Research proposal

Introduction.

My dissertation research project consists of experiments to be conducted over the following six months, and concerns the recognition and processing of Chinese characters. Specifically, it examines how readers make use of the linguistic information in the character components, and the influence of linguistic factors processing times. Characters contain at least one basic semantic component, or radical, and possibly additional non-radical semantic components (NRCs); these often provide some cue about the whole-character meaning. Most characters also contain a phonetic indicator, which provides an approximate cue to the pronunciation of the character.

The non-alphabetic nature of Chinese script raises questions as to (1) how readers of a script with indirect semantic and phonological information recognize words, and (2) how standard psycholinguistic models of word recognition and processing could apply to Chinese. In psycholinguistic studies of Chinese, some take the strong phonological view that only phonetic information is used early and predominantly in the process of lexical recognition, and present experimental evidence for this view from. Others take the strong semantic view that only semantic information is used early and predominantly, with experimental results supporting their claims. The framework adopted here is the dual route model, which posits that readers recognize words via direct orthographic recognition and via phonological information; both streams of information work in parallel, and interact with other linguistic factors.

Research hypotheses.

The following hypotheses will be addressed: (1) various textual and linguistic variables affect processing times and usefulness of semantic and phonetic information in characters, i.e., visual-level, lexical, phonological and semantic factors; (2) both semantic and phonological information of characters are used early in lexical recognition, with the relative degree and usefulness of each depending on such lexical, semantic, and phonological effects; (3) semantic components will contribute to lexical access equally well, whether they serve as as radicals or non-radical components; and (4) multiple semantic components in a character should lead to faster processing time than for one semantic component, if transparent and related to character meaning; otherwise, opaque or less related components should slow processing times.

Experiments.

A set of four experiments will be carried out with subjects performing computer tasks in E-Prime, a psychological experimental software package. The experiments will use a standard masked priming paradigm: a prime that is semantically, orthographically, or phonologically similar or dissimilar to the target is presented for a duration of under 50 milliseconds, which subjects do not consciously detect; then a visible target item is presented. Subjects respond by naming the word or character (naming task), or by pressing a button to indicate whether the word or character is a real word or character (versus a pseudo-character control) – a character decision task (CDT). Response times and error rates are recorded and measured as the dependent variables. To test semantic processing of characters, a semantic prime (NRC / radical) is used to prime the target character, followed by a CDT (semantic priming); in phonological priming, a phonetic component or homophone prime with a naming task is used to test phonological activation. The results will be
subjected to ANOVA/ANCOVAs, hierarchical regression, principal components analysis, and other multivariate statistical procedures. In addition to more representative stimulus sets, various factors will be controlled for statistically: visual (e.g., number of strokes and character components, spatial density), lexical (e.g., radical and character frequency), phonological (e.g., syllable frequency), and semantic variables. Such factors have not been sufficiently controlled for in past studies.

Expt. 1 will test the role of semantic factors of characters, namely, the semantic transparency, or relatedness between radical and character meaning, by comparing priming effects of characters and radicals of high and low semantic transparency, as well as high and low frequency radicals as a second factor. With different prime types, the effects of the number and types of semantic components (NRCs, radicals) will be compared in Expt. 2, and the effects of varying degrees of phonological relatedness or correspondence between phonetic indicators and characters will be compared in Expt. 3. The relative contributions of semantic and phonetic components, and the time course of phonological and semantic activation, will be compared in Expt. 4 by means of different timing periods in stimulus presentations (stimulus onset asynchrony, SOA).

**Significance.**

This research will show how a standard word recognition model can apply to character recognition in Chinese. The results will show how semantic and phonetic component information is used and processed, how this is similar to and differs from reading alphabetic scripts, and how various linguistic factors affect the processing of these cues. Specific similarities and differences in reading Chinese and alphabetic scripts can be quantified and characterized with the same psycholinguistic mechanisms. The proposed studies also introduce considerable methodological improvements over past research, as previous disparate results are likely due to a lack of sufficient controls for various linguistic factors, and the small stimulus sets used, with small and unrepresentative numbers of radicals.

The design is based on reaction time studies of character and word recognition in Chinese, English, and other languages, but with much improved statistical controls for linguistic factors, for greater statistical precision. These controls, using better sample sizes, and the use of principled, quantifiable semantic controls for the first time in the field, represent significant methodological improvements, and greater statistical power and reliability, over past studies.

As a psycholinguistic project, the experiments involve measuring and analyzing psychological, cognitive processing of linguistic information in reading, and discussion of psycholinguistic theories of lexical access. Linguistic factors, such as lexical factors, semantics, and phonology will be examined, and discussion of semantics and phonology will draw from both linguistics as well as psychological paradigms, such as exemplar theory from cognitive psychology. An exemplar based theory of encoding of semantic and phonological information in Chinese script will be developed within the psycholinguistic framework of the dual route processing model. Aspects of visual cognition are also involved, as well as possible applications to computer recognition of text.

The results of this research will show how a standard psycholinguistic processing model of reading, developed originally for alphabetic scripts, can be extended to non-alphabetic, non-Western languages such as Chinese. The research will thus help us better understand the linguistic and cognitive mechanisms involved in recognizing words and in reading different writing systems, particularly Chinese – which has not undergone sufficient, scientifically rigorous study. The results will also have applications to language acquisition theory, particularly for reading and literacy, and for first and second language instruction of Chinese reading and writing. The results of this project will be submitted for publication in well known experimental psychology journals.