

致 謝

一顆好奇的種子在我心中發芽，帶我進入語言學的學術殿堂...

曾經好幾次想著當論文完成後要如何寫致謝詞，沒想到當這一刻來臨時卻久久不知道該從何下筆。在這段求學過程中，學到了不只是課業上的知識，也增加了解決問題的能力以及讓發掘問題的觸角更敏銳，而要完成一本論文不僅僅是在學術上的精益求精、腦力的激盪，更是對自我人格弱點的挑戰。

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A Study of the Brain Response to Segmentally and Tonally Induced Semantic Violations to Taiwan Mandarin

Abstract

In this study, the function of event-related potential (ERP) was used to examine the role of segmental and tonal information in Taiwan Mandarin word processing. Participants listened to the sentences with last syllable correct or deviant. The last syllable to sentence end were either semantically congruous or semantically violated which were resulted from segmental (vowel or consonant) violations or tonal violations. There were four conditions in this study: the semantic congruous (SC), tonal violations (TV), vowel violations (VV), and consonantal violations (CV).

Two experiments were included in this study. Experiment 1 consisted of the behavior experiment and the ERP experiment and Experiment 2 focused on the ERP method. The behavioral experiments showed that participants made least mistakes in vowel violated conditions but made most mistakes in consonantal violations. The results also revealed that violated conditions elicited the earlier N400 peak latency and stronger N400 peak latency during the time window of 350ms ~ 500ms from the onset of the target syllables. The ERP experiment 1 showed that subjects detected the vowel violations more efficiently and therefore made less mistakes comparing to other violated conditions. The ERP experiment 2 showed similar results as Cantonese study that tonal and vowel violations triggering salient N400 waveforms. Moreover, the tonally and vowel induced semantically incongruence was comparable.

In addition, our study also discovered that although the consonantal violations did not triggered relatively salient N400 peak as tonal and vowel violated conditions in general, the aspirated stops also triggered specifically earlier and stronger N400 waveform than the other types of consonantal violations. The findings of the present study further suggested that acoustic features such as aspiration, duration and sonority could be more reliable elements to figure out the relations between auditory information and speech comprehension process.

Key words: ERP, N400, semantically incongruous, tone, segments

摘要

此篇研究是以 ERP (腦事件相關電位) 工具為研究方法來探討台灣華語的聲調以及區段音素 (例如: 子音、母音... 等等) 在語意辨認的過程中所扮演的角色差異。受試者在實驗過程中聆聽國語的句子, 這些句子有可能是正確的, 或是在句子最後一個音節的語音錯誤。錯誤的組成包含了聲調、子音以及母音等的語音違反。

在此篇研究中包含了兩個實驗; 實驗一包括行為實驗以及 ERP 實驗的設計, 而實驗二則著重於 ERP 的實驗方法。在行為實驗的結果顯示, 受試者在語意錯誤的句子出現時, 對句子的判斷正確率明顯的減少, 其中以子音錯誤的情況最容易混淆受試者的判斷, 但是在母音錯誤的情況出現時, 判斷的正確率相對的比其他兩組語音違反的情況高, 聲調錯誤的錯誤率介於母音錯誤和子音錯誤之間。研究亦發現, 在語音違反的音節出現開始的 350 至 500 毫秒之間, 偵測到受試者腦波出現明顯的 N400 波峰。ERP 實驗一顯示母音錯誤引發最明顯的 N400 波峰, 其波峰出現時間較早且振幅較大, 並進一步顯示受試者對母音錯誤的感知能力最高, 因此相對地在行為實驗的母音錯誤出現時, 受試者的判斷力較不受影響而正確率也較好。實驗二的結果和之前的粵語研究有類似發現。在音節的核心部份, 也就是母音和聲調錯誤的情況引發明顯的 N400 波峰。而母音和聲調錯誤這兩個情況的差異不會造成顯著的 N400 波峰差異。

此外, 此研究亦發現雖然受試者對於子音成份在語意認知的過程中倚賴程度不如母音和聲調, 但相對於其他組子音, 送氣阻塞音這組子音的錯誤亦引發明顯的 N400 波峰。以上研究結果也發現超越區段或是超音段的音素, 而改以區辨特徵 (例如: 送氣、時長、響度等等) 來聽覺訊息和語意感知過程的關係可幫助更進一步了解以及探討相關的議題。

關鍵字: ERP、N400、語意違反、聲調、區段音素

Table Content

No.		Pages
=====		
Figure 1:	Four lobes of the cerebral cortex, in lateral view of the left hemisphere.....	5
Figure 2:	The procedure of the experiment.....	14
Figure 3:	The distributions of 30 electrodes.....	23
Figure 4:	Group Averages of Four Conditions.....	24
Figure 5:	N400 effect of four conditions among left, central, and right hemispheres	30
Figure 6:	N400 effect of four conditions among frontal, central, temporal, and parietal cortex.....	33
Table 1:	The sentence ‘Xiao3-ming2 yin1 wei4 gan4 mao4 liu2 bi2 ti4’, <i>Xiao3-ming2 sniveled because of the flu</i> , in four conditions.....	19
Table 2:	Behavioral results of four conditions.....	21
Table 3:	The Significance of Word Condition on Latency and Amplitude.....	25
Table 4:	Word Condition×Hemisphere on latency.....	26
Table 5:	Word Condition×Hemisphere on amplitude.....	28
Table 6:	Word Condition×Site on amplitude.....	28
Table 7:	Word Condition×Site on latency.....	31
Table 8:	The average of peak latency and peak amplitude of N400 negativity among four conditions in Exp 2.....	32
Table 9:	The main effect of Word Condition on latency and amplitude of N400 peak	39
Table 10:	Two-way ANOVA of Hemisphere * Word Condition on latency.....	39
Table 11:	The average of peak latency and peak amplitude of N400 negativity among three parts of hemispheres in Exp 2.....	40
Table 12:	One-way ANOVA: the main effect of Hemisphere on latency and amplitude of N400 negativity in Exp2.....	41
Table 13:	The average of peak latency and peak amplitude of N400 negativity among five cortical areas in Exp 2.....	41
Table 14:	One-way ANOVA: the main effect of Site on latency and amplitude of N400 negativity in Exp2.....	43
Table 15:	The multiple comparisons of latency and amplitude among the violations of unaspirated stops, aspirated stops, fricatives and sonorants.....	43
Table 16:	The multiple comparisons of latency and amplitude among the violations of unaspirated stops, aspirated stops, fricatives and sonorants.....	47

Content

No.	Pages
Chapter 1 Introduction.....	1
Chapter 2 Literatures Review	
2.1 Language and the Brain.....	4
2.2 The ERP Tool.....	6
Chapter 3 Methodology	
3.1 Experiment Procedure.....	12
3.2 Data analysis.....	15
Chapter 4 Experiment 1	
4.1 Subject.....	18
4.2 Materials.....	18
4.3 Behavioral Results.....	21
4.4 ERP results.....	22
Chapter 5 Experiment 2	
5.1 Subjects.....	35
5.2 Materials.....	35
5.3 Procedures.....	36
5.4 Results.....	37
Chapter 6 General Discussion	
6.1 The comparisons of behavioral experiment and ERP experiments.....	44
6.2 The comparison and analysis among Mandarin and Cantonese.....	50
Chapter 7	
7.1 Contributions.....	53
7.2 Limitation and Further Study.....	54