The Grammatical Class of Verbs that Function as the Heads of 'N+V' Noun Phrases in Mandarin: Behavioral and ERP Evidence

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Nouns and verbs are fundamental word classes in languages. In English and other Indo-European languages, verbs are usually changed to derived word form when they are used as nouns (i.e., to promote, promotion). However, such morphological change for verb nominalization is not required in Mandarin. It is thus still unclear whether verbs that function as the heads of 'N+V' noun phrases (i.e., '推广' [to **promote**] in '项目推广' [project **promotion**]) are converted into nouns or are still verbs. This study aims to figure out this question by using behavior and ERP approaches. We hypothesized that, even without overt morphological change, verbs functioning as the heads of 'N+V' phrases are nominalized.

We selected 46 nouns and 46 verbs that can function as the heads of 'N+X' noun phrases in Mandarin. The nouns and verbs selected do not differ in word frequency, No. of stroke and concreteness ($ps > 0.05$) but significantly differ in the ratings of word class ($p < 0.05$). In Experiment 1, the stimuli were presented in isolation and participants were instructed to judge whether the words presented are nouns or not. The results showed that nouns were processed faster and more accurately than verbs ($ps < 0.05$), indicating the nouns and verbs are processed differently without context.

In Experiment 2, the target nouns and verbs were embedded in the 'N' contexts, which form 'N+X' noun phrases. In the phrases, the nouns and verbs function as the heads and 'N' function as the modifiers. Based on the results of a large corpus of Mandarin and subjective ratings by Mandarin speakers, the 'N' in 'N+X' phrases were further divided into two types, 'N' that precedes nouns most than other word classes ($ps < 0.05$) and 'N' that precedes verbs most than other word classes ($ps < 0.05$). Twenty-three 'N' contexts favoring nouns and verbs respectively were chosen. The cloze probability of 'N' contexts and targets was controlled for ($ps > 0.05$). Participants were instructed to judge whether the contexts and upcoming words are acceptable. The brain responses to the stimuli were collected from 128 sites placed on the scalp. The behavior and ERP results showed that, when primed by the 'N' contexts favoring nouns, the target nouns and verbs did not show any difference; while when primed by the 'N' contexts favoring verbs, the nouns were responded longer and elicited increased N400 than verbs. The sLORETA analysis showed that this N400 effect locates at left middle temporal gyrus, indicating nouns requires more effort than verbs in the semantic access.

This study is the first to investigate the grammatical class of verbs functioning as the heads of 'N+V' noun phrases, providing behavior and ERP evidences that verbs in Mandarin are nominalized in the phrases even without apparent morphological change. The degree of the nominalization of verbs relates to grammatical class anticipation of 'N' contexts, which calls attention the importance of 'N' contexts in the study of verb nominalization in Mandarin.