Syntactic representations encode grammatical functions: evidence from structural priming in Cantonese

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The current study tests whether the mapping between grammatical functions (e.g., subject, direct object) and thematic roles (e.g., agent, patient) persists across utterances. The goal is to investigate whether grammatical functions are encoded in sentence representations during real-time language processing. Current literature only provides limited evidence for the priming of mapping between grammatical functions and thematic roles. This lack of evidence is mainly attributed to the challenge of finding an appropriate prime–target set that allows us to control for major confounding sources of structural priming, such as phrasal constituent structure (e.g., [NP [$_{VP}$ V NP]]), information structure (e.g., emphasis on the patient), and linear thematic role order (e.g., patient–agent order), particularly in within-language structural priming contexts.

The present study introduces a new priming–target set in Cantonese: the standard active and passive constructions and their variants, namely, the Topic-OSV active and Topic-Passive constructions (see [1] and the discussion of these constructions on page 3). As summarised in Table 1, Topic-OSV and standard active sentences share the same agent–subject and patient–direct object mapping, but they differ in terms of all other potential structural priming sources. In contrast, Topic-OSV and passive sentences only share information structures and thematic role orders. Thus, Cantonese Topic-OSV sentences can potentially prime both standard active and passive sentences, but via different levels of linguistic representations.

Given these possible outcomes, this study provides evidence of grammatical function–thematic role mapping priming in the following three cases. The first one, which provides the clearest evidence, is that Topic-OSV actives prime standard actives. Recall that these two constructions are similar only regarding the mapping between grammatical functions and thematic roles. The second case is that Topic-OSV actives prime standard passives (due to the shared information structure and thematic role order) and that Topic-Passives also prime standard passives, the latter more strongly. Since Topic-Passives and standard passives share not only information structure and thematic role order, but also grammatical function–thematic role mapping, it is reasonable to attribute the extra passive priming effect from Topic-Passives to their shared grammatical function–thematic role mapping. The last case is that Topic-OSV actives show no priming effect on standard passives, but Topic-Passives strongly prime them. This result can be interpreted as the grammatical function–thematic role mapping priming and information structure/thematic role priming of Topic-OSV actives cancelling each other out, providing indirect evidence of the mapping priming.

In each trial of this experiment, thirty native speakers of Cantonese first memorized and repeated an auditory prime sentence in one of three different syntactic constructions, namely, (i) Topic-OSV, (ii) Topic-Passive, and (iii) conjoined NP (e.g., '*the policeman and the thief*'), and then described a target picture in one sentence using a given transitive verb. The conjoined NP primes were included to measure the baseline rate of standard active/passive production. The prime and target in each set were lexically and semantically unrelated, and animacy was consistently controlled for throughout all sets. Each participant was tested on 24 critical and 48 filler items.

The results show that Topic-OSV actives prime standard actives rather than standard passives, suggesting that the mapping between grammatical functions and thematic roles can be the most influential locus of structural priming in some contexts. As Figure 1 shows, the use of the standard active construction increased by 11% after repeating auditory Topic-OSV primes compared to after baseline noun phrases. A logit mixed-effects model confirmed that the log-odds of producing an active response is significantly higher in the Topic-OSV prime condition than in the baseline prime condition ($\beta = .58, z = 2.78, p = .005$). Based on these findings, we argue that grammatical functions are encoded in our mental representation of sentences.

(1) Active and passive constructions in Cantonese[1]:

(a) Standard active construction:
Go3 caai1jan4 zuk1-zo2 go3 siu2tau1 laa3.
CL policeman catch-PERF CL thief SFP
'The policeman has caught the thief.'

(b) Standard passive construction:
Go3 siu2tau1 bei2 go3 caai1jan4 zuk1-zo2 laa3.
CL thief by CL policeman catch-PERF SFP
'The thief has been caught by the police.'

(c) Topic-OSV (active) construction:
Go3 siu2tau1 **ne1** go3 caai1jan4 zuk1-zo2 laa3.
CL thief TOP CL policeman catch-PERF SFP
'The thief, the policeman has caught.'

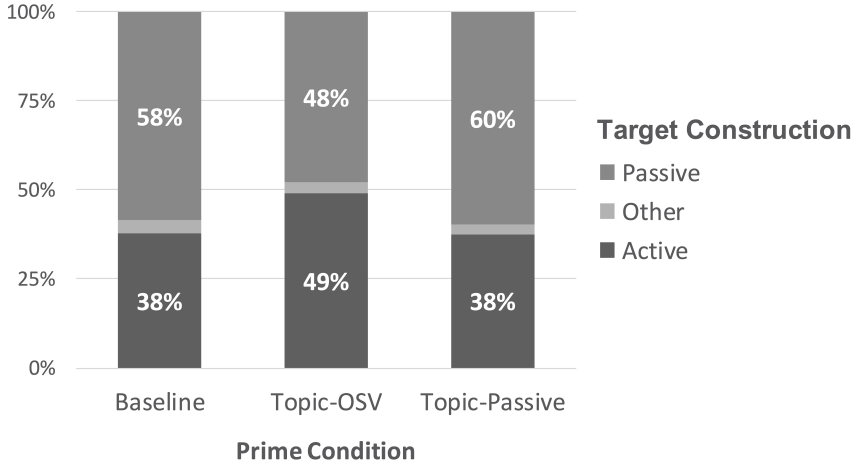
(d) Topic-Passive construction:
Go3 siu2tau1 **ne1** bei2 go3 caai1jan4 zuk1-zo2 laa3.
CL thief TOP by CL policeman catch-PERF SFP
'The thief, he has been caught by the police.'

Table 1. *Analysis of prime and target constructions*.

	Syntactic construction	Mapping b/w GFs and TRs	Constituent structure	Information structure	Thematic Role order
Prime	Topic-OSV	S–A & DO–P	NP-NP-V	patient topic	patient-agent
	Topic-Passive	S–P & O–A	NP-PP-V	patient topic	patient-agent
Target	Standard active	S–A & DO–P	NP-V-NP	agent topic	agent-patient
	Standard passive	S–P & O–A	NP-PP-V	patient topic	patient-agent

Note. GF: grammatical function; TR: thematic role; S: subject; DO: direct object; O: oblique; A: agent; P: patient

Figure 1. *Percentages of active, passive, other responses in each prime condition*.



[1] CL: noun classifier; PERF: perfective aspect; SFP: sentence final particle; TOP: sentence topic; numbers: lexical tones.

Further information about the Cantonese active and passive constructions

As (1a) shows, standard actives in Cantonese are in the subject–verb–object (SVO) word order. Like actives in other languages, they typically employ subject–agent and direct object–patient mapping, and the subject (thereby the agent) is in general seen as the topic of the sentence. As in (1b), Cantonese passives are marked by a *bei2* phrase (*bei2* + agent NP); the patient is mapped onto the subject, becoming the sentence topic, and the agent onto the oblique, as in other languages.

Example (1c) demonstrates that the direct object in standard active sentences can be fronted, resulting in the object–subject–verb (OSV) word order. Such a fronted direct object (i.e., patient) can be marked as a topic more explicitly with a topic particle *ne1*, as in (1c). In this paper, this OSV active construction with the particle *ne1* is referred to as the Topic-OSV construction. As shown in (1d), the topic particle *ne1* can also be added directly following the subject (i.e., patient) NP in standard passive sentences to more explicitly mark it as a topic. This passive construction with the particle *ne1* is referred to as the Topic-Passive construction in this paper.