

The Critical Period Hypothesis Revisited: An Investigation of Taiwanese University EFL Learners' Production of Two English Consonants

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Abstract

This study mainly investigates the relationship between onset age of exposure to formal English instruction and Taiwanese university EFL learners' accuracy in pronouncing two English consonants (i.e., /s/ and /θ/). A total of 50 English majors who studied at a single university in northern Taiwan were recruited to participate in the current research. All of the participants were asked to fill in a language background questionnaire, followed by receiving a pronunciation test that required them to read into a tape recorder 16 English words with either a /s/ sound or a /θ/ sound. The recordings of the participants were rated by three native speakers of English, who either held a PhD in the TESOL- or linguistics-related field or had taught English at university for at least 10 years. The learners' productive performances were then analyzed along with their ages of starting learning English (retrieved from the data of the questionnaires) via Pearson Product-Moment Correlations. The statistical results show that there were no significant correlations of onset age to the participants' production of the consonants. As a result, the findings of the study suggested that onset age did not appear to play a critical role in foreign language acquisition of producing consonants.

Keywords: critical period hypothesis (CPH), onset age, production, consonantssee the comments

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Introduction

As internationalization and globalization have become the trends in the world of the twenty-first century, English has become one of the most important languages on the planet. In Taiwan, there is a huge market for English education amid a flood of advertisements and commercials for cram schools, private tutoring, and supplementary reading materials. Many such programs are aimed at teaching children to speak English at as young an age as possible. Moreover, a substantial number of parents in the country expect their kids to learn English at such a young age because there is a commonly-held conception that it is better and more effective to learn English as early as possible. This “earlier is better” concept primarily comes from the critical period hypothesis (CPH) proposed by Eric Lenneberg in 1967.

In fact, the CPH was first introduced by Penfield and Roberts (1959), and then expanded and given a new interpretation by Lenneberg. Lenneberg (1967) examines how well language can be acquired during the critical period. He claims that a critical period is a sort of like a window of opportunity in a child’s linguistic developmental process during which his or her ability to learn a language is at its peak. If the child is exposed to a language within this window, the process of acquisition is easy, complete, and can reach the level of proficiency consistent with that of native speakers. But, if a learner is too old, beyond the stage of the critical period, it becomes harder to acquire a language and the learner may not reach the level of native-like proficiency.

The CPH was first applied to the study of first language (L1) acquisition, and the findings were nearly positive. One of the most famous studies is the case of Genie. Genie was an abused girl found in 1970, who was 13 when at the time of her discovery. Genie did not react to hot or cold temperatures and had a primitive look. She could not stand still or straighten her limbs. She was only able to walk with much difficulty and could not run. She was incontinent of feces and urine and did not even know how to chew. Genie was a victim of her father’s abuse and was strapped to a potty chair, wearing diapers when she was found. Her father had judged her retarded at birth and had subjected her to confinement in the bedroom, presumably with little to no social contact for most of her life. She appeared to have never acquired language ability over the course of her entire life. In the following years, doctors attempted rehabilitation, during which she did slowly improve her language ability. But even so, though she improved, her phonology and syntax still did not function like that of native speakers (Curtiss, 1977; Hung, 2012b, 2016).

Later on, the notion of a critical period was also extended to the contexts of second and foreign language (L2/FL) acquisition; however, mixed results were found. Take for example the aspect of phonological acquisition. Tsukada, Birdsong, Bialystok, Mack, Sung, & Flege (2005) investigated the discrimination of four English vowel contrasts by 36 native Korean children and 36 native Korean adults who had migrated to North America. They found that the native Korean children consistently discriminated the vowel contrasts more accurately than the native Korean adults. Furthermore, Hung (2012a) researched the relationship between onset age of exposure to formal English instruction and 104 Taiwanese university EFL learners’ perception of four English vowels. The findings suggested that “a critical period exists for foreign language acquisition of perception of vowels” (p. 89).

In contrast, Bongaerts, Mennen, and Slik (2000) tested 30 advanced late adult Dutch learners of different L1s in producing 10 Dutch sentences. The results showed that at least two adult participants were found to pronounce like native speakers. This finding was interpreted as evidence against the CPH. In addition, Nikolov (2000) examined how many successful adult L2/FL learners would be mistaken for native speakers via a structured interview. The outcome of two experiments revealed that L2/FL acquisition of phonology was still possible after the critical period had been reached.

The review of past literature above suggests that the position age assumes in L2/FL phonological acquisition is still not clear and more research studies are required to clarify its importance. Hence, the current study aimed to shed light on the importance by focusing on the correlation of age of first exposure to formal English instruction and Taiwanese university EFL learners' pronunciation of two consonants (i.e., /s/ and /θ/). The following are the questions this project sought to address.

1. Does onset age of learning English significantly correlate with Taiwanese university EFL learners' proficiency in pronouncing the two consonants (/s/ and /θ/)?
2. What is the relative productive difficulty of the two English consonants (/s/ and /θ/) for the students?

Method

Participants

Originally, there were a total of 124 students who all majored in applied English. Due to the fact that this study was meant to investigate the relationship between native Taiwanese EFL learners' onset age of learning English and their accuracy in pronouncing the English consonants /s/ and /θ/, this research only included students who had been learning English in Taiwan. Those who had received English instruction in other countries or who were born and had been raised in an environment where English is consistently spoken needed to be excluded from this study. Based on the data collected from the initial questionnaire, nine out of the 124 students mentioned that they had learned English in other countries. After these learners were removed from the study, 50 of the remaining 115 learners were randomly selected as the finalized participants. These participants also reported no impediments in their speaking and hearing abilities.

These finalized participants consisted of 22 males and 28 females, and they were either sophomores or juniors at the university where this study was conducted. Their ages ranged from 19 to 21 at the time of the study (mean: 19.54), and the onset ages of their English learning ranged from 5 to 13 (mean: 8.76). In addition to these 50 participants, three native speakers of English took part in this research. They functioned as raters of the pronunciation test, and their main task was to listen to the word recordings produced by the participants and identify the words they heard on an answer sheet. The three English native speakers either held a PhD in TESOL or linguistics-related fields, or had been teaching English at a university for years.

In order to guarantee the reliability and consistency of this panel's assessment of the participants' pronunciation, a mock-up test was administered to them before the experiment. The researchers selected three students not among the officially selected participants and administered the same production task to be used later in the experiment. The native listeners were then asked to judge the performance of these mock subjects. The results of this test

displayed a consistent consensus among the judges' assessments for all test responses given by the students. The inter-rater reliability was 1, shown in Table 1.

Table 1 *Inter-Rater Reliability among the Three Raters*

| | Intraclass Correlation | 95% Confidence Interval | | F Test with True Value 0 | | | Sig. | Single |
|------------------|------------------------|-------------------------|-------------|--------------------------|-----|-----|------|--------|
| | | Lower Bound | Upper Bound | Value | df1 | df2 | | |
| measures | 1.00 | 1.00 | 1.00 | - | 2 | - | - | |
| Average measures | 1.00 | 1.00 | 1.00 | 1.00 | - | 2 | - | |

Instruments

Two instruments were used in this experiment to collect data: a questionnaire and a pronunciation test. The questionnaire was used to retrieve every finalized participant's English learning background, and the pronunciation test was used to test the participants' accuracy in pronouncing the two English consonants (/s/ and /θ/).

Questionnaire.

The questionnaire was designed based on the one from Hung (2012a) to gather information about the 50 participants' language learning background. It was administered before the participants took the pronunciation test. It gathered personal information such as the learners' initial age of exposure to formal English instruction, their current age, gender, university major, name, the environment in which they had learned the target language, their hearing and speaking conditions, and so forth. Some of the questions required the participants to check the most appropriate answer while others required them to fill in the blanks (see Appendix B). The questionnaire administered to the participants was written in Mandarin Chinese (see Appendix A) and had been proofread by a native speaker of Mandarin Chinese who majored in Chinese.

Pronunciation

One of the main goals of this study was to measure Taiwanese university EFL students' productive accuracy of two English consonants (i.e., /s/ and /θ/). Therefore, a pronunciation test of these two consonants was designed. The tested consonants were selected as two that pose great difficulty for Mandarin Chinese speakers to distinguish, since consonants like the English /θ/ are not phonemically comparable to any consonants in Mandarin Chinese (Zhang & Yin, 2009). The pronunciation test consisted of 16 stimuli which were selected from among the 7,000 frequently occurring words announced by the Ministry of Education in Taiwan, which then elicited 16 minimal pairs (see Appendix C). Each minimal pair has two monosyllabic words, and each was different from the other only in either the initial consonant (such as sick and thick) or the final consonant (such as pass and path). The two tested consonants were equally distributed both word-initially and word-finally among both the test stimuli (see Appendix D) and among the test options on the answer sheet (see Appendix E) that were designed for the three native speakers to identify what they heard from the participants' recordings.

Scoring.

After the production test was completed, the students' recordings were evaluated by three native speakers of American English, who all listened to the same recordings and then identified words they heard. The same response made by at least two of the native listeners for each test item was

taken as the student's actual productive performance for the tested consonant. If the response represented the correct answer, a point was earned by the participant. In the pronunciation test, a correct answer was worth one point. The maximum score was 16/16, and the minimum was 0/16. The higher the score a participant received, the more proficiently he or she showed an ability to pronounce the two English consonants. In terms of the questionnaire, the collected data was only used for analyzing the relationship between the onset age variable and the test scores.

Procedure

All the participants were first chosen via a questionnaire that was performed on a class basis. After the students who did not meet the requirements of the study (such as having studied abroad or having grown up in a place where English is constantly spoken) were eliminated from the experiment, 50 of the rest of the students were randomly selected to take the pronunciation test. The task was conducted in a noise-free room at the university where the participants studied. It asked the learners to read aloud 16 English words into a tape recorder.

Prior to the actual implementation of the test, all the examinees were informed of the purpose of the study and instructed on how to complete the task. Then, each was given three minutes to scan all the tested words on the test form, followed by reading them twice into a high-quality recorder with a head-mounted microphone. All the participants' recordings were later evaluated by three native speakers, who were required to mark or select words they heard in each recording on an answer sheet. A response was needed for each test item, and the native judges were told to guess if uncertain. After all the relevant data was gathered, the participants' ages of first exposure to formal English instruction and their scores on the pronunciation test were calculated and organized in Excel for further statistical analysis.

Results

To address the questions of this study, Pearson Product-Moment Correlations and an independent-samples t test were utilized to analyze the collected data. Table 2, Table 3 and Table 4 summarize the statistical results obtained.

Research Question 1

Table 2 illustrates the correlations between the participants' onset age of exposure to formal English instruction and their test scores for the two English consonants. The Pearson Product-Moment Correlation results show that no significant correlations are found between the onset age factor and the students' pronunciation of the consonants. These results suggest that the EFL learners' accuracy in producing the consonants did not increase as their onset age of learning English decreased. Therefore, it appears that onset age does not play a role in the phonological acquisition of English as a foreign language (particularly the acquisition of skill in pronouncing these consonants).

Table 2 *Pearson Product-Moment Correlation Results for the Taiwanese University EFL Learners' Onset Age of Learning English and Their Scores for the Two English Consonants (N=50)*

| | /s/ | /θ/ | Overall |
|-----------|-----|-----|---------|
| Onset age | .15 | .11 | .15 |

* $p < .05$

Research Question 2

Table 3 displays the mean age at which the Taiwanese university EFL students started receiving formal English instruction and the mean scores they received in pronouncing the two English consonants and their overall performance on the pronunciation test. The statistical data indicate that the mean score (7.30) received in producing the English consonant /s/ is higher than the score (6.96) for the English consonant /θ/. Based on these mean scores, it seems that the English consonant /s/ was easier for the learners to pronounce than the English consonant /θ/.

Table 3 *Mean and Standard Deviation for the Onset Age Variable and the Tested Consonants (N=50)*

| | Mean | Standard Deviation |
|-----------|-------|--------------------|
| Onset age | 8.94 | 2.40 |
| /s/ | 7.30 | 1.25 |
| /θ/ | 6.96 | 1.47 |
| Overall | 14.26 | 1.37 |

Table 4 represents the degrees of freedom and the t value for the mean difference between the scores for the two consonants. The results of the independent-samples t test point to no significant difference between the means, $t = 1.25$, $p > .05$. These data suggest that the mean score for the English consonant /s/ is not significantly higher than the score for the English consonant /θ/. The means that the two consonants posed a similar level of difficulty for the participants. Hence, the relative productive difficulty sequence for the Taiwanese university EFL learners becomes /s/ = /θ/ instead of /θ/ > /s/, the results obtained from the descriptive statistics in Table 3.

Table 4 *Independent-Samples t Test Results for the Mean Difference between the Scores for the Two English Consonants (N=50)*

| | Mean Difference | t | DF | Sig. (2-tailed) |
|-----------------------------|-----------------|------|-------|-----------------|
| Equal Variances assumed | .34 | 1.25 | 98 | .22 |
| Equal Variances NOT assumed | .34 | 1.25 | 95.52 | .22 |

Discussion and Conclusion

As described in the Introduction section, many studies have been conducted to investigate whether or not age plays an important role second/foreign language acquisition of phonology. Some studies have found that younger learners ultimately perform better than older learners in learning a L2/FL (Hung, 2012a; Tsukada, Birdsong, Bialystok, Mack, Sung, & Flege, 2005);

however, there have also been some L2/FL research studies with results that contradicted the critical period hypothesis (Bongaerts, Mennen, & Slik, 2000; Nikolov, 2000). Due to the mixed results, the current study was performed to determine the role of the age factor in an EFL context like Taiwan.

The results of this study showed that the participants' scores on the pronunciation test did not increase as their onset age of learning English decreased. The finding resonated with the ones of those L2/FL studies that contradicted the CPH (Bongaerts et al., 2000; Nikolov, 2000). Hence, it appears that a critical period does not exist for FL phonological acquisition (particularly of consonants).

With respect to the limitations and delimitations of this research, the 50 participants were recruited only from a single university. Consequently, the outcome of this study might not be generalizable to students from other universities. For those who plan to study the same issue in the future, it is suggested that learners from different schools as well as from different parts of the country be included. Moreover, language acquisition is not only limited to the production of the sound system of the target language. Other skills such as listening, reading, and writing also need to be taken into account. Therefore, it is also recommended that prospective researchers should examine these areas of learners' language acquisition.

About the Authors:

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Appendix A

各位同學好:

我們想要了解您學習英文的經驗，麻煩您幫忙回答以下的問題。您提供的資料可以幫助我們研究、分析大家學習英文的方法與成就關係，也可以進一步幫忙您自己和我們的下一代更有效地學習英文。問卷大約5到10分鐘可以填完。請盡量不要漏填。謝謝您的合作!

1. 姓名: _____
2. 性別: 男 女
3. 年紀: _____歲
4. 科系/年級: _____系/_____級
5. 有無任何聽力/口語、學習或其他語言障礙? 有 無
6. 是否住過英語系國家或是在其他國家學過英文?
是, 哪一個國家: _____ 否
7. 你是否在持續說英文的環境中長大? 是 否
8. 你是從幾歲開始接受正式的英文教學? _____歲
9. 請問你於國小畢業以前是否學過英語?(請勾選一答案)
是 否(若選擇「否」, 請跳至第15題)
10. 請問你所就讀的國小為 公立或私立小學? 公立 私立
11. 請問你在國小時平均每週上幾節英文課?
2節(包含以下) 3節 4節 5節 6節 7節(包含以上)
12. 在國小時(在學校)是否有被外籍老師教導過?
是, 共上了_____年_____月 否
13. 在國小時你是否參加校外英文補習或請人個別家教你英文?
是, 共上了_____年_____月; 每星期約____小時 否

14. 課後是否有自己加強英文口語能力(如:到教會、語言學習中心等找外籍人士交談來練習英文)?
有, 平均每週_____小時 無
15. 請問你所就讀的國中為公立或私立中學?
公立 私立
16. 請問你在國中時平均每週上幾節英文課?
2節(包含以下) 3節 4節 5節 6節 7節(包含以上)
17. 在國中時(在學校)是否有被外籍老師教導過?
是, 共上了_____年_____月 否
18. 在國中時你是否參加校外英文補習或請人個別家教你英文?
是, 共上了_____年_____月; 每星期約____小時 否
19. 課後是否有自己加強英文口語能力(如:到教會、語言學習中心等找外籍人交談來練習英文)?
有, 平均每週_____小時 無
20. 請問你所就讀的高中/職為公立或私立高中/職?
公立 私立
21. 請問你在高中/職時平均每週上幾節英文課?
2節(包含以下) 3節 4節 5節 6節 7節(包含以上)
22. 在高中/職時(在學校)是否有被外籍老師教導過?
是, 共上了_____年_____月 否
23. 在高中/職時你是否參加校外英文補習或請人個別家教你英文?
是, 共上了_____年_____月; 每星期約____小時 否
24. 課後是否有自己加強英文口語能力(如:到教會、語言學習中心等找外籍人交談來練習英文)?
有, 平均每週_____小時 無
25. 你的聯絡方式:
手機: _____
E-mail: _____

問卷結束。

再次感謝您的耐心填寫及配合!!!

Appendix B

Dear Participant,

We would like to understand your English learning experience. Please do us a favor by answering the following questions. All of the information that you provide can help us in our research and analysis of Taiwanese English proficiency. The results from this research may provide the next generation of your peers to learn English more effectively. The questionnaire

will take 10-15 minutes for you to finish. Please try to be specific when you answer questions. Please leave your phone number and email address, in case your questionnaire is invalid and we need to get in touch with you for more information. Thanks for your help.

1. Name
2. Gender: male/female
3. Age:
4. Major/grade:
5. Do you have any hearing or speaking impairments? Yes No
6. Have you ever studied or lived in an English-speaking country?
Yes, which country:
No
7. Did you grow up in an environment where English was constantly spoken?
Yes
No
8. When did you first accept formal English instruction? Started when _____ years old.
9. Did you learn English before elementary school? (Please select one as an answer) Yes No
(If select No, please jump to Q15).
10. What kind of school did you study in for elementary school: public school or private school?
Public Private
11. How many hours did you learn English in elementary school per week?
one or two three four five six seven or more
12. Were you taught by English native speakers in elementary school?
Yes, _____ years and _____ months No
13. Did you attend cram school or tutoring for your English after school in elementary school?
Yes, _____ years and _____ months; _____ hours per week No
14. Did you strengthen your oral skills after school? (Ex: in church, in language centers, or by having conversations with foreigners)?
Yes, _____ hours per week No
15. What kind of school did you study in during junior high school: public school or private school? Public Private
16. How many hours did you learn English in junior high school per week?
one or two three four five six seven or more.
17. Were you taught by English native speakers in junior high school?
Yes, _____ years and _____ months No
18. Did you attend cram school or tutoring for your English after school in junior high school?
Yes, _____ years and _____ month ; _____ hours per week No
19. Did you strengthen your oral skills after school? (Ex: in church, in language center, by having conversations with foreigners)?
Yes, _____ hours per week No
20. What kind of school did you study in senior high school, public school or private school?
Public Private
21. How many hours did you learn English in senior high school per week?
one or two three four five six seven or more.
22. Were you taught by English native speakers in senior high school?
Yes, _____ years and _____ months No
23. Did you attend cram school or tutoring for your English after school in senior high school?
Yes, _____ years and _____ months; _____ hours per week No

24. Did you strengthen your oral skills after school? (Ex: in church, in language center, or by having conversations with foreigners)?

Yes, _____ hours per week No

25. Please leave your contact information:

Cell phone: _____

E-mail: _____

.....Questionnaire finished

Thanks again for your patience and cooperation!!!

Appendix C

Minimal Pairs List

A. Minimal pairs of initial /s/ and /θ/

1. surd – third
2. sink – think
3. sank – thank
4. sin – thin
5. sick – thick
6. seem – theme
7. sought – thought
8. sigh - thigh

B. Minimal pairs of final /s/ and /θ/

1. truce – truth
2. mouse – mouth
3. tense – tenth
4. Norse – north
5. worse – worth
6. pass – path
7. mass – math
8. kiss - kith

Appendix D

Pronunciation Test

(Stimuli for Participants to Read)

1. mouse
2. third
3. truth
4. sink
5. tenth
6. worse
7. thank
8. north
9. sin
10. sick
11. path
12. mass
13. theme
14. thought
15. kiss
16. sigh

Appendix E

Marking Sheet

(For Native Judges Use)

1. mouse / mouth
2. third / surd
3. truth / truce
4. sink / think
5. tenth / tense
6. worse / worth
7. thank / sank
8. north / Norse
9. sin / thin
10. sick / thick
11. path / pass
12. mass / math
13. theme / seem
14. thought / sought
15. kiss / kith
16. sigh / thigh