Psycholinguistics, Overview

INTRODUCTION

In its primary sense, psycholinguistics is an interdisciplinary field in which linguists and psychologists use behavioral evidence to study how language is processed in the normal adult mind, though more broadly psycholinguistics also encompasses the learning of language by children and adults (language acquisition) and the implementation of language processing in the brain (neurolinguistics). This lemma gives an overview of psycholinguistics in its primary sense, reviewing its scope and history and describing some representative studies on Chinese. (For another general review of Chinese psycholinguistics, see Li *et al.* 2006; for a review of Chinese language acquisition, see "First language acquisition of Chinese: an overview"; for a review of Chinese neurolinguistics, see "Neurolinguistics: an overview".)

THE SCOPE OF PSYCHOLINGUISTICS

Psycholinguistics is notoriously difficult to define (Tanenhaus 1988). This is even reflected in the name: psycholinguistics (心理語言學 *xīnlǐ yǔyánxué*), a branch of linguistics, is also often called psychology of language (語言心理學 *yǔyán xīnlǐxué*), a branch of psychology. Crucial to understanding psycholinguistics is seeing how it relates to, yet differs from, both theoretical linguistics and neurolinguistics.

One tool for addressing this issue is the notion of levels of analysis proposed by the psychologist and neuroscientist David Marr (1982). He noted that any complex system can be described in terms of what it does (its function or abstract computation), how it does it (its representations and algorithms), and how it is realized (its physical implementation). In the

case of language, the computational level describes the abstract code shared by the speakers of a language, the algorithmic level describes the processing of this code, and the implementational level describes how this algorithm works in the brain. Marr's key insight was that no one level can subsume all of the others. Even the more concrete levels don't make much sense without the more abstract ones, much as a full understanding of clockwork (implementation) requires understanding its effect on the clock's hand movements (algorithm) and the clock's function of keeping time (computation).

The difference in Marrian level between linguistics and psychology can be seen in the fact that psycholinguistic theories involve temporal mechanisms, unlike grammatical theories. As the psychologist George Miller (1990:321) put it, "[l]inguists tend to accept simplifications as explanations"; for example, X-bar theory of phrase structure explains "a vast array of specific rules" by reducing them to one schema. By contrast, "[f]or a psychologist, ... an explanation is something phrased in terms of cause and effect, antecedent and subsequent, stimulus and response." In this view, X-bar theory is not an explanation, but rather "if it is true, it is something to be explained" (i.e. in terms of temporal processes, not merely further simplification).

Since psycholinguistics describes temporal processes, psycholinguistic experiments often measure time explicitly, as in the reaction time experiment, in which the researcher measures how quickly an experimental participant responds (e.g. by pressing a button) to a stimulus (e.g. a word), with faster responses indicating simpler, fewer, or pre-activated processes. However, data in theoretical linguistics also depend on processes (even so-called linguistic introspection is actually a form of mental process; Myers 2009), and reaction time experiments may be quite revealing about grammatical knowledge (e.g. Phillips and Wagers 2007).

Just as psycholinguistics differs from linguistics in its interest in time, it differs from

neurolinguistics in its failure to study (anatomic) space, or indeed, time prior to the production of a measurable behavior (i.e. a muscle movement of some sort). While this clearly makes neurolinguistics crucial to fleshing out language mechanisms (literally), psycholinguistic theory and findings still provide essential Marrian guidance. Behavioral data are also much richer than is sometimes assumed. Even in the typical button-press experiment, processes occurring before the response can be inferred through experimental design (e.g. whether a word-matching task involves comparing pronunciations or meanings), reaction time variation (faster responders may be more sensitive to earlier processes; e.g. Yap *et al.* 2009), and statistical techniques (e.g. the additive method of Sternberg 1969, which tests whether two aspects of a task are processed together or separately). Behavioral techniques also include eye tracking (e.g. Griffin and Davison 2011), which uses tiny cameras to follow where participants are looking on a computer screen, thus providing behavioral information about language processing before the participant makes any overt decision.

HISTORY OF PSYCHOLINGUISTICS

The structure of contemporary psycholinguistics follows not just from the logical principles sketched above, but also from its complex interdisciplinary history. We first outline this history in the West, since Chinese psycholinguistics started later and has remained closely dependent on it.

Psycholinguistics in the West

Linguistics emerged as a scholarly specialty quite early, in ancient India (Cardona 1994) and Greece (Hovdhaugen 1982). By contrast, despite sophisticated discussions of the mind

from ancient times, psychology remained a branch of philosophy until the second half of the nineteenth century, when European scholars (primarily in Germany) realized that perceptions and voluntary behaviors could be quantified and manipulated experimentally, on the model of physics (Boring 1950).

Of course, the nineteenth century was also when linguistics matured as a science, and it quickly became clear that questions of language diversity and change were also psychological questions (Graffi 2001). Thus philologist Heymann Steinthal (1823-1899) argued that formal differences across languages correlate with differences in how their speakers think (a precursor of the Sapir-Whorf hypothesis; see "The Sapir-Whorf hypothesis"). The Neogrammarians also framed theoretical constructs like analogy in explicitly psychological terms (i.e. as the unconscious generalization of regularities from memorized word forms).

The early experimental psychologists were also interested in language (Levelt 2013). Wilhelm Wundt (1832-1920), founder of the first dedicated psychology laboratory in 1879, was arguably also the first interdisciplinary psycholinguist, expressing respect both for the processes that he said were studied in experimental psychology and for their products, including language, which he believed were best studied using observational methods like those used by comparative linguists. Even though Wundt felt that only superficial aspects of language could be studied experimentally, his laboratory quickly established methods and findings that remain essential to psycholinguistics today, including the use of nonsense syllables as stimuli and the discovery of the frequency effect, whereby more common words are responded to more quickly than rarer ones (Pronko 1946).

In the nineteenth century the influence of psychology on linguistics was such that by the time American linguist Leonard Bloomfield's first book appeared early in the twentieth, he could confidently declare that "linguistics is, of all the mental sciences, most in need of guidance at every step by the best psychologic insight available" (Bloomfield 1914:323).

However, his more famous later book expresses a quite different attitude: “The findings of the linguist ... will be all the more valuable for the psychologist if they are not distorted by any prepossessions about psychology” (Bloomfield 1933:32). What had happened in the interim was that American experimental psychology had succumbed to behaviorism, a philosophy that sharply restricted theorizing about the internal structure of the black box of the mind, hidden between stimulus and response (e.g. Skinner 1957). This framework required linguists to treat many linguistically essential notions, from phonemes to meanings, in purely structural terms. Meanwhile, the psychologists themselves also lost interest in language; the introductory psychology textbook Munn (1946) has no chapter on language, while Boring’s (1950) history of experimental psychology doesn’t even have an index entry for it.

This began to change, however, with a paper by the American psychologist Nicholas Pronko (1946), who used the term “psycholinguistics” in its modern sense for the first time, as an interdisciplinary field. The Summer Seminar in Psychology and Linguistics was held at Cornell University not long afterwards, in 1951, conventionally taken as the birthdate of modern psycholinguistics (Levelt 2013). Nevertheless, it was not until the 1960s that psycholinguistics really took off (literally: Google’s Ngram Viewer (Michel *et al.* 2011), which plots the proportional frequency over time of words used in Google’s monumental book corpus, shows the term rocketing up at that time). This is because psycholinguistics was swept up into the so-called cognitive revolution, which rejected behaviorism and brought the mind back into psychology and linguistics.

Driven by American scholars like the linguist Noam Chomsky and the psychologists George Miller and Ulric Neisser (author of Neisser 1967, which popularized the term “cognitive psychology”), the cognitive revolution had many causes (Gardner 1985, Leahey 1992). Among these was the development of the digital computer over the previous decade or

so, which among other things provided a highly productive metaphor for understanding the black box of the mind, the mystery that had stymied the behaviorists. In both linguistics and psychology, theories began to look like computer programs (specifically, so-called von Neumann machines, first described in 1945; von Neumann 1993), with ordered sequences of procedures (e.g. the syntactic transformations of Chomsky's 1965 theory of syntax) interacting with an independent memory store (e.g. the lexicon in Chomsky's theory).

One sign of the rekindled interdisciplinary collaboration was that experimental psychologists were immediately inspired to test Chomsky's generative syntax. Unfortunately, psychologists did not realize at first that linguists were operating at a different Marrian level, and thus misinterpreted Chomsky's syntactic derivations as taking place in real time. This led to them to suppose that if English passive sentences require an extra derivational step (as early generative analyses claimed), they should take longer to process than active sentences. When this prediction was proved false, and Chomsky explained that his theory never made that prediction in the first place, many psychologists lost interest in linguistic theory again (Fodor *et al.* 1974; Reber 1987). Nevertheless, the study of sentence processing, which was virtually nonexistent before Chomsky, remains one of the most interdisciplinary areas of psycholinguistics (by contrast, only a minority of studies in speech processing make reference to current phonological theory).

The history of psycholinguistics was influenced by computer technology again in the 1980s, as increasingly powerful yet inexpensive von Neumann machines (i.e. office PCs) made it possible to simulate a radically different sort of computer architecture, in which information was processed in parallel and distributed throughout a network (eliminating the independent memory store). Such connectionist models (e.g. Davis 1992) seemed to do two radical things at once: unify Marr's algorithmic and implementational levels (since the brain is also a network), and revive behaviorism in a more sophisticated form, filling the mind's

black box with (thousands of) simple stimulus-response links.

While connectionist modeling remains an important tool in neuroscience (see e.g. Eliasmith *et al.* 2012), its heyday in psychology seems to be past (Google Ngram Viewer shows that peak usage of the term "connectionism" was in 1991). In addition to its empirical limitations (reviewed in Marcus 2003), arguably the primary reason for the decline is that connectionism violates Marrian principles: it is very difficult to work with algorithms that are also implementations. This realization, along with the never-ending advance of technology, particularly as applied to brain imaging, has led to an increasing interest in the implementational level for its own sake (an early classic explicitly calling for psycholinguistics to adopt neuroimaging techniques is Kutas and Van Petten 1994).

Chinese psycholinguistics

Ancient Chinese philosophers had been as interested in the mind as Western ones, particularly under the influence of Buddhism, and the Chinese civil servant system included what would now be called aptitude and personality testing (Higgins and Zheng 2002), but as in the pre-modern West, psychology in pre-modern China can hardly be considered scientific. However, unlike the West (and India), there was also very little linguistics (aside from sophisticated analyses of characters and syllables), perhaps due to the impoverished morphology and phonologically opaque orthography of Chinese (Malmqvist 1994); indeed, the term *grammar* comes from the Greek phrase *tékhnē grammatikē* 'art of letters' (Hovdhaugen 1982).

Western linguistics and Western psychology came to China around the same time, starting in the late nineteenth century. The first Chinese psychology laboratory was set up at Peking University in 1917 by Cài Yuánpéi 蔡元培, who had been trained in Wundt's

laboratory (Higgins and Zheng 2002). Cài also became president of Peking University, an institution that itself had been modeled on the Běijīng 同文館 *Tóngwén Guǎn* 'School of Combined Learning', a school for training language interpreters. The boom in natively written Chinese grammars starting in the 1920s (Peverelli 1986) happened at exactly the same time the first Chinese psycholinguistics articles were being published (彭 Péng *et al.* 1997).

Like the grammarians, the early Chinese psycholinguists, whether working in China or abroad, were primarily interested in pedagogy and language reform, which led them to focus almost exclusively on reading. Many of the issues and methods that still appear in today's Chinese reading studies were established remarkably early: studies on the visual complexity of characters, the roles of phonology and semantics in character recognition, and eye movements during reading had all been conducted by 1929 (Péng *et al.* 1997). This focus on orthographic pedagogy and reform continued through the 1960s, now supplemented with notions adopted from the cognitive revolution going on in the West: character complexity was analyzed with information theory (not just the number of strokes), and remembering characters and texts was modeled in terms of the memory chunks of Miller (1956).

Chinese psycholinguistics didn't begin to expand in scope until the late 1970s, when the first dedicated conferences were held. While keeping their focus on reading, researchers began to shift towards more theoretical questions (Tzeng *et al.* 1977 is an early classic; see below). The scope expanded even further in the 1990s, perhaps in part because of the opening up of China, when numerous studies began to appear on topics other than reading. These include early studies on morphological processing (e.g. Zhang and Peng 1992), spoken word recognition (e.g. Zhou and Marslen-Wilson 1994, Ye and Connine 1999), sentence processing (e.g. Li *et al.* 1993, Miao 1999), discourse processing (e.g. Tao and Healy 1996, Yang *et al.* 1999), and the Sapir-Whorf hypothesis (e.g. Zhang and Schmitt 1998). After the turn of the

millennium, sentence processing studies became more sophisticated (see below), and new topics (e.g. metaphor processing; Ahrens 2002), models (e.g. connectionism; Xing *et al.* 2004), and techniques (e.g. neuroimaging; Liu *et al.* 2003) began to addressed.

Despite the welcome increase in breadth, Chinese psycholinguists remain fixated on reading: more than half of the adult behavioral studies in the collection Li *et al.* (2006) focus on reading, and of the Chinese psycholinguistic studies published from 2003 through 2013 indexed in the Linguistics & Language Behavior Abstracts database (published by ProQuest), more mention reading in the abstract (24%) than do studies involving English (16%), German (10%), or Japanese (13%).

SAMPLER OF CHINESE PSYCHOLINGUISTICS

As in all areas of scholarship, research on Chinese psycholinguistics has exploded in the past decade (LLBA indexes almost 5000 such studies for 2003-2013). To give a flavor of contemporary research, we highlight some of the issues and methods prominent in four major areas: reading, spoken language processing, lexical access, and sentence processing.

Reading

The most fundamental theoretical question addressed by reading studies is how reading is possible at all, given that the human brain could not have evolved for it. Given the ubiquity of speech across human cultures and the non-universality of literacy, it seems plausible to view reading as tied in some way to phonological processing. Indeed, all orthographic systems seem to be designed to ease the translation into phonology, most obviously in the case of alphabets, but arguably in Chinese orthography as well (DeFrancis 1989; Djamouri

2006; Sagart 2006). Reading Chinese orthography is crucial in research on this issue, given its typologically unusual encoding of semantics via radicals (部首 *bùshǒu*) and the unreliability of its phonological encoding; even the relatively consistent phonetic element 青 *qīng* 'green, blue, black' is associated with crucially different pronunciations in 請 *qǐng* 'please' and 精 *jīng* 'fine'.

The earliest study on this issue, Tzeng *et al.* (1977), found that the silent reading of Chinese sentences was slower if the characters rhymed (e.g., 糊塗夫婦砍樹木 *Hútú fūfù kǎn shùmù* 'The stupid husband and wife chopped down the trees') than if they didn't (e.g., 迷糊夫妻摘花草 *Míhú fūqī zhāi huācǎo* 'The stupid husband and wife picked the flowers'), as if the readers were experiencing tongue-twisters in their minds. With the expansion of Chinese psycholinguistic research in the 1990s, the phonological activation hypothesis was further supported by experiments using the priming paradigm, whereby participants make a decision about a stimulus item (e.g. whether a visual image is a real character or not) that is preceded briefly by another stimulus (a prime) that is or is not related to the target item (for a critical view of this widely used paradigm, see Bodner and Masson 2003). Using this method, Perfetti and Zhang (1991) found that character recognition times were facilitated (i.e. sped up) by homophonous primes, suggesting that phonological information was indeed activated quickly and automatically even when irrelevant to the task. Other studies purporting to show the same thing include Zhang and Perfetti (1993), Perfetti and Zhang (1995), Tan *et al.* (1995), Tan and Perfetti (1997), and Perfetti and Tan (1998).

The studies by Tan in particular hinted that phonology may even mediate between orthography and semantics, because phonological priming occurred with briefer interstimulus intervals (between prime and target) than semantic priming, and because priming was reported to occur even if the target was semantically related only to a homophone of the

prime (e.g. Tan and Perfetti 1997 found that primes like 碎 *suì* 'broken', homophonous with 歲 *suì* 'year' [岁 in their study], facilitated responses to targets like 年 *nián* 'year').

Phonological mediation has always been a controversial claim, however; Chen and Shu (2001) failed to replicate the results of Perfetti and Tan (1998) using the same materials and methods, and Chen and Peng (2001) in fact found the opposite order of activation (i.e. semantics before phonology). Indeed, the consensus today is that while phonological activation occurs early during reading, it is not required to mediate lexical access, not just for Chinese readers (Zhou and Marslen-Wilson 2000), but even for readers of alphabetic orthographies (e.g. Coltheart *et al.* 2001; see also "Lexical and Sub-lexical Access in Reading: Behavioral Studies").

Beyond the fundamental issue of how Chinese reading is possible at all, theoretical issues in reading research become more language-specific. One of these concerns the role of the regularity or consistency of character components in helping readers to activate phonology or semantics (e.g. 青 is a more reliable phonetic component than 充 in 流 *liú* 'flow' and 梳 *shū* 'comb'); the fact that readers are sensitive to such factors suggests that they have developed a mental "grammar" of character form (albeit a statistical one; Lee 2011). Another issue that is only now beginning to attract focused attention is the recognition of characters in sentential context. A crucial tool here is eye tracking, which shows that when reading Chinese text, the eye jumps roughly from word to word (not character to character), similar to what happens in the reading of text written in alphabetic orthographies (Feng 2006), suggesting a possibly universal role for wordlike units in reading, despite the lack of word boundary marking in Chinese orthography. Moreover, since each eye fixation covers more space than a single character, readers are able to gather a bit of information about upcoming characters prior to fixating on them (e.g. Tsai *et al.* 2004, Yan *et al.* 2009), something that of course isn't possible in spoken word processing.

Spoken language

Spoken language processing has received even less attention in research on Chinese than in that on Western languages, and most of what has been done has concerned tone perception. A basic finding is that just as with vowels and consonants, native listeners perceive lexical tones (particularly contour tones) categorically (see "Categorical perception"). That is, when listeners are presented with a series of pitch contours that differ gradiently from each other and are asked to discriminate or identify them, their responses are not gradient. For example, Peng *et al.* (2010) found that discrimination accuracy for Mandarin speakers listening to tone pairs peaked in the middle of an eleven-stimulus continuum from 姨 *yí* 'aunt' (rising tone) to 衣 *yī* 'clothes' (high level tone), suggesting a perceptual boundary between the two lexical tone categories (German listeners showed no such discrimination peak)..

Chinese psycholinguists have also studied the role of the lexicon in the time course of tone perception. Lee (2007) addressed this issue by presenting Mandarin listeners with spoken prime-target pairs that were related indirectly as in Perfetti and Tan (1998), e.g. prime 搂 *lǒu* 'hug' and target 建築 *jiànzhú* 'building', which is semantically related to 樓 *lóu* 'building', a near-homophone of the prime. Lexical decisions (i.e. whether the target was a real word; half of the targets were nonwords like *wái*) were faster for real words only if the prime and target were separated by 50 milliseconds (ms), but not by 250 ms, suggesting that the tone difference between *lǒu* and *lóu* affected lexical access very early. Surprisingly, perhaps, eye tracking has also proven to be a useful tool in the study of spoken language processing. Thus Malins and Joanisse (2010) presented Mandarin listeners with a spoken word of an object (e.g. 床 *chuáng* 'bed') and asked them to find it in a visual array that also included phonological competitors (e.g. 窗 *chuāng* 'window' and 船 *chuán* 'ship'). The

time course of (temporarily) looking at competitors that differed from the target only in tone (*chuāng*) or only in segments (*chuán*) proved to be the same, confirming that tonal information comes into play very early.

While studies on spoken language comprehension are rare enough in Chinese psycholinguistics, studies on language production are relatively rare for all languages, in part because it is much harder to get an experimental participant to produce a word on cue (reading aloud introduces confounds from orthographic processing). One method is to analyze naturally occurring speech errors, which reveal linguistic units and operations via their misuse (e.g. units appearing in the wrong location); see Chen (1993) and "Speech Errors in Mandarin". Of experimental techniques, the picture naming task is the most straightforward (e.g. Bates *et al.* 2003), but in order to test a wider variety of word types, cleverer methods must be used. These include the implicit priming or form preparation task (Meyer 1990), in which participants are trained to produce words when given semantically related prompts; facilitation when the targets within a training set share some phonological property suggests that this property is active in word production. Using this method, Chen *et al.* (2002) reported evidence that tones and syllables both play crucial roles in Mandarin word production, while segments do not (see "Word-form Encoding and Speech Production").

Lexical access

While linguists study the lexicon (an object), psycholinguists study lexical access (a process). Questions of lexical representations and structures are intimately connected with questions of lexical processing. For example, linguists may note that the progressive form 看著 *kàn-zhe* 'looking' is fully predictable from the base form 看 *kàn* 'look' and conclude that the progressive form need not be memorized, but a psycholinguist may ask whether speakers

store it in the mental lexicon anyway, for processing efficiency. Indeed, Myers *et al.* (2006) reported just such redundant storage, based on their finding that the lexical frequency (i.e. commonness) of the inflected (or cliticized) form, not just of the stem, affected the speed of lexical decisions. Since frequency is an arbitrary property, the inflected form must be stored in memory, though perhaps only in terms of the probability that the stem is inflected.

Although Chinese morphology has virtually no affixation, similar questions can be asked about the access and storage of compounds, which form the majority of modern Chinese words (see "Chinese Compounds" and "Processing of Chinese compounds"). The primary issue here concerns decomposition: how and when is a morphologically complex word broken down into its component morphemes during word recognition? Robust findings on this question in Chinese include the discovery that both morpheme (character) frequency and whole-word frequency affect lexical decision times, supporting a model of the lexicon with both levels of representation (e.g. Cai and Brysbaert 2010). Lexical decisions are also affected by a word's morphological neighbors (i.e. other words that share the target item's first or second morpheme), reminding us that lexical access involves distinguishing a target from otherwise similar competitors (e.g. Tsai *et al.* 2006). There are also some preliminary but intriguing results on the effects of compound-internal structure, hinting at the role of grammar (i.e. morphological operations) in processing (e.g. Ji and Gagné 2007). Primed lexical decision tasks have also found evidence for morpheme activation not only with written compounds (e.g. Zhou *et al.* 1999) but with spoken compounds as well (e.g. Zhou and Marslen-Wilson 1995). However, decomposition is limited for compounds that are semantically opaque (e.g. 草率 *cǎoshuài* 'careless', literally 'grass-command'), where the meanings of the constituent morphemes actively compete with the whole-word semantics (e.g. Liu and Peng 1997).

Sentence comprehension

Unlike research on this topic in the West, early studies on Chinese sentence comprehension were not motivated by contemporary syntactic theory. For example, Li *et al.* (1993) presented readers with character strings containing three randomly ordered content words (two nouns and a verb) with or without the role markers 被 *bèi* and 把 *bǎ*, and asked them to identify the agent (regardless of how unnatural the sentence was). While a wide variety of factors were found to influence their decisions, it is not obvious how the findings help choose among competing models of sentence processing.

It was not until after the turn of the millennium that syntactically sophisticated studies began to be conducted on Chinese. By far the most influential such study is Hsiao and Gibson (2003), which continues to set the research agenda today. Motivation came from broad theoretical considerations. For decades psycholinguists had been interested in how arguments are linked with the syntactic positions they seem to be displaced from, as in relative clause constructions, where the head nominal is linked with a gap in the modifying clause. A robust finding from English (reviewed in Waters *et al.* 1987) is that relative clauses with gaps in subject position (e.g. *This is the man who _ met John*) are read more quickly than those with object gaps (e.g. *This is the man who John met _*). This result, however, is theoretically ambiguous: subject gaps may be special for linguistic reasons (e.g. subjects are higher in the syntactic tree) or for general processing reasons (e.g. the subject gap is closer to the head than the object gap, putting less of a burden on memory). Fortunately, Chinese relative clauses are right-headed, meaning that subject gaps are further from the head (e.g. 這是 _ 遇見了張三的那個男人 *Zhè shì _ yùjiànle Zhāng Sān de nàge nánrén* 'This is the man who _ met Zhang San') than object gaps (e.g. 這是張三遇見了 _ 的那個男人 *Zhè shì Zhāng Sān yùjiànle _ de nàge nánrén* 'This is the man who Zhang San met _').

Exploiting this difference, Hsiao and Gibson (2003) had Chinese readers perform a self-paced reading task, where sentences are displayed a fragment (e.g. a word) at a time; the pace is set by the participant's button presses, allowing the experimenter to measure how much processing time is needed for each fragment. The results showed that Chinese readers spent more time reading relative clauses with subject gaps than with object gaps, thus seeming to support a memory-based processing approach. However, while some studies have replicated this finding (e.g. Lin and Garnsey 2011), others show a processing advantage for subject gaps in Chinese just as in English, thus seeming to support a linguistic approach (e.g. Lin and Bever 2011).

Unfortunately, resolving this discrepancy depends on factors of otherwise lesser theoretical importance. Chief among these is the ambiguity created by right-headed relative clauses, where the clause may at first be misparsed as a main clause, thus slowing reading. The likelihood of such misparsing in turn depends on whether the construction as a whole appears as main clause subject or object, whether the determiner (or number) appears before or after the relative clause, and whether the classifier agrees with the relative clause head or with one of the relative clause internal arguments (see "Comprehension of Chinese relative clauses" and "The Neuroimaging of Relative Clause Comprehension" for reviews of such issues).

Chinese linguists and psycholinguists have also begun to collaborate on studies that apply psycholinguistic methods to theoretical syntactic questions. Notable examples include Francis and Matthews (2006) and Xiang et al. (2014) (see also "Psychological reality of linguistic structure").

FUTURE PROSPECTS

More Chinese psycholinguistics, of better quality, is being done today than ever before, but certain trends should perhaps be encouraged more than others. Most obviously, psycholinguists should be encouraged to look beyond reading: Chinese language processing raises a breathtaking range of exciting research questions, as even a quick skim through the theoretical linguistic literature will show. Even as fundamental an issue as spoken language processing has hardly been explored at all beyond the perception of tone, and sentence processing, a core part of psycholinguistics in the West, is still in its infancy when it comes to Chinese.

Most fundamentally, more consideration should be given to the development of psycholinguistics as a branch of natural philosophy (i.e. as a theory-driven science), rather than as a relatively disconnected set of natural history reports about this or that linguistic quirk. To do so, psycholinguists will have go beyond the piecemeal comparisons of one language with another (e.g. Chinese vs. English), and instead build a quantitatively sophisticated typological psycholinguistics (see e.g. Jaeger and Norcliffe 2009, Myers 2012). Moreover, there is no principled reason why Chinese psycholinguists can't drive theoretical discussions, instead of merely reacting to them, as has been the case from the beginning until today. This may require them to take a new look at the less "exotic" aspects of Chinese, and also to go beyond merely replicating findings first shown in other languages (though replication is also crucial to science). After all, if there are still fundamental open questions about the processing of human language, why can't they be addressed first with data from Chinese?

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Summary

In its primary sense, psycholinguistics is an interdisciplinary field in which linguists and psychologists use behavioral evidence to study how language is processed in the mind of mature speakers when they produce or comprehend language. This lemma gives an overview of psycholinguistics in its primary sense, reviewing its scope and history and describing some representative studies on Chinese.

Index terms

psycholinguistics

reading

spoken language

language comprehension

language production

lexical access

sentence processing