Implicit learning of probabilistic distributions of structural events: Evidence from syntactic priming

Language users employ structural probabilities when processing utterances (see Pickering & van Gompel, 2006 for an overview). For example, the probability of a specific argument frame given a verb (henceforth VERB BIAS) affects comprehension and production. So language users’ knowledge about verbs includes information about their biases (see also Stallings et al., 1998). This raises the question whether VERB BIASES are acquired once (e.g. during a critical period) or whether speakers keep learning VERB BIASES. We argue that a phenomenon known as syntactic priming yields evidence for the latter.

Syntactic priming (e.g. Bock, 1986) refers to the tendency of speakers to repeat abstract syntactic patterns. Consider the ditransitive alternation:

(1a) We could give [physicals] [to the rest of the family members].
(1b) We could give [the rest of the family members] [physicals].

Speakers are more likely to choose the NPNP construction if they has been an NPNP construction in the preceding discourse (and, mutatis mutandis, for NPPP). Such syntactic priming has been attributed to implicit learning (Bock & Griffin, 2000; Bock et al., 2006; Ferreira, in progress). Implicit learning predicts that less frequent (and hence more surprising) events lead to more activation (and hence more learning). So, if speakers keep track of VERB BIAS, and if priming effects are in part due to this implicit learning, priming strength (i.e. the increase in likelihood that a prime and target have identical structures) should be inversely correlated with VERB BIAS.

Study 1 is a meta-analysis of five ditransitive priming experiments (Bock and Griffin, 2000 and Bock et al., 2006). After exclusion of incomplete trials, the data consist of 8,212 prime-target trials. We find that the prime’s VERB BIAS is inversely correlated with its priming strength. This effect is highly significant (p < .001) even after accounting for all factors from Bock & Griffin’s (2000, 2006), as well as additional controls.

Study 2 replicates the effect for spontaneous speech. We use a database of 2,300 ditransitives extracted by Bresnan et al (2004; also Recchia et al., 2006) from the full Switchboard corpus (LDC, 1993). We find the predicted inverse effect of the prime’s VERB BIAS to be highly significant (p < .001), even after controlling for other factors influencing the choice between NPPP and NPNP (Bresnan et al., 2004).

We conclude that priming strength is inversely related to the surprisal associated with the prime’s structure (given the prime’s VERB BIAS). Only implicit learning accounts of syntactic priming (Bock & Griffin, 2000) predict this relation. Our results also argue that speakers continuously ‘keep track’ of probabilistic distributions even of such fine-grained events as the conditional probability of a syntactic construction given the verb (VERB BIAS).