41 The competition model

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Introduction

One outgrowth of psycholinguists' increasing attention to languages with various structural features is the Competition Model (CM) of MacWhinney and Bates (1989). Invoking emergentist concepts from functional linguistics and cognitive psychology, this model seeks to integrate the traditions of L1 acquisition, L2 acquisition, and adult processing research without relying on hardwiring of principles from Universal Grammar.

This chapter will outline the model, and then review some of the major findings of research it has inspired, with a focus on sentence comprehension in Japanese and Korean.

Outline of the competition model

Cue coalition and competition

Although the Competition Model addresses issues in both production and comprehension, the majority of studies have focused on comprehension, because it is easier to control experimentally. Many of those studies have examined comprehension of simple sentences with two noun phrases and one transitive verb phrase. Others have looked at comprehension of datives (McDonald, 1987), causatives (Sasaki, 1998), relative clauses (MacWhinney & Pleh, 1988), and pronouns (McDonald & MacWhinney, 1995), as well as sentence production (Bates & Devescovi, 1989).

In standard CM experiments, participants listen to sentences and then judge which of the two nouns was the actor. Young children do this by selecting between toys, or enacting the scene with them (enactment task). Older children and adults may press a button or name the noun. Consider this Japanese sentence:

(1) Gorira-ga kakine-o kizutsukeru.
gorilla-SUBJ fence-OBJ damage

Table 41.1 *Combining English WO and animacy cues*

		Animacy cue bias		
		None	1st noun	2nd noun
Word order cue	VNN	V A A / V I I	V A I	V I A
	NVN	A V A / I V I	A V I	I V A
	NNV	A A V / I I V	A I V	I A V

V: verb; A: animate noun; I: inanimate noun

Here, the noun animacy (lexical semantics) of *gorira* and the presence of the subject-marking particle *ga* are both cues that favor the choice of *gorira* as agent. Word order (Japanese SOV schema) also supports the identification of *gorira* as agent and subject. Thus, in this sentence, the animacy cue, the case-marking cue, and the word-order (WO) cue form a coalition that supports *gorira* as the subject.

(2) Kakine-o gorira-ga kizutsukeru. (WO vs. case + animacy)
Fence-OBJ gorilla-SUBJ damage

In sentence (2), animacy and case marking suggest that *gorira* is the subject. However, the sentence-initial position typical of a subject is occupied by *kakine*. When different cues compete in this way, the interpretation that has the strongest cue support will win the competition for the particular role (Bates & MacWhinney, 1989).

By systematically varying the levels of the various cues in an orthogonalized ANOVA design, we can measure the strength of each cue in competition with the others. Table 41.1 illustrates a 3×3 ANOVA design, where the three levels of WO are systematically crossed with the three levels of animacy.

When we vary cues orthogonally in this way, we usually end up including at least some ungrammatical sentences. In this case, all of the VNN and NNV sentences deviate from the standard English prescriptive grammar, whereas NNV is a possible fragment (i.e. noun + relative clause). Japanese and Korean use NNV as the canonical order. NVN and VNN are also possible orders, although they may sound awkward without context.

Gibson (1992) worries that the inclusion of ungrammatical sentences may compromise the validity of CM experiments. However, in an experiment designed to test for just this effect, MacWhinney, Pleh, and Bates (1985: 199) found that Hungarians indicated similar response patterns to both grammatical and ungrammatical strings. This finding supports the conclusion that the processing of both grammatical and ungrammatical sentences proceeds by reference to the same cues and processing patterns.

Origin of cue strength difference between languages

When Japanese native speakers (NSs) encounter a Japanese sentence without case particles, they will rely on animacy rather than WO (Kilborn & Ito, 1989). English NSs will give priority to the WO cue in response to similar English sentences (Bates & MacWhinney, 1989). More generally, languages vary markedly in the order in which they prioritize the various cues to sentence interpretation. From the very beginning of language learning, children become sensitive to these language-specific cue orderings (Bates & MacWhinney, 1989).

Development mechanism of cue strength

McDonald (1989) proposes a simple learning mechanism underlying cue strength development: when a listener recognizes that her/his interpretation of a certain sentence is wrong, the strengths of cues supporting the alternative interpretation will increase. When a listener's interpretation is correct, cue strengths will remain the same.

In this framework, three factors determine cue strength development: "cue availability," "cue reliability," and "cue validity." "Cue availability" denotes how frequently a certain cue appears in input. "Cue reliability" indicates how often a certain cue in presence supports the correct interpretation. "Cue validity" is computed by multiplying availability by reliability.

The model holds that children's cue acquisition order will be predicted by cue validity. However, in adults, cue strength, as measured in a CM experiment, will be predicted by cue reliability. This shift occurs because children initially focus on most available cues. Later, learners come to rely on those cues that lead to the correct choice, even if they are relatively less frequent and less available. By adulthood, we have learned to make maximally effective use of even the rarest cues.

Applications to second language acquisition research

The first CM studies focused on L1 acquisition (Bates et al., 1982). However, early on Bates and MacWhinney (1981) conducted a pilot study applying the CM to SLA. They presented English sentences that varied WO, animacy, and agreement to three of their academic colleagues from Germany and Italy. Those L2 learners, even after many years in the US, used their L1-like strategy when processing English.

Since then, this theoretical framework has inspired many studies, in both L1 and L2, with various combinations of languages and cue types. The 1990s saw active applications to East Asian languages such as Japanese, Korean (Ito, Tahara & Park, 1993) and Chinese (Liu, Bates & Li, 1992).

Table 41.2 *Competition model studies of L1 Japanese and Korean*

Chapter in Ito, Tahara & Park (1993)	Participants / L1 = stimulus language	Sentence type / Mode of response	Manipulated cues	Cue strengths in NNV strings in adults
Ch. 4	children–adults/ Japanese	simple transitive/ Enactment	• NNV • subject marker (*ga*); topic marker (*wa*) • animacy	*ga* > *wa* > animacy > WO
Ch. 5	children–adults/ Japanese	simple transitive/ Enactment	• NNV; NVN; VNN • WO • object marker (*o*) • animacy	*o* > animacy, WO
Ch. 6	children–adults/ Korean	simple transitive/ Enactment	• NNV • subject marker (*i*/*ga*); topic marker (*neun*) • animacy	*i*/*ga* > *neun* > WO *, animacy* WO is dominant until about 10 years old.
Ch. 7	children–adults/ Korean	simple transitive/ Enactment	• NNV; NVN; VNN • object marker (*eul*/*reul*) • animacy	*eul*/*reul* > animacy,WO

Competition model studies on Japanese and Korean

Ito and his colleagues (Ito, Tahara & Park, 1993; Kilborn & Ito, 1989) found that adult NSs of Japanese and Korean are predominantly dependent on case markers, although Korean children younger than 10 are more dependent on WO than their Japanese counterparts (See table 41.2).

In addition, Sasaki (1991; 1994; 1997; 1998), Miyauchi (1998), Koda (1993), and Rounds and Kanagy (1998) also conducted studies of JSL sentence comprehension strategies (See table 41.3). In all of these studies subjects were English-native students (Sasaki; Miyauchi; Koda) or K-7 immersion school children learning Japanese (Rounds & Kanagy), although Koda also included Chinese and Korean NSs. Some studies presented all three WOs (NVN, VNN, NNV), and others looked at a specific WO only.

Major findings

Findings on L1, or both L1 and L2

Finding 1: for adult NSs, the strongest cues are the most reliable
Both Ito, Tahara, and Park (1993) and Sasaki (1994) report that the order of cue

Table 41.3 *Competition model studies of Japanese as L2*

Study	Participants/ L1	Sentence type/Mode of response	Manipulated cues	Influential cues
Kilborn & Ito (1989), Ito, Tahara & Park (1993) Ch. 3	students / English	simple transitive / enactment	WO (NNV, NVN, VNN); case; animacy	SOV > case > animacy
Sasaki (1991)	students / English	simple transitive / oral	WO (NNV, NVN, VNN); animacy	animacy
Sasaki (1994, 1997)	students / English	simple transitive / oral	WO (NNV, NVN, VNN); case; animacy	animacy > case > SOV
Sasaki (1998)	students / English	double object transitive & causative / CRT picture choice	NNNV, case	case; WO
Miyauchi (1998)	students / English	simple transitive / CRT picture choice	WO (NNV, NVN, VNN); case; animacy	case > animacy > SOV
Koda (1993)	students / English; Chinese; Korean	simple transitive / (not reported)	NNV; case; animacy	SOV (English & Chinese L1)case (Korean L1)
Rounds & Kanagy (1998)	Children / English	simpla transitive/booklet picture choice	NNV; case; animacy	SOV > animacy > case

strengths for adult Japanese NSs was: case > animacy > WO. This hierarchy parallels their reliability order in Japanese.

Moreover, Ito, Tahara, and Park (1993) conclude from the data in the first two studies in table 41.2 that adult Japanese NSs' reliance on postpositions in an enactment task is: *o* > *ga* > *wa*. This superiority of *o* over *ga* and *wa*, again, is consistent with the cue reliability hierarchy, since the reliabilities of *ga* and *wa* are diminished because of their multiple functions.

Sasaki (1997) reports that *ga* was stronger than *o*. This discrepancy may stem from Sasaki's task. He asked participants to report the subject orally. In a task of this type, choosing a noun marked by *ga* is cognitively less demanding than choosing one *not* marked by *o*.

Finding 2: stimulus blocking can elevate cue use Sasaki (1994, 1997) gave Japanese NNV strings to English and Japanese NSs under two consecutive conditions: (1) NNV strings only → (2) NVN strings were presented in mixture with NNV and VNN strings randomly. Generally, their reliance on WO cues

relative to case markers was higher under the NNV-only condition where it was easier to use the constant WO cue. This cue-blocking effect was even more evident in his English sentence data.

Finding 3: assignability problems can decrease cue use Sasaki (1998) gave isolated sentences like (3) to Japanese NSs:

(3) Panda-ni gorira-ga tegami-o kakaseru.
Panda IOBJ gorilla-SUBJ letter-DOBJ write-CAUSATIVE
"A gorilla makes a panda write a letter."
IOBJ: indirect object; DOBJ: direct object

They tended to choose the first noun as the lexical verb's agent in noncanonical active sentences (N-*ni* N-*ga* N-*o* V) irrespective of case markers, resulting in frequent misinterpretations. This contrasts with earlier studies (e.g. Ito, Tahara & Park, 1993), where native Japanese consistently relied on case markers.

Sasaki explains this in terms of "cue assignability" (Bates & MacWhinney, 1989): Japanese *ni* can mark a noun for either indirect object (active) or agent (causative). In his experiment involving sentences of these two voices, listeners had to retain all information until the verb's voice is determined. This unusually heavy cognitive load might have overloaded their working memory capacity, blocking the normal use of case markers.

Findings specifically on L2

Finding 4: L2 learners rely at first on animacy Gass (1987) advocates the "universal prepotency" of semantics, on the ground that both her native Italian learners of English and native English learners of Italian employed Italian-like animacy strategies, instead of relying on WO. Sasaki (1991) reports similar results from his Japanese/English bidirectional study, indicating that learners tend to rely on animacy in early stages.

However, animacy's influence remained low in McDonald's (1987) Dutch/English learners, Kilborn and Cooreman's (1987) native English learners of Dutch, and Wulfeck et al.'s (1986) Hispanic ESL learners. Furthermore, Miao (1981) and Liu, Bates, and Li (1992) report that English NSs transferred their SVO dependency in processing Chinese.

These results indicate that semantic transfer is particularly important when transfer of other cues is blocked (Sasaki, 1994; Shirai, 1992), as in English NVN (SVO) vs. Japanese NNV (SOV). As MacWhinney (1987: 324) argued, "In areas where L1 and L2 show little formal correspondence, there will be only the basic positive transfer of functions." For example, the role of the recipient or benefactive is identical in English and German. As a result there is a smooth basic transfer of the conceptual function. However, English marks

these roles through prepositions and the double object construction. German, on the other hand, relies more on a specific form of the double object construction in which dative case marking on determiners and modifiers marks recipients or beneficiaries. Thus, although there is a basic conceptual transfer from English to German, the transfer of formal devices is incomplete. On the other hand, when the L1 and L2 cue mappings are similar (e.g. canonical NVN (SVO) orders in English, Chinese, Dutch, and Spanish; pronoun declensions in English and Dutch), those cues can be "a candidate for positive transfer" (MacWhinney, 1987: 324).

Finding 5: transfer of word order strategies in thematic role assignment is relatively weak Bates and MacWhinney's (1981) German NSs preferred an SOV interpretation of English NNV strings in accord with SOV order in German relative clauses. Gass's (1987) American learners of Italian tended to consider VNN strings as VOS, possibly due to transfer of their L1 "second-noun strategy" (i.e. choosing the second noun in NNV and VNN strings as agent), namely, English speakers' inclination to interpret English NNV and VNN sentences as OSV and VOS respectively (Bates & MacWhinney, 1981). These results might suggest transfer of specific surface WO schema from L1, particularly for noncanonical orders.

Indeed, Ito (Kilborn & Ito, 1989; Ito, Tahara & Park, 1993) reports that both their highly advanced and less proficient JFL (Japanese as a foreign language) learners slightly preferred the VOS interpretation of Japanese VNN strings without case markers (although statistically insignificant). On the other hand, Sasaki's (1991, 1994) native English JFL learners tended to interpret VNN strings as VSO, and NNV as SOV. This discrepancy could again be due to the task difference: Sasaki's participants, who responded orally, might have found it easiest to repeat the first noun.

In any case, the transfer of surface WO schema for noncanonical orders from English to Japanese appears to be weak at the best.

Finding 6: learners rigidify Japanese SOV order Kilborn and Ito (1989) report that English-speaking JFL learners relied more on the SOV order schema than do native Japanese. This reliance on SOV cannot be due to a transfer of a particular surface WO, because English speakers interpret English NNV strings as OSV. To explain this, they invoke the notion of "meta-transfer," namely, transfer of sensitivity to a *type* of cue (e.g. WO in general).

Sasaki's (1994) intermediate JFL learners also relied on the SOV schema to a greater extent than native Japanese. However, his elementary-level JFL learners relied less on the SOV schema than native Japanese, whereas those beginners ought to be most susceptible to English-origin WO sensitivity transfer. In this connection, Rounds and Kanagy (1998) report that American children in a

Japanese immersion school developed their dependency on the SOV schema, in proportion to the length of their exposure to Japanese.

Moreover, Koda (1993) found that Chinese as well as English speakers, unlike Korean speakers, relied on WO in interpreting Japanese. This dependency cannot be solely due to meta-transfer from L1, since Chinese is less dependent on WO than English (Miao, 1981).

These results support the idea that JFL learners are applying focused learning to the acquisition of the Japanese WO cue. Learners often try to pick up one highly available and accordingly predictive cue or pattern at a time and develop its strength rapidly, relative to its actual reliability (Matessa & Anderson, 2000). In the case of JFL learners, a focus on SOV as a predictor of sentence interpretation is a useful (although not optimal) initial strategy, whereas eventually reliance on SOV must be more fully integrated with reliance on case and other cues. It is also possible that the reliance on SOV in Japanese learners may be induced, in part, by heavy use of this order by teachers and textbooks.

Finding 7: JFL learners do not mix processing systems Wulfeck et al. (1986) report convergence of L1-L2 processing strategies in Californian Spanish–English bilinguals. This convergence could be due to the frequent code-switching in the Spanish–English bilingual speech environment. However, Sasaki's (1994) JFL learners and Liu, Bates, and Li's (1992) CFL (Chinese as a foreign language) learners, both from classroom backgrounds, used distinct strategies for L1 and L2.

Concluding remarks

The CM perspective on SLA sheds light on human language through incessant conflicts between multiple linguistic systems within an individual. Meanwhile, the rich case-marking devices of Japanese and Korean enable systematic tests of the model. As new research continues to expand the model's scope, it can give us an increasingly clear vision of the shape of both L1 and L2 acquisition.