Abstract of thesis entitled:

Lexical and Sublexical Processing in Chinese Character Recognition

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Three studies were conducted to investigate lexical and sublexical processing in Chinese character recognition. Each study consisted of a behavioral experiment and an event-related potential (ERP) experiment. Participants were asked to judge whether each individually presented character belonged to the semantic category of animal.

In Study 1, position-general radical frequency (GRF) and position-specific radical frequency (SRF) were manipulated to explore radical processing using the behavioral method and the ERP technique. The behavioral data revealed a robust effect of GRF and a relatively weak effect of SRF, with HGRF and HSRF characters processed faster than LGRF and LSRF characters, respectively. The ERP data showed that the effect of GRF was associated with N170, whereas the effect of SRF was associated with P200 and N400.

In Study 2, I used masked priming paradigm together with the behavioral method and the ERP technique to investigate radical processing. The behavioral experiment revealed similar priming effects for target characters preceded by primes containing them as radicals in both dominant and subordinate positions. The ERP experiment also revealed reliable priming effects for target characters preceded by primes containing them as radicals, but the effect produced by radicals of high

position-specific radical frequency appeared earlier than that yielded by radicals of low position-specific radical frequency.

In Study 3, I used multiple linear regression approach with the behavioral method and the ERP technique to investigate the processing of radical-level and character-level properties when they functioned jointly during visual Chinese character recognition. The behavioral data showed that all the 7 variables contributed to character recognition, with the variance accounted for by familiarity being the largest, followed by stroke number and semantic transparency, and followed by the four radical-level variables. The ERP data showed that the first significant effects of stroke number, the SRF of the first radicals, the GRF and SRF of the second radicals occurred around 100 ms post-stimulus onset, and the first significant effects of the GRF of the first radicals, familiarity and semantic transparency appeared slightly later round 150 ms. At later stages from 150 ms to 350 ms, different levels of variables contributed to the processing simultaneously.

The results from the three studies together indicate that 1) radical-level and character-level information contributed to the process of character recognition simultaneously, but the contribution of character-level information and semantic-radical information were greater than that of phonetic-radical information during single Chinese character recognition in a semantic categorization task., 2) position is an important property of radicals that should be considered during Chinese character recognition, 3) the temporal relationship between radical identity and position coding is relatively flexible and can be modulated by various factors. Based on the results of the current studies and previous studies, an interactive model of orthographic processing in Chinese character recognition was proposed.

论文摘要：汉字认知中的词汇与亚词汇加工

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　　本论文报告了三个研究，旨在探讨部件信息和整字信息在汉字加工过程的作用和时程。每个研究由一个行为实验和一个脑电实验组成。所有实验都采用语义类别任务，被试需要判断屏幕中央所呈现的汉字是否属于动物类别。

　　研究一中通过操纵不携带位置信息的部件频率(position-general radical frequency)以及携带位置信息的部件频率(position-specific radical frequency)来探讨部件在汉字加工中的作用和时程。行为实验的结果显示，两种部件频率都会影响汉字的识别，但是不携带位置信息的部件频率的效应比携带位置信息的部件频率的效应相对强一些。脑电实验也发现两种部件频率都会影响汉字加工。其中不携带位置信息的部件频率引发了 N170 的变化，而携带位置信息的部件频率引发了 P200 和 N400 的变化。

　　研究二采用掩蔽启动范式进一步探讨部件的作用和时程。行为实验发现当目标字以部件形式出现在启动刺激中时，不管是出现在常见还是不常见的位置均会出现显著的启动效应。脑电实验也发现了类似的启动效应，但是这种启动效应会受到目标字在启动刺激中所处位置的影响。当目标字出现在常见位置的时候启动效应出现得早于不常见位置。

研究三采用多元回线性归方法对部件信息和整字信息在汉字加工中的作用和时程进行探讨。行为实验的结果表明部件信息和整字信息都会影响整字加工，但是整字信息的影响相对大一些。脑电数据的结果跟行为实验结果一致，都显示整字信息的作用要比部件信息的作用强。另外，脑电信息表明，整字笔画数、第一个部件的携带位置信息频率、第二个部件的携带和不携带位置信息的频率在汉字呈现 100 毫秒左右就出现了效应，而熟悉性、语义透明度以及第一个部件的不携带位置信息频率最早的效应出现在 150 毫秒左右。在 150 到 350 毫秒之间，部件信息和整字信息同时起作用共同影响汉字加工。

综合三个研究的结果，在单个汉字加工过程中，1）整字信息和部件信息都会起作用，但整字以及义旁的作用比声旁相对强；2）部件位置信息是影响汉字加工的一个重要因素；3）携带位置信息的部件与不携带位置信息的部件在激活的先后次序上并非固定的，而是相对灵活会受到各种因素的影响。最后，论文总结部分基于本研究以及先前相关研究的结果，提出了一个关于汉字字形加工的激活模型。