

中央研究院研究人員及研究技術人員出國報告表 共二頁

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服務單位及職位	本院語言學研究所副研究員		
活動日期	99/11/9-99/11/18	地點	San Diego, USA
經費來源(非本院 經費支出者不需填 寫此報告)	國科會計畫(閱讀議題六:字彙量,音旁表音一致性與規則性與識字發展的關係)與本所業務費		
出國類別	出國類別(一) <input type="checkbox"/> 參加國際會議會議名稱: (中文) 第四十屆神經科學學會年會 (外文) The 40th annual meeting of the Society for Neuroscience 會議舉辦機構: Society for Neuroscience		
論文題目、講學或 報告題目	The mismatch negativity to the tonal changes of pseudosyllables in adults and preschoolers		

學術活動報告內容

報告內容將上網公告,請審慎認真撰寫。報告之內容應包括下列各項:

一、如有發表論文請提供摘要。

Abstract

Mandarin Chinese is a tone language. The four tones, including T1, T2, T3, and T4, can be described phonetically as high level, high rising, low falling rising, and high falling, respectively. Our recent study used the mismatch negativity (MMN) to trace the brain response to tonal changes in adult and in 4 to 6 year old preschooler. One contrast consisted of two tones that are acoustically similar to one another (T2/T3, deviant: yi2 standard: yi3). The other one consisted of two tones that are acoustically dissimilar to one another (T1/T3, deviant: yi1 standard: yi3). The adults showed typical frontal-central distributed MMN to both contrasts while the MMN response to the T1/T3 contrast showed earlier onset and larger amplitude than that for T2/T3 contrast. In preschooler, the adult-like MMN to the T1/T3 contrast were found in all age groups. However, the 4 years-old preschooler showed no significant MMN response to T2/T3 contrast and both 5 and 6 age groups showed the positive mismatch response (P-MMR) to the T2/T3 contrast. Previous studies have demonstrated the influence of meaning on the perception of speech sounds. Given these three syllables used in previous study were not well matched in their token frequency (115866, 34886 and 111184 per ten million for yi1, yi2, yi3, respectively), it is hard to tell if the T2/T3 contrast elicited smaller MMN than T1/T3 is due to the difference of acoustically similarity or the lexical frequency. The present study aims to reexamine this issue by tracing the brain response to the changes of Mandarin lexical tones which were embedded in the pseudosyllables without the contamination of lexical memory from preschoolers to adults.

Methods:

18 adults, 52 preschoolers (age 4: 17, age 5: 17, age 6: 18) participated in the multi-deviants oddball paradigm with the pseudosyllables *fi1* and *fi2* serve as deviants (10% for each) and pseudosyllables *fi3* serves as standard (80%). The whole experiment consist 1000 trials. The stimuli were pronounced by a

female native Mandarin and their duration were normalized to 250 msec. Participants were requested to passively listen to those sounds while playing computer game or watching silent video. The EEG was recorded at a sampling rate of 500 Hz from 32 sintered Ag/AgCl Quikcap with SYNAMPS2 (Neuroscan).

Results: The adults showed typical frontal-central distributed MMNs for both T1/T3 and T2/T3 contrasts from 150 to 300 msec. The 4 years-old preschooler showed adult-like MMN in T1/T3 contrast and but no significant mismatch response to T1/T2 contrast. However, the 5- and 6-years old groups showed typical adult-like MMN to both T1/T3 and T2/T3 contrasts.

Conclusion: The larger MMN amplitude for the T1/T3 relative to the T2/T3 condition was only evident for 4 years-old group. Moreover, preschooler showed adult-like MMN to T1/T3 contrast in all age groups. This is congruent with the findings of developmental study of speech production that showed that the mastery of lexical tone achieved around 3 years old; the level and falling tones were acquired before rising and dipping tones and that most errors involved a lack of distinction between rising and dipping tones (Clumeck, 1977; Li & Thompson, 1977; Zhu, 2002).

Discussion of significance: The present study demonstrated the feasibility of using MMN to index the subtle difference between T1/T3 and T2/T3 contrast in 4 years-old preschoolers. It might serve as a neurophysiological marker for the early identification of children with language or reading deficits.

Title: Sublexical ambiguity effects in reading Chinese disyllabic compounds

For Chinese compounds, neighbors can share either both orthographic forms and meanings, or orthographic forms only. In this study, central presentation and visual half-field (VF) presentation methods were used in conjunction with ERP measures to investigate how readers solve the sublexical semantic ambiguity of the first constituent character in reading a disyllabic compound. The sublexical ambiguity of the first character was manipulated while the orthographic neighborhood size of the first character (NS1) was controlled (Figure 1). Subjective rating of number of meanings corresponding to a character was used as an index of sublexical ambiguity. Results showed that low sublexical ambiguity words elicited a more negative N400 than high sublexical ambiguity words when words were centrally presented. Similar patterns were found when words were presented only to the left VF (right hemisphere) in the second experiment. Interestingly, different patterns were observed for pseudowords. With left VF presentation, high sublexical ambiguity pseudowords showed a more negative N400 than low sublexical ambiguity pseudowords. In contrast, with right VF (left hemisphere) presentation, low sublexical ambiguity pseudowords showed a more negative N400 than high sublexical ambiguity pseudowords. We suggested that more morphemes corresponding to the initial character implies smaller numbers of words within a meaning when the neighborhood size was controlled (Figure 1). Furthermore, the whole word presentation of a Chinese word provides top-down information, and we showed different sublexical ambiguity patterns of words and pseudowords in two hemispheres. These findings indicate that a level of morphological representation between form and meaning needs to be established and refined in Chinese. In addition, hemispheric asymmetries in the use of word information in ambiguity resolution should be taken into account, even at sublexical level.

二、敘述學術活動內容，例如會議經過、講學大綱、研究、進修內容等；並請詳述本次活動之心得，以供相關領域研究人員學術交流，並請勿敘述非關學術或文化活

動內容。(請勿以論文本身或蒐集會議資料為報告的主體，格式以 A4 橫寫繕打，字數約一頁，不含論文摘要)。請上網參考範例

神經科學學會年會(The annual meeting of the Society for Neuroscience)，是北美最大的神經科學研究組織，每年論文發表，以及各種小型會議，總可以吸引有 2-3 萬人參與，議題從基礎的分子生物研究，到認知神經科學，皆有涵蓋。這次論文發表主要是在此年會下的新成立的組織，名為語言的神經生物基礎(Neurobiology of Language Conference)，這個聚會是以神經科學界中，以語言為研究對象的研究者為主，研究方法則是聚焦在最新的神經科學技術，例如 fMRI, ERP, MEG, TMS 等。這個小型組織在神經科學學會年會下，為第二度的聚會，此次的聚會吸引將近 400 人參與，除了例行的論文發表與演講之外，也正式成立了 Neurobiology of Language 的學會，正式選舉學會主席，執行秘書。與會者都非常興奮，因為這是第一個以語言研究為主體的認知神經科學研究組織，未來對於語言的認知神經科學研究，可以有更聚焦，更有效的交流方式，對於這個領域的進展，想必有莫大的幫助。

這個會議的另一個特色，是除了例行的口頭報告，海報展示之外，每天都有一場針對某個議題的辯論，邀請對該議題最具盛名的兩位學者，以辯論的形式各自闡述其研究成果與論點，之後交互詰問，並有整整一小時的時間由現場聽眾提問，兩方輪流答辯，最後在結辯之後，由聽眾決定辯論結果由哪方獲勝。最令我印象深刻的一場是由 Stanislas Dehaene (Director of the INSERM-CEA Cognitive Neuroimaging Unit, Paris, France.) 與 Cathy Price (Professor at Wellcome Trust Department of NeuroImaging, University College London (UCL) 針對 Visual Word Form Area 這個腦區在文字辨識中所扮演的角色進行辯論。這兩位學者都分別來訪問過台灣，所上博士培育人才徐峻賢的論文主軸，也跟這個議題息息相關。兩位學者用該諧的方式各自闡述並相互詰問，整個過程讓大家更清楚現有的共事與爭議所在。最令我感動的是，學者們就事論事的精神，不會把議題的爭議衍生為對個人的批判，學者可以盡情闡述與批判，這是科學進步的最大原動力，但卻是我覺得在台灣的學術研究氛圍中，比較難做到的。

此外，實驗室在這次會議中，發表了兩篇研究，一篇與幼兒對國語聲調區辨的電生理研究有關，另一篇則是討論複合詞中組成字的語意模糊性，與兩半腦功能側化的關連。這兩篇研究都獲得很多迴響與鼓勵。其中第一篇的主題，與會場另一篇紐約大學發表的研究有共同的興趣，但主要的差別在於我們直接測量發展的變化，而紐約大學的學者則是用在第二語言學習的領域中。這類電生理研究都屬於新興領域，我們彼此交換許多研究經驗與建議，是另一大收穫。

註：請申請人印出本表親自簽名，並由所屬單位主管審閱及簽章後，連同第二頁出國報告表交由各單位承辦人掃描為 PDF 檔，上傳至本院，方為完成報告繳交。

填表人簽章

填表日期

99.11.26

所屬單位主管審閱簽章