

## Iconicity, frequency, or efficiency?

### A related-event approach to causality in Japanese complex predicates

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Whether iconicity or frequency drives coding asymmetries, such as the formal difference between the singular *apple* and plural *apples*, is a topic of ongoing debate (Croft 2008; Devylder 2018; Haiman 2008; Haspelmath 2008a, 2008b, 2021). This corpus study investigates the underlying cause of coding asymmetries by analyzing two forms of Japanese complex predicates: V-V compound verbs (e.g., *toke-otiru* (melt-fall) ‘melt and fall’; *osi-akeru* (push-open) ‘push open’) and V-*te* V complex predicates (e.g., *kaet-te neru* (return-TE sleep) ‘go back to sleep’; *yai-te taberu* (grill-TE eat) ‘grill something and eat it’). Specifically, this study focused on the concept of “causality” and explored how conceptually different complex predicates (two events that are causally related and two events that are not) differ in their token frequency.

To identify the causal relationship of V-V and V-*te* V, this study proposed an original “related-event approach,” which focuses on understanding the nature of verbs by examining their “related events” (see Chen 2013; Chen & Matsumoto 2018), such as causes and purposes. Expressions such as complex sentences were used to examine the causal relationship between the two verbs that constitute a compound predicate (Table 1). Causality here includes direct (cause-result and means-purpose) and shared causality (common cause and common purpose). The causal relationships were identified using the Japanese Web 2011 corpus with the Sketch Engine. The token frequency of each complex predicate was determined using the Balanced Corpus of Contemporary Written Japanese (BCCWJ) with the Chunagon web interface program to guarantee the precision of frequency-based studies. The complex predicates under scrutiny were randomly selected from 3,757 V-V in a web-based database (<http://csd.ninjal.ac.jp/comp/index.php>) and 6,580 V-*te* V collected from BCCWJ, each with 100 instances.

The results show that 1) the formally simpler/shorter V-V is significantly more causal than V-*te* V; 2) V-V is significantly more frequent than V-*te* V; 3) complex predicates that are causally related are significantly more frequent than those that are not. This study further employed a Python library for causal reasoning (CausalNex) to generate a directed acyclic graph (DAG; see Zheng et al. 2018) of three variables (causality, formal complexity, and frequency) for investigating the direction of motivation (Figure 1).

The findings contradict Haspelmath’s frequency theory, as frequency is not found to be the cause of coding asymmetry. Regarding iconicity, the correlation between form and concept is spurious due to the confounding factor of “efficiency.” According to Levshina (2022), language users spend less effort and time on highly accessible information. Research has shown that information with a causal relationship is more likely to be remembered than without one (Myers et al. 1987). From a communicative efficiency perspective, this suggests that events in a causal relationship are more easily accessible, resulting in their expression in shorter, less costly forms (Figure 2).

In conclusion, by considering motivational directionality, this study suggests that the motivation for coding asymmetry is efficiency. The frequency of usage is a result rather than a driving force, and iconicity can be caused by efficiency (although there are iconic linguistic phenomena that cannot be explained by efficiency; see Chen 2020, in press). The related-event approach presented in this study provides a novel method of examining the characteristics of verbs and their relationships, thereby creating a new area of linguistic analysis centered on “high-resolution event relationships.”

Keywords	Examples
V to V	<i>kogoeru to sinu</i> (freeze then die) ‘die from freezing’
N ni V	<i>itami ni nai-ta</i> (pain DAT cry-PST) ‘cried from pain’
N de V	<i>syokku de nai-ta</i> (shock in cry-PST) ‘cried in shock’
V tame ni V	<i>sagasu tame ni mawaru</i> (search PURP go.around) ‘go around to search’

Table 1: Keywords for searching causes and purposes (*V* is the verb to be investigated).

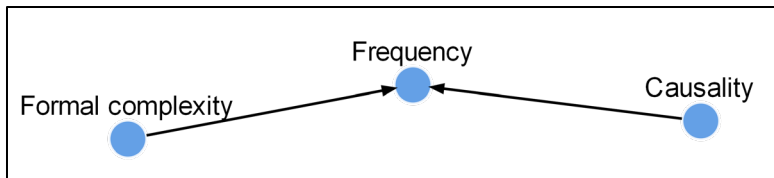


Fig. 1: DAG of formal complexity, causality, and frequency (arrows represent direct causal effect).

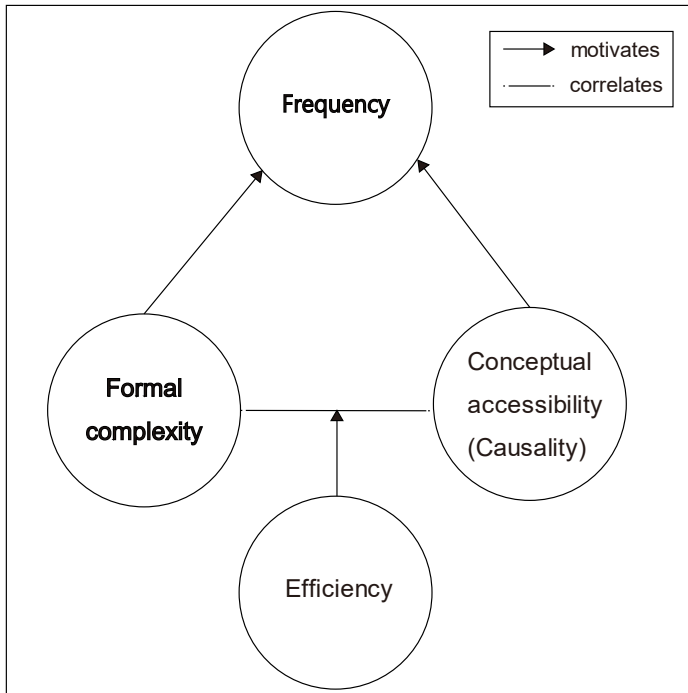


Fig. 2: The relationship between formal complexity, conceptual accessibility, and frequency.

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