Psycholinguistic Studies of Language Processing in Japanese

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Introduction

Japanese scholarship has often followed an independent line of development in certain areas of scientific endeavor. The study of language and scientific approaches to primatology are two prime examples where the motivating intellectual force for research has been derived from specifically Japanese perspectives. It is fruitless to understand Japanese work in areas like psycholinguistics, natural language, and the structure of mental representations, without understanding the sources from which the relevant research questions are derived. At the same time, Japanese psycholinguistics has also been influenced from Anglo-American theoretical concerns.

This paper attempts to sketch a representative sub-section of the field of Japanese psycholinguistics, employing the topic of language processing as an illustration of theoretical approaches to questions of language behavior, and by extension, the degree to which linguistics and psychology collaborate in the actual practice of Japanese psycholinguistics. As a sample database, the research reported on here is derived from a representative survey of professional journals in linguistics and psychology, limited to research reported in the last twenty years.

Unlike Maclay's (1973) useful classification of developmental steps in early psycholinguistics and Kess' (1976, 1990, in press) historical overviews of the past century of activity, no such inventory as yet exists for Japanese psycholinguistics. Nor does the contribution of Japanese psycholinguistics figure at all in the comprehensive overviews that purport to cover the field of psycholinguistics for the *Annual Review of Psychology*. Indeed, these overviews are quite comprehensive, but are largely limited to reports of Anglo-American social science. In this respect, there is little difference between the first modern overview in the *Annual Review of Psychology* by Rubenstein and Aborn (1960), and later ones in the same *Annual Review of Psychology* by Ervin-Tripp and Slobin (1966), Fillenbaum (1971), Johnson-Laird (1974), and Danks and Glucksberg (1980). Even the current review by Foss (1988) contains no mention of Japanese pursuits.

The history of Anglo-American psycholinguistics over the past century is well-known. But the research paths of concern to Japanese psycho-

linguistics during this period are either ignored or are considerably less transparent in the commonly accessible literature.[1] Questions like whether there were independent developments, in contrast

Questions like whether there were independent developments, in contrast to or in complementation to Anglo-American research goals, and even the question of what is happening currently are only vaguely answered by scanning the usual literature. The occasional promising title, as for example, Jun Haga's (1988) fine *Gengoshinrigaku Nyuumon* [Introduction to Psycholinguistics], does not overview Japanese psycholinguistics, but typically presents the author's own work.

There is no question that fields related to psycholinguistic interests have been particularly rich and more than occasionally serve as the subject of overview articles. For example, Fukuzawa, Onose, Fukuda, and Nishitani (1990) chronicle the directional trends in psychological studies of reading in Japan from the 1960s through the 1990s, Takano, Okajima, Sakurai, and Watanabe (1986) chart trends in educational psychology in Japan, and Watanabe and Ohtsuka (1979) reflect the earlier fascination with cross-cultural psychology in the 1960s and 1970s. Of course, the emphasis on foreign language acquisition and the establishment of a sound language pedagogy have always made Applied Linguistics a field of particular interest, and this can be traced in the continuing emphasis in the literature (see, as an example, Sasaki 1991), as well as the recent realization of the professional Japanese Association of Applied Linguistics (JAAL in JACET).

Psycholinguistic Studies of Language Processing

Certainly the most striking work in Japanese studies on language processing has been in the area of kana-kanji processing. The orthographic expression of phonological fact is carried by the two syllabic kana systems, hiragana and katakana, and one expects that this will incur processing in the left hemisphere. It is of course the left hemisphere which undertakes on-line left-to-right sequential processing in space, as well as sequential processing in time. But the Japanese writing system incorporates Chinese-based kanji characters into the printed form of the language as well, making for an orthographic system which incorporates both form-based and meaning-based symbols into the decoding process. The general finding has been, of course, that there is a left hemisphere advantage for linguistic stimuli like kana and a right-hemisphere advantage for abstract configura-

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[1] Unfortunately, this lack of knowledge is a general failing of Western assessments of the theoretical and research directions in psychology and related social sciences as intellectual enterprises developed within Asia. See, for example, Shapiro's (1986) article for a lament on the general neglect of Asian psychology in the United States, and Harris' book (cited in Levine 1991) for even more specific commentary on *The Cross-cultural Challenge to Social Psychology*.

tional stimuli like kanji (see Endo, Shimizu, and Hori 1978; Feldman and Turvey 1980; Hatta 1978, 1981a; Morikawa 1981; Morinaga and Kiyoshi 1988; Nishikawa and Ninna 1981; Nomura 1981; Paradis, Hagiwara, and Hildebrandt 1985; Sasanuma 1975; Sasanuma, Itoh, Kobayashi, and Mori 1980; Sugishita, Iwata, Toyokura, Yoshioka, and Yamada 1978; Toma and Toshima 1989; Yokoyama, Imai, and Furukawa 1991. This result is consistent with hemispheric advantages in processing Chinese characters reported in logographic writing systems like Chinese itself (see Keung and Hoosain 1989), and some even make the claim that the right hemisphere is specialized for kanji processing (see Hatta 1981a). It is of course certainly conceivable that the five types of potential orthographies realized in hiragana, katakana, English alphabetic, kanji, and pictographs each require their own processing system, as Hatta (1985) has suggested. And indeed, others like Fujihara (1989) have found processing differences for kana and numerals (see also Shimahara 1987). The notion of separate processing sub-systems, or modules, is perfectly compatible with the modularity camp in the debate between modularity and interactionism (see Fodor, 1983, and Kess 1991a, 1991b, in press). A variety of evidence has supported the possibility that the domain-specific language processing system is encapsulated to deal with linguistic input alone in the initial bottom-up analysis of the linguistic input, and it would not be surprising to see the system further subdivided into smaller subsystems.

It is worth noting that a significant portion of the work with kana-kanji processing and word recognition differences ascribed to the writing system type overlaps and/or is derived from work with decremental loss of such abilities in aphasics (see, for example, Hayashi, Ulatowska, and Sasanuma 1985; Morinaga and Kiyoshi 1988; Paradis, Hagiwara, and Hildebrandt 1985; Sasanuma 1975; Sasanuma, Itoh, Kobayashi, and Mori 1980; Sugishita, Iwata, Toyokura, Yoshioka, and Yamada 1978), or is complementary to capitalizing on developmental abilities in children (see Steinberg, Isozaki, and Amano 1981; Toma and Toshima 1989).

Differences in processing kanji, as well as the possibility of hemispheric advantages in processing kanji, have also been investigated (see Elman, Takahashi, and Tohsaku 1981; Endo, Shimimizu, and Hori 1978; Hatta 1977a, 1977b, 1981b, 1981c; Hayashi and Hatta 1978; Langman and Saito 1984; and Nomura 1979). The general finding is that kanji recognition is facilitated by considerations of imagery and iconicity. Very simply, the more concrete the kanji referent of the Chinese character, the quicker its recognition; the greater the iconicity of the kanji form of the Chinese character, the more prototypical the kanji is perceived to be.

In turn, differences in representational models of kana (Itsukushima 1981) and differences in processing kana, as well as the possibility of hemispheric advantages in processing kana (see Hatta 1983, 1985; Hatta, Ohnishi, Yamamoto, and Ogura 1981) have also been investigated. In general, there has been and continues to be tremendous interest in writing systems and the possible processing systems that may be involved in lexical access

and comprehension (see Hatta 1985, 1986). A variety of experiments have been cross-orthographic by contrasting English (Hatta, Hatae, and Kirsner 1984), Korean hangul (Endo, Shimizu, and Nakamura 1981) and even numerals (Fujihara 1989; Itsukushima, Tozawa, and Itagaki 1990). Much of this work is reflective of the general interest in the uniqueness of the Japanese writing system, and by extension, in the possible uniqueness of the associated processing systems. There is no question that a case can be made for unique processing systems to deal with varying types of input, even if it is all in one domain, as for example, the orthographic domain (see Hatta 1985). Again, as suggested above, such a position is quite compatible with the modularity side of the debate between modularity and interactionism (see Fodor 1983, and Kess 1991a, 1991b, in press). And while some sound experimental work has been done on this topic (see Hatta and Dimond 1981), the presentation of the question can overlap the boundary into the larger introspective tradition abbreviated by the concept of *Nihonjinron*. For example, consider the recent popularization of the discussion about possible brain differences, as exemplified by the wide reception accorded Tsunoda's *Nihonjin no Noo* [*The Japanese Brain*] (see also Tsunoda 1984).

Although speech perception fits naturally within the domain of processing and comprehension of natural language, the literature here is so vast and specialized that it is beyond the scope of this paper except for mere mention. More traditional concerns are mirrored in some discussions, as for example, the use of the click monitoring paradigm to determine segmentation procedures (see Fukuda 1983). Sound symbolism (see Haga 1988), and the related notion of auditory speech images (see Inoue and Inoue 1986), have always have been a rich source of experimentation. But the real focus of current work in speech perception is related to industrial uses of acoustic principles for speech recognition devices. These have the potential to be attached to a range of industrial applications, encompassing their implementation in interactive devices ranging from language learning to virtual reality simulations.

Word recognition and lexical access is a focal topic in much Anglo-American contemporary psychological research, so much so that Foss' recent (1988) overview singles it out as the most productive area in psycholinguistics as practiced by psychologists. This emphasis is of course reflected in Japanese work, where familiar and reliable tasks like lexical decision and pronunciation tasks investigate the scope of factors like priming (see, for example, Harada 1987). Most word recognition studies by Western psychologists have focussed on aspects of written-word recognition, (see Kess in press); similarly, word recognition studies in Japanese also involve written-word recognition, and processing dimensions associated with kanji reading and/or recognition (see Kawaguchi 1987).

The implications of generative transformational grammar, and the resulting research paradigm which held sway for almost two decades between the 1960s and the 1980s, has had a ripple effect in both Japanese linguistics and psycholinguistics. With the sentence as the basic unit, and