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The Effects of Proficiency on Processing a Second Language: From ERPs Experiments*

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This study investigated the role of proficiency in SL (Second Language) among Korean university students based on the results of two-year ERPs (Event-related Brain Potentials) experiments to offer pedagogical implications for English education. All the experiments were conducted at a laboratory at Y University and both high and low proficient university students participated. The first year experiment was conducted to investigate students' electrophysiological responses to metaphorical and literal sentences and the second year experiment focused on how students processed sentences with joke and non-joke endings. Their ERPs were compared with those of native speakers of English in existing literature to understand how they differed and were similar. The results revealed that ERPs from high proficient students were similar to those of native speakers but ERPs from low proficient students were different from those of native speakers of English. Based on the results, some valuable implications were offered for English education: rethinking CPH (Critical Period Hypothesis), teaching students according to proficiency levels, and focusing on strategies-based instruction.

[second language learning/ERPs/CPH/proficiency/native speakers of English/ nonnative speakers of English/strategies-based instruction]

I. INTRODUCTION

Whether age plays an absolute role in processing a SL has been a controversial issue. In fact, some argue that native-like mastery of SL is impossible after CP, around puberty

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(DeKeyser, 2000; Johnson & Newport, 1989). That is, automatic acquisition from mere exposure to a SL seems to disappear after this age (Lenneberg, 1967). On the other hand, others argue that high proficient SL learners do not significantly differ from native speakers of English (Bialystok & Hakuta, 1994; Bialystok & Miller, 1999). However, the areas of phonology and phonetics are the sole linguistic capacity which showed age effects. Similarly, researchers differ in defining the term, CP: between 6 to 12 for phonology, as early as 6 for lexis, and in the mid teenage years for morphology (Geschwind, 1970; Krashen, 1973; Lenneberg, 1967; Long, 2005)

In the field of neurolinguistics, researchers have investigated if age has absolute effects on cortical processing a SL by employing ERPs technique and have reported more native like patterns of scalp activity in more proficient L2 learners. For instance, the largest N400 and P600 were observed when advanced SL learners read metaphorical and joke sentences like native speakers of English (Aaron, Antoine, Emily, Helen, & Michael, 2012; Ardal, Donald, Meuter, Muldrew, & Luce, 1990; Ojima, Nakata, & Kakigi, 2005). If late learners with high level of proficiency are shown to process a SL like native speakers of English, it is worth to shed light on the effect of proficiency on SL processing in SLA (Second Language Acquisition) research.

Therefore, this study investigated if the largest N400 was observed when SL learners with high and low proficiency read metaphorical and joke sentences like native speakers of English and compared the results of the experiments to those of Coulson's and Petten's (2002) (i.e., ERPs from literal, metaphorical, and literal mapping sentences) and Coulson's and Kutas' (2001) (i.e., ERPs from jokes and non-jokes) experiments in which ERPs were recorded from native speakers of English. Instead of delineating the results of the experiments in great detail, this study sought to offer more practical implications for English education based on the results of the experiments.

II. LITERATURE REVIEW

Research about CP hypothesis in the field of SLA has generated two different positions regarding a biologically determined CP: for or against a CP. The most influential research about the assumption that there should be discontinuous relations between proficiency and AoA (Age of Arrival) is reported by Johnson and Newport (1989). In their study, SL learners' scores of grammatical judgment test differed according to their AoA, so it was concluded that there was a determined CP for SLA, which closes after puberty. In a similar way, other researchers administered the similar test used in Johnson's and Newport's study (1989) and found out that there was a significant correlation in between AoA and test scores, which constituted evidence in

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favor of a CP (DyKeyser, 2000; Flege, Yeni-Komshian, & Liu, 1999).

Unlike the results of the aforementioned studies, some researchers found out that adults SL learners' performance on grammatical judgment test was similar to that of natives, so they concluded that there was no evidence for a CP for SLA (Bialystok & Miller, 1999; Coppieters, 1987). In the area of pronunciation, Neufeld's (1978) study is often used to refute the CPH. In this study, adult SL learners were rated as natives, so it was suggested that adults could achieve nativelike pronunciation under the right conditions. Similarly, some researchers found out that it was possible to obtain native like proficiency in the area of grammar for advanced learners under optimal learning conditions (Birdsong, 1992; Bongaerts, 1999; Moyer, 1999).

One suitable approach to discuss this issue is to use neuroimaging techniques to see if there are neurophysiological changes in the brain before puberty that can explain the general tendency that early learners attain a higher level of proficiency. In fact, many researchers have employed the ERPs where aspects of the brain's electrophysiological activity can be recorded from the scalp. In ERPs research, certain linguistic manipulations elicit robust effect when participants read or listen to tokens of the L2. The important finding has been that syntactic and semantic anomalies elicit qualitatively distinct ERPs effects. For instance, when semantic anomalies are presented (i.e., the dog will read a book.), a negative wave that peaks at about 400ms is observed after the anomalous word appears (i.e., the N400 effect) (Kutas & Hillyard, 1980; Osterhout & Nicol, 1999). By contrast, syntactic anomalies (i.e., The dog will eating the food.) elicit a large positive wave that onsets at about 500ms after presentation of the anomalous word and persist for at least half a second (i.e., the P600 effect) (Osterhout & Holcomb, 1992; Osterhout & Mobley, 1995; Osterhout & Nicol, 1999).

Some ERPs related studies with SL learners provide an interesting perspective on relevant issues with respect to the CPH for SLA. For instance, it is found out that proficiency is more important as a determinant of cortical representation than age of onset of L2 acquisition. In Ardal et. al (1990), the comparison was made among three groups, early proficient learners of French, late proficient learners of English, and English monolinguals to understand their responses to incongruent and congruent sentence final words through ERP. It was found out that the differences between the monolinguals and the late bilinguals were caused by the differences in having one versus two languages and in proficiency rather than age of onset of acquisition.

Similarly, Weber-Fox and Neville (1996) studied how Chinese English bilinguals with different AoA responded to syntactic and semantic anomalies. For the semantically incorrect sentences, all the participants who arrived before the age of eleven were shown to perform like native speakers. For instance, the N400 was later for the highest AoA group and the remaining groups had a normal N400 pattern. On the other hand, the delay

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of the P600 was observed in the second highest group and the P600 was absent for the highest group.

With a similar purpose, Hahne and Friederici (2001) investigated how late SL learners with different AoA and native speakers processed correct and incorrect syntactic and semantic sentences in German. For the semantically incorrect sentences, the N400 was later for the highest AoA group but the remaining groups had a normal N400 pattern. For the syntactically incorrect sentences, the P600 effect was delayed for the group (AoA 11-13) and was not observed for the oldest learners.

Unlike aforementioned ERPs studies, Ojima, Nakata, and Kakigi (2005) more focused on the effects of proficiency on processing a SL by investigating ERPs from three different groups (i.e., natives, non-natives with high and low proficiency). There were differences in ERPs between Japanese speakers with high proficiency and those with low proficiency. Specifically, a clear N400 component was observed in all three groups, when they read English sentences with semantic anomalies. However, syntactic anomalies evoked a P600 in the two groups, native speakers of English and Japanese speakers with high proficiency. Thus, it was concluded that there was no concrete evidence for an absolute CP effect on SLA. Similarly, Aaron et. al (2012) also investigated the influence of proficiency on learners' processes of a SL. It was found out that late proficient SL learners' performance was similar to that of natives when they read semantic violations. As discussed above, there is little evidence for an absolute CP effect and thus age of onset of L2 acquisition is not a sole determinant of successful SLA.

III. METHODS

1. Setting and Participants

From July 2009 to June 2011, two different types of ERPs experiment were conducted: metaphors and jokes at a laboratory at Y University in Seoul, Korea. The laboratory was equipped with an ERPs and computers and a research professor and several assistants were stationed to carry out experiments. In the experiments, both high and low proficient students voluntarily participated and were paid for their participation (High: over 850 & low between 450 and 550 on the TOEIC). In the first experiment, 17 students (7 females and 10 males) with high proficiency and 14 students (6 females and 8 males) with low proficiency and in the second experiment, 17 students (8 females and 9 males) with high proficiency and 11 students (6 females and 5 males) with low proficiency were the participants of the experiments. They had normal visual acuity, and none had any reported history of neurological or psychiatric disorders. All of them were students of Y

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University, aged from 21 to 27, and studied varying majors (i.e., accounting, business, chemistry, education, engineering, English language & literature, history education, international trade, etc.).

2. Materials

For the first experiment, the researcher made 110 sets of the materials. The sets were divided into two lists (i.e., 55 literals and 55 metaphors) so that each word occurred in every condition across participants while a given participant saw sentence final word in one of its two possible sentence frames.

As shown in Table 1, each set has a one literal sentence followed by a comprehension question and a one metaphorical sentence followed by a comprehension question. Each type of sentence has a similar number of words in it and the same ending (critical word). The purpose of using comprehension questions was to see how well the participants understood the given sentences.

TABLE 1
A Sample Set of the Materials from the First Experiment

Types & CQs	Examples
Literal (8 words)	The UN committee found evidence of widespread **malnutrition**.
Literal CQ (T/F)	There are many cases of malnutrition all over the world (T).
Metaphor (8 words)	He complained that prison life was spiritual **malnutrition.**
Metaphor CQ (T/F)	He thinks he felt empty in prison (T).

Likewise, as shown in Table 2, 200 sentences which ended as jokes (100 sentences) or non-jokes (100 sentences) were used in the second experiment and they are identical until the final word. Each type of sentence was followed by a comprehension question. All the materials were reviewed by a native English speaking professor to check how appropriate and natural they were and revised based on his opinion.

TABLE 2
A Sample Set of Materials from the Second Experiment

Joke Stimuli & CQs	Examples
Joke Stimulus	The only ones who want me for my body are **mosquitoes**.
Joke CQ (T/F)	People do not find me very sexy (T).
Non-joke Stimulus	The only ones who want me for my body are **losers.**
Non-joke CQ(T/F)	Everybody finds me very attractive (F).

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3. Procedures

The recruitment of participants was carried out from posting the flyers on the bulletin boards in several buildings at Y University to obtaining consent forms from the participants before each experiment. To get ready for the experiment, the research assistants injected gel into rods in an elastic cap and got the participants to wear the cap. The participants sat in a comfortable chair and read what appeared on the monitor. The sentences were presented one word at a time for a duration of 200 msec each. The sentence final words were presented for 200 msec before the onset of the true/false questions and the questions were shown for 6 sec and the participants responded through a buttonpress. Sentences followed by incorrect answers were not included in the analysis. There were 2 sec of blank screen followed by each question before the beginning of the next trial. All the experiments were carried out at a laboratory at Y University and each lasted approximately 60 minutes.

4. Electrophysiological Recording

Participants' electroencephalogram (EEG) was recorded from 32 electrodes mounted in an elastic cap. Midline frontal (Fz), central (Cz), and parietal (Pz) recording sites were used along with parietal (P3 and P4) and occipital (O1 and O2) scalp. Each scalp site was referred to the left mastoid and later re-referenced to an average of the left and right mastoids. To monitor blinks and eye movements, electrodes were also placed under the right eye and at the outer canthi. EEG was digitized online with a sampling rate of 250 Hz and stored on a hard disk for subsequent averaging. Trials with eye movement, muscle or amplifier saturation artifacts were rejected offline prior to averaging. ERPs were time-locked to the onset of sentence-final words in each condition

IV. RESULTS AND DISCUSSION

1. ERPs in Metaphorical and Literal Sentences

The ERPs in metaphorical and literal sentences were elicited from high and low proficient English language learners from all the 32 channels. Larger N400 was observed at Fz, Cz, Pz, and Oz sites from ERPs of high proficient learners. Specifically, as shown in Figures 1 and 2, metaphors (i.e., dotted lines) elicited a larger late positivity than did the literal (i.e., solid lines) conditions at Pz and Oz.

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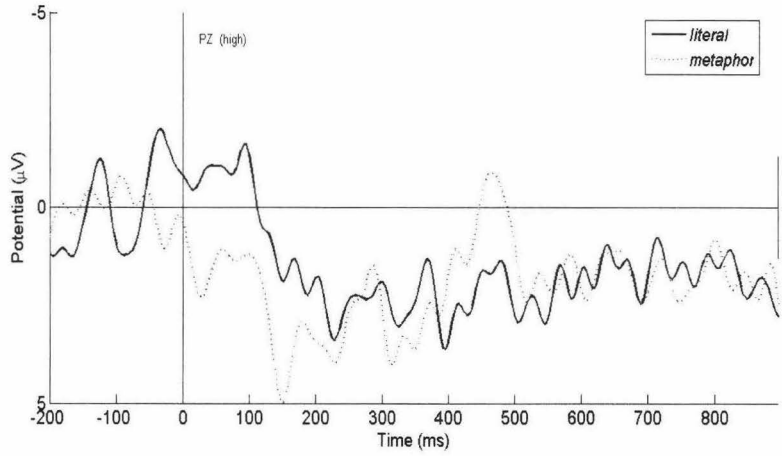
FIGURE 1

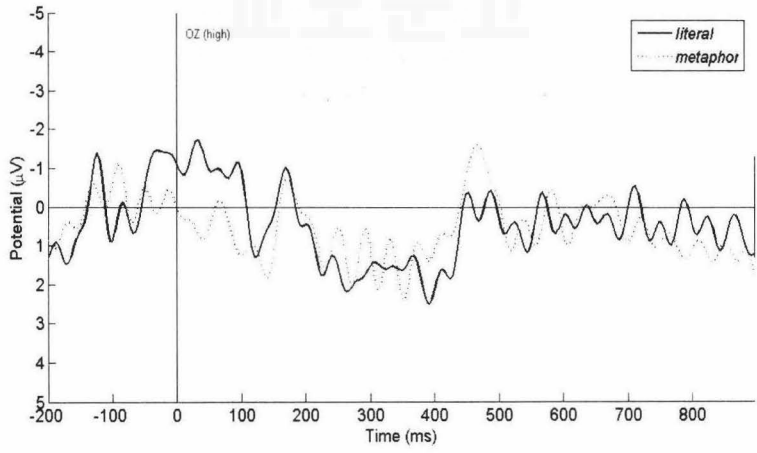
Grand Average ERPs to Metaphorical and Literal Endings at Pz from High Proficient Learners



The quite similar observation was detected in Coulson's and Petten's (2002) study in which N400 was visible at all scalp sites and metaphor elicited larger N400s when adult native speakers of English read metaphorical sentences.

FIGURE 2

Grand Average ERPs to Metaphorical and Literal Endings at Oz from High Proficient Learners



Unlike literal and literal mapping sentences, metaphors elicited larger N400s at posterior scalp sites (i.e., parietal and occipital) in their study, which is similar to the results of the study shown in Figures 1 and 2. Based on the comparison, it is noticeable that adult

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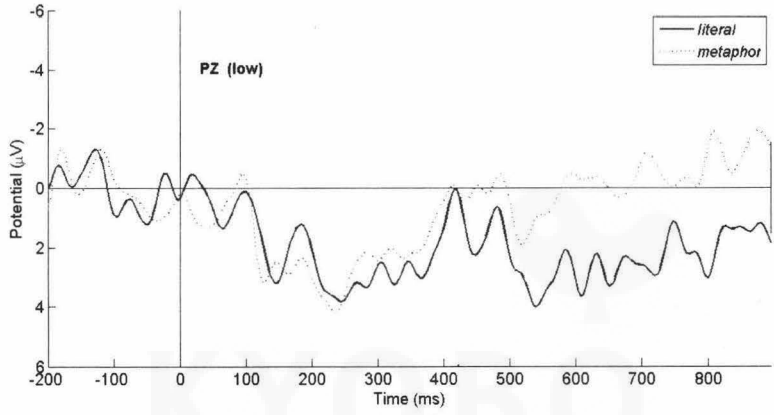
native speakers of English and high proficient English language learners process literal and metaphorical sentences in quite a similar way.

On the other hand, larger N400 was detected at only Fz but not Cz, Pz, and Oz sites among ERPs from low proficient learners. Unlike N400 at Fz, no N400 amplitude difference was observed in literal and metaphoric sentences at Pz and Oz, which is shown in Figures 3 and 4.

FIGURE 3

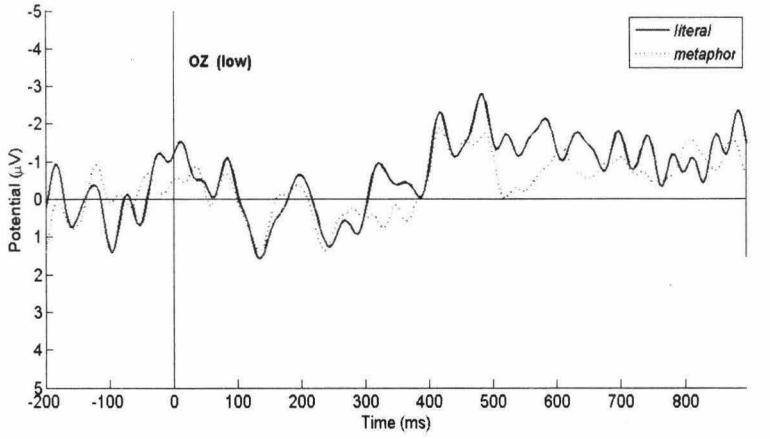
Grand Average ERPs to Metaphorical and Literal Endings at Pz from Low Proficient Learners



As shown in Figures 3 and 4, ERPs of low proficient learners were different from those of high proficient learners shown in Figures 1 and 2.

FIGURE 4

Grand Average ERPs to Metaphorical and Literal Endings at Oz from Low Proficient Learners



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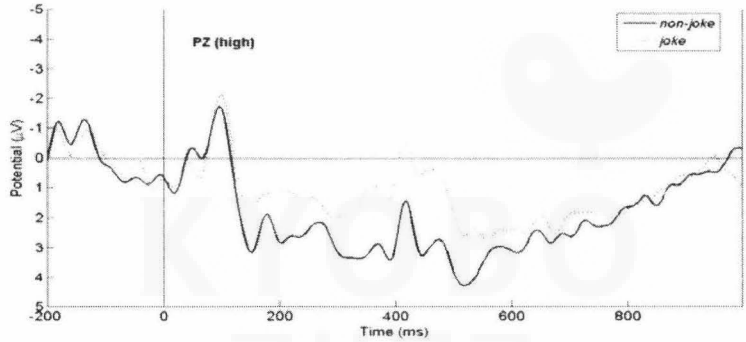
Thus, it was concluded that high and low proficient English language learners processed the same language condition in a different way. However, there was a similarity in the way of processing the similar langauge conditions between adult native English speakers in Coulson's and Petten's (2002) and high proficient English language learners.

2. ERPs in Joke and Non-joke Sentences

Like the first experiment, the ERPs in jokes (i.e., dotted line) and non-jokes (i.e., solid line) were elicited from high and low proficient learners from all the 32 channels.

FIGURE 5

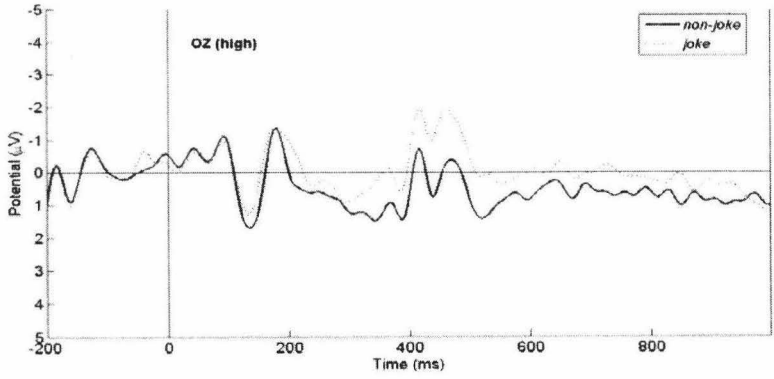
Grand Average ERPs to Joke and Non-joke Endings at Pz from High Proficient Learners



Among ERPs of high proficient learners, jokes elicited larger N400 than did non-jokes at Fz, Cz, Pz, and Oz sites.

FIGURE 6

Grand Average ERPs to Joke and Non-joke Endings at Oz from High Proficient Learners



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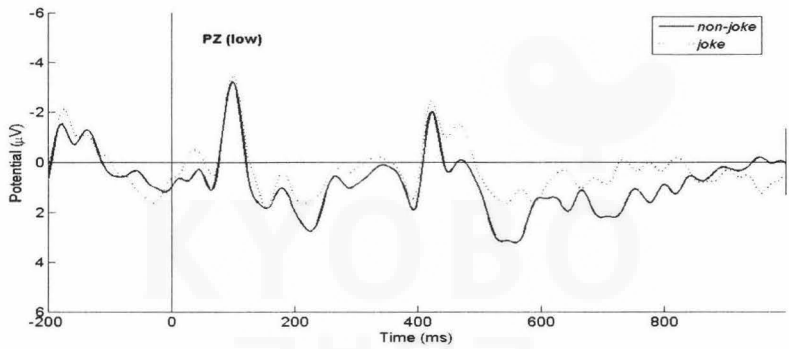
As shown in Figures 5 and 6, larger N400 was observed in ERPs of Jokes at Pz and Oz. In Coulson's and Kutas' (2001) study, it was shown that there are differences of ERPs among adult native speakers of English in that joke comprehension involved a process of frame-shifting, activating a new frame from long-term memory to reinterpret already activating in working memory. Thus, larger N400 was observed in sentences with joke-endings. A similar observation was noticeable in Figures 5 and 6 in which sentences with joke endings elicited larger N400 than did those with non-joke endings among ERPs of high proficient learners, especially at Pz and Oz.

Unlike ERPs from high proficient learners, no major difference was detected around 400msec at Fz, Cz, Pz, and Oz sites.

FIGURE 7

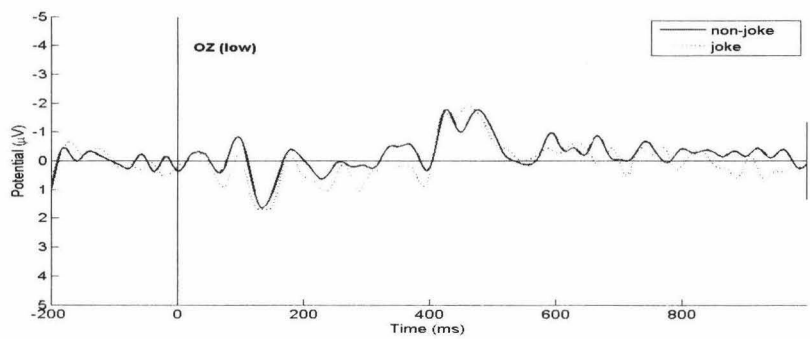
Grand Average ERPs to Joke and Non-joke Endings at Pz from Low Proficient Learners



Figures 7 and 8 shows ERPs when low proficient learners read sentences with joke and non-joke endings.

FIGURE 8

Grand Average ERPs to Joke and Non-joke Endings at Oz from Low Proficient Learners



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It is quite similar to ERPs of poor joke comprehenders in Coulson's and Kutas' study (2001) in which a right frontal negativity (300-700ms) to jokes was observed among ERPs of poor joke comprehenders. In fact, joke and non-joke ERPs among native speakers of English differ depending on individual's differential ability to get the joke and contextual constraint. In their study, there was a sharp difference of ERPs between good and poor joke comprehenders. For instance, good joke comprehenders elicited a larger N400 when reading jokes unlike poor joke comprehenders. Like the results of the first experiment, it was shown that native like process of a SL was observed in ERPs of high proficient learners.

3. Suggestions for English Education

Much research has been done on the role of age in SLA since the 1960s. The proponents of CPH argue that a normal language acquisition is guaranteed up to the age of six and is compromised from then until short after puberty (Birdsong, 2005: Pinker, 1994). However, this issue is controversial because it seems inconsistent with accumulating evidence that the brain remains remarkably plastic throughout much of life (Van Praag, Kempermann, & Gage, 2000). Likewise, it was shown that similar ERPs were observed between native speakers of English and high proficient learners when they read metaphoric and literal sentence and sentences with joke and non-joke endings.

The results of the study provide implications in the field of SLA. First, CPH needs further inquiry. As previously discussed, CPH implicates that around puberty or beyond puberty, automatic acquisition of a SL to a native level seems to disappear. However, CPH is problematic for two reasons: the dichotomy between native speakers of English and nonnative speakers of English and the definition of the term, puberty. First, it must be understood in the light of what it means to be native-like in learning a SL (Brown, 2007). The dichotomy, native and nonnative speakers of English, is somewhat obsolete. Through the lens of post-structuralist perspectives, monolingual and monocultural biases should be reconsidered to understand multiple reality of the contemporary world. Moving toward multiplicity allows SLA researchers to avoid the use of simplistic dichotomy, native and nonnative speakers of English, judged by monolingual and monocultural yardsticks.

Recently, English is used as a world language because more and more people use English to communicate with other people all over the world (Kachru, 2006). English is no longer a subject to study but a tool to communicate and language learners are not learners but users of English. Nowadays, a variety of Englishes are used all over the world, which implicates that no dichotomies exist (i.e., standard English Vs nonstandard

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English, native speakers of English Vs nonnative speakers of English) and English plays an important role as a communication tool in many fields of activity (Yang, 2011). Thus, what is important is comprehensibility not native-like perfection in communicating with other people.

This idea can be applicable to teaching environment. Teachers can make students actively participate in class by disseminating the idea that they are part of a globalized society and language is a tool to communicate with other people (Yang, 2013). Through this, it is hoped that students will be able to transform their identity from passive language learner to active language users and this kind of ownership of English will make them invest more in studying English conducive to their English language proficiency.

Another pitfall of this hypothesis is the term, puberty. Like other researchers have argued, it is hard to define when puberty occurs because puberty is getting younger compared to that defined earlier (Geschwind, 1970; Krashen, 1973; Lenneberg, 1967; Scovel, 1988).

Moreover, some practical classroom implications were made. To reap more fruitful outcomes, teachers should stream students for beginning, intermediate, and advanced levels, set suitable goals in the areas of speaking, listening, reading, and writing, and guide students in the fulfillment of the stated goals by applying appropriate teaching methods and classroom materials and activities to each level.

Most importantly, teachers should implement meaningful and systematic strategies-based instruction across proficiency levels to assist students (Chamot & O'Malley, 1986). To do this, teachers should raise awareness about strategies, train students in strategy use and encourage students to practice and personalize the strategies throughout the instruction. More systematically, first, teachers should understand which strategies students already have and use. Second, teachers should raise students' awareness about presence of strategies they might never think about. Third, teachers should explicitly introduce how, when, and why certain strategies can be used to facilitate students' process of learning a SL and encourage students to experiment with a wide range of strategies and let them have ample opportunities to try them out on different types of tasks. Finally, teachers should help students personalize what they have learned about the strategies they used and, evaluate how they used the strategies, and transfer the strategies to other contexts (Cohen & Dornyei, 2002; Oxford, 2001).

V. CONCLUSIONS

The results of the ERP experiments revealed that there was a similarity between native

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speakers of English and high proficient learners when they processed linguistic information and it suggested that there be a possibility of late SL learners' reaching a level of native-like attainment. Thus, the researcher suggested that CPH be redefined by including how English is defined nowadays, addressed the necessity of disseminating the idea that English is a language to use and students are users of the language, and emphasized the importance of refining students' language skills by adopting more strategies-based instruction.

Although this study made an effort to suggest pedagogical implications for English education based on neuroimaging experiments, there are some limitations. First, like other researchers argued (Geschwind, 1970; Krashen, 1973; Lenneberg, 1967; Scovel, 1988), the way of defining the term, late language learners, is somewhat problematic. Second, it might be said that the researcher overgeneralized the results of the study because she focused on only one language area, semantics.

REFERENCES

Aaron, J. N., Antoine, T., Emily, S. N., Helen, J. N., & Michael, T. U. (2012). The influence of language proficiency on lexical semantic processing in native and late learners of English. *Journal of Cognitive Science, 24*(5), 1205-1223.

Ardal, S., Donald, M. W., Meuter, R., Muldrew, S., & Luce, M. (1990). Brain responses to semantic incongruity in bilinguals. *Brain and Language, 39*(2), 187-205.

Bialystok, E., & Hakuta, B. (1994). In other words: *The psychology and science of second language acquisition.* New York: Basic Books.

Bialystok, E., & Miller, B. (1999). The problem of age in second language acquisition: Influences from language, task, and structure. *Bilingualism: Language and Cognition*, *2*(2), 127–145.

Birdsong, D. (1992). Ultimate attainment in second language acquisition. *Language, 68*(4), 706-755.

Birdsong, D. (2005). Why not fossilization. In Z.-H. Hahn & T. Odlin (eds.) *Studies of fossilization in second language acquisition* (pp. 173-188). Clevedon: Multilingual Matters.

Bongaerts, T. (1999). Ultimate attainment in L2 pronunciation: The case of very advanced late L2 learners. In: D. Birdsong (ed.), *Second Language Acquisition and the Critical Period Hypothesis* (pp. 133-159). Mahway, NJ: Lawrence Erlbaum.

Brown, H. D. (2007). *Principles of language learning and teaching*. White Plains, NY: Pearson

교보문고 KYOBO Book Centre

Chamot, A., & O'Malley, M. (1986). *A cognitive academic language learning approach: An ESL content-based curriculum*. Wheaton, MD: National Clearinghouse for Bilingual Education.

Cohen, A. D., & Dornyei, Z. (2002). Focus on the language learner: Motivation, styles, and strategies. In N. Schmitt (ed.), *An introduction to applied linguistics* (pp. 170-190). London: Arnold.

Coppieters, R. (1987). Competence differences between natives and near-native speakers. *Language, 63*(3), 544-573.

Coulson, S., & Kutas, M. (2001). Getting it: Human event-related brain response in good and poor comprehenders. *Neuroscience Letter, 316*(2), 71-74.

Coulson, S., & Petten, C. V. (2002). Conceptual integration and metaphor: An event-related potential study. *Memory & Cognition, 30*(6), 958-968.

DeKeyser, R. (2000). The robustness of critical period effects in second language acquisition. *Studies in Second Language Acquisition, 22*(4), 499-533.

Flege, J. E., Yeni-Komshian, G., & Liu, S. (1999). Age constraint on second language learning. *Journal of Memory and Language, 41*(1), 78-104.

Geschwind, N. (1970). The organization of language and the brain. *Science, 170*(3961), 940-944.

Hahne, A. & Friederici, A. D. (2001). Processing a second language: Late learners' comprehension mechanism as revealed by event-related brain potentials. *Bilingualism: Language & Cognition, 4*(2), 123-141.

Johnson, J. S., & Newport, E. L. (1989). Critical period effects in second language learning. The influence of maturational state on the acquisition of English as a second language. *Cognitive Psychology, 21*(1), 60-99.

Kachru, Y. (2006). *World Englishes in Asian contexts.* Hong Kong: Hong Kong University Press.

Krashen, S. (1973). Lateralization, language learning, and the critical period: Some new evidence. *Language Learning, 23*(1), 63-74.

Kutas, M., & Hillyard, S. A. (1980). Reading senseless sentences: Brain potentials reflect semantic anomaly. *Science, 207*(4427), 203-205.

Lenneberg, E. (1967). *Biological foundations of Language*. New York, NY: Wiley.

Long, M. (2005). Problems with supposed counter-evidence to the critical period hypothesis. *International Review of Applied Linguistics, 43*(3) 287-317.

Moyer, A. (1999). Ultimate attainment in L2 phonology: The critical factors of age, motivation, and instruction. *Studies in Second Language Acquisition, 21*(1), 81-108.

Neufeld, G. (1978). On the acquisition of prosodic and articulatory features in adult language learning. *Canadian Modern Language Review, 34*(2), 163-174.

교보문고 KYOBO Book Centre

Ojima, S., Nakata, H., & Kakigi, R. (2005). An ERP study of second language learning after childhood: Effects of proficiency. *Journal of Cognitive Neuroscience, 17*(8), 1212-1228.

Osterhout, L., & Holcomb, P. J. (1992). Event-related brain potentials elicited by syntactic anomaly. *Journal of Memory and Language, 31*(6), 785-806.

Osterhout, L., & Mobley, L. A. (1995). Event-related brain potentials elicited by failure to agree. *Journal of Memory and Language, 34*(6), 739-773.

Osterhout, L., & Nicol, J. (1999). On the distinctiveness, independence, and time course of the brain responses to syntactic and semantic anomalies. *Language and Cognitive Processes, 14*(3), 283-317.

Oxford, R. L. (2001). Language learning styles and strategies. In M. Celce-Murcia (ed.), *Teaching English as a second or foreign language* (pp. 359-366). Boston: Heinle & Heinle/Thompson International.

Pinker, S. (1994). *The language instinct: How the mind creates language*. New York: Harper Collins.

Scovel, T. (1988). *A time to speak: A psycholinguistic inquiry into the critical period for human speech*. New York: Newbury House.

Van Praag, H., Kempermann, G., & Gage, F. (2000). Neural consequence of environmental enrichment. *Nature Reviews Neuroscience, 1*(4), 191-199.

Web-Fox, C. M. & Neville, H. J. (1996). Maturational constraints on functional specializations for language processing: ERP and behavioral evidence in bilingual speakers. *Journal of Cognitive Neuroscience, 8*(3), 231-256.

Yang, T. S. (2011). Korean university students' perceptions about native and nonnative English speaking teachers in TEE courses. *English Language & Literature Teaching, 17*(3), 237-254.

Yang, T. S. (2013). Implications for English education based on ERP Experiment. *English Language & Literature Teaching, 19*(3), 319-334.

Examples in English
Applicable Languages: English
Applicable Levels: All

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