Groups	Mean rank
Kindergarteners with F-FDH (n=31)	43.43
Kindergarteners without F-FDH (n=20)	44.07
Secondary students with F-FDH (n=29)	50.59
Secondary students without F-FDH (n=14)	54.96

These findings again appear to indicate that participants exposed to FE have indeed established the phonology of this variety. Nonetheless, similar to the previous task, their performance was rather poor. In light of that, post-hoc comparisons with native FE speakers were carried out.

Extra data were collected from two FE English FDHs working in HK in 2012. Following the same procedures described above, they undertook the

[7]The mean rank table (Table 5) is given here because it is necessary for parametric statistical measurement, such as the Kruskal–Wallis test used here.

picture choosing task with the FE stimuli and the sound discrimination task. Their average score can be seen in table 6.

Table 6. Group means in the picture-choosing task and sound discrimination task

Groups	FE – picture choosing task	Sound discrimination task
Kindergarteners with F-FDH (n=31)	68.98 (12.50)	46.00 (18.96)
Secondary students with F-FDH (n=29)	62.54 (10.47)	57.01 (19.40)
Filipino-FDHs (n=2)	92.10 (0.00)	83.33 (4.71)

Standard deviations are given in parentheses.

Multiple t-tests were run to compare the data between the experimental groups and the Filipinos.[8] Results show that the Filipino FDHs are significantly better than both the kindergarteners and the secondary students in both the picture choosing task and the sound discrimination task. The inferential statistics of the comparison between the kindergarteners with FE exposure and the Filipinos in the picture choosing task are as follows: $p = 0.016$, Cohen $d = 1.60$ (large effect size). While the comparison in the same task between the secondary students and the Filipinos yielded the following: $t = -3.930$, $p = 0.000$, Cohen $d = 2.82$ (large effect size). T-tests between the kindergarteners and the Filipinos in the sound discrimination task generated these figures: $t = -7.768$, $p = 0.001$, Cohen $d = 7.91$ (large effect size). Finally, the comparison between the secondary students with Filipino exposure and the Filipinos in the same task resulted in the following: $t = -5.363$, $p = 0.004$, Cohen $d = 5.58$ (large effect size). These clearly indicate that although the participants are better than the controls as shown in tables 3-5 their performance is significantly worse than that of native FE speakers. Therefore, it behooves us to scrutinize the nature of FE phonology acquisition by these participants.

DISCUSSION

Previous research on L2 speech learning tells us that learners are mostly able to acquire aspects of L2 phonology upon sufficient exposure to the target language. What is not so well-known is whether this generalization

[8] In the comparison between the scores of kindergarteners and Filipinos in the picture choosing task, Mann-Whitney U test was used instead as the data were not normally distributed.

can be upheld in situations where multiple varieties of the same TL are present. The current study aims to dig into this issue further by investigating HK children's acquisition of L2 English under the influence of multiple varieties, particularly concentrating on the Filipino variety. At first glance, data obtained through the two perception tasks seem to concur with the above generalization. Participants in the experimental group who were exposed to FE via live-in FDHs alongside HK, UK, and US English received through education and the media were able to acquire all of these varieties. In addition, they outperformed controls who had not had FE exposure in both tasks that target this variety. These apparently provide support for existing L2 speech acquisition accounts which claim that acquisition is possible upon exposure to input, therefore, suggesting that contexts where multiple varieties exist are essentially no different from other settings where input is/ assumed to be uniform.

However, upon scrutiny a more complex picture emerges. Not only can we see that participants' performance vis-à-vis FE in the picture choosing task is clearly worse than their scores in other tested English varieties, participants in the experimental group are also significantly worse than native FE speakers in both the picture choosing task and the sound discrimination task. This is indeed quite puzzling, on one hand, the participants in the experimental group seem to have acquired FE to a certain extent as indicated by their superior ability over the controls in this variety; but on the other hand, despite their early, relatively abundant and in some cases ongoing FE input, their performance is far from native-like. In order to solve this puzzle one would perhaps need to delve into the nature of FE input these children obtained. Unlike input for other targeted varieties (i.e. HK, US, UK) which informants would have encountered in various domains beyond their own home (e.g. school, media), their exposure to FE is typically limited to the one/ two Filipino housekeeper(s) their families have employed. Their interaction with FE would hence have been rather limited, restricted to exchanges they had with the few helpers in the household domain, since it is uncommon that they would have interacted with any other Filipinos outside their home.[9] This severely narrowed the diversity they received for this variety in terms of inter-speaker variability, which could be essential for the development of robust phonological categories (Johnson & Mullennix, 1997).

[9] The strict terms and conditions of the working visa of FDHs in HK restrained them from seeking jobs other than domestic helpers.

Indeed, it has been shown in strictly controlled laboratory studies that exposure to multiple varieties during training facilitates the learning of categories in question. For instance, Clopper and Pisoni (2004) tested the sensitivity of L1 adult American English speakers towards American English dialects and found that participants who were trained with three talker variations outperformed controls trained with only a single talker when categorizing novel speech produced by unfamiliar talkers. Bradlow and Bent (2008) demonstrated that the benefit of training with multiple variations extends beyond native speaker varieties. They showed that native English speakers are better at adapting to novel Chinese-accented English if they were trained with multiple talkers of the Chinese variety. Even more germane to the present L2 context is the classic study by Lively, Logan and Pisoni (1993) which showed that L1 Japanese learners trained with talker variation were better at generalizing the L2 English *r*/ *l* distinction that is lacking in their L1 to novel items and talkers not included in training. More recently Brosseau-Lapré and colleagues (2013) demonstrated that L1 English participants perceptually trained with multiple talkers are better at categorizing the L2 French rounded/ unrounded vowel pairs absent from English. Together these studies provide a strong case for the close relationship between training associated with multiple variations and the robustness of the categories to be acquired.

Tying these with the present study, it could be argued that the lack of diversity in the FE input to which participants were exposed has impeded their development of robust phonological categories for this variety of English. This explains why, in spite of some signs of acquisition of FE, participants ran into trouble when confronted with speech stimuli prepared by speakers who were not the actual Filipino they had previously come into contact with. According to the insights gained from laboratory speech training studies, it is perhaps not surprising that the performance on the perception tasks by informants in the study fall short of native FE speakers who, unlike the participants, would have received input from a wide-array of contexts containing multiple instances of speaker variation.

CONCLUSION

Against the backdrop of a dearth of research in relation to L2 speech acquisition and input multiplicity, this paper reports on a study that explores the issue in the context of Hong Kong where children were

exposed to Filipino English input from live-in foreign domestic helpers in addition to the institutional and community input encompassing HK, UK, and US English. On the surface, findings obtained from the perceptual instrument (picture choosing task and sound discrimination task) seem to suggest that participants exposed to these varieties have established the respective phonological categories that the study targets (/f, v, p, t, k/). In particular, informants in the experimental group who have been exposed to FE appear to have established categories for this variety as well. Hence, confirming current understanding of L2 phonology, namely that acquisition will take place upon input exposure. Nonetheless, these informants' performance was shown to be inferior to native FE speakers. Borrowing insights from laboratory speech training studies, an account has been proposed to explain these results. It is argued that participants' experience of FE was rather limited which in turn hampered the development of robust categories that is crucial for speech perception. However, this account remains speculative at this stage since the study did not rigorously control for the input diversity with regard to FE, nor had it clearly documented the number of Filipino helpers each participant's household had employed. To validate the proposed account, the study will have to be replicated with a tighter control over the number of Filipino housekeepers with whom informants have interacted. Equally, much needed longitudinal studies can be setup to follow individuals closely for a deeper understanding of the nature of interaction with Filipino FDHs.

In spite of its limitations, the present study highlights the need to better quantify and qualify input, echoing the call by researchers such as Flege (2009) and Moyer (2011). The results of the present study underscored the fact that it is not sufficient to rely on broad-brush claims about L2 acquisition in accounting for the context concerning input multiplicity. The presence of input diversity or lack thereof could have an impact on the acquisition outcome; this is an issue that has to be taken seriously if we are to enrich our knowledge of L2 speech acquisition beyond a laboratory. In the past, studies assuming uniformity in L2 input have deepened our understanding of L2 speech acquisition; however, perhaps the time is ripe for us to attempt to tackle the issue of input multiplicity in the current era of mobility abounds with language and dialect contact.

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