Semantic Roles, Animacy Effect, and Working Memory Interaction in Real Time Sentence Processing in Turkish

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In this study, we aim to examine the interaction among the animacy effect, semantic roles, and working memory in the process of sentence comprehension in Turkish, as reflected in eye-tracking data collected during silent reading. The animacy effect is defined as a factor that reduces cognitive load in information processing and plays a key role in the fundamental operations of the mind (Caramazza & Shelton, 1998; Müller et al., 2011). Meanwhile, semantic roles carry out role assignment in parallel with structural composition during in-process comprehension (Dowty, 1991; Jackendoff, 1993). In the neurolinguistic literature, the relationship between animacy—which is central to basic cognitive functioning—and semantic roles—which constitute the building blocks of a language's surface-level meaning—has been shown to interact within the framework of the Extended Argument Dependency Model (eADM; Bornkessel & Schlesewsky, 2006). The primary motivation of our research is to obtain broader, typologically oriented findings based on this eADM model. Bornkessel and Schlesewsky (2006) emphasized that the mental processes underlying sentence parsing could vary across speakers of different native languages.

For instance, in Turkish, the presence of linguistic elements that may intervene between the subject and the verb leads Turkish speakers to rely more heavily on working memory compared to English speakers. In verb-final languages (e.g., Japanese, Turkish), information must be retained from the beginning to the end of the sentence, thus influencing working memory usage (see Van Gompel, 2013). Our central question is whether the eADM model (see Figure 1) might yield differing outcomes in a silent reading experiment when controlling for working memory capacity.

Figure 1. Experiment Procedure

As illustrated in Figure 1, the final stage of the eADM involves the assignment and interpretation of argument roles. This process extends beyond mere linguistic elements; it also incorporates perceptual analyses (e.g., the animacy effect) that interact with language to facilitate argument

assignment. The second and third stages of the eADM constitute the critical components of this study. In Turkish, intransitive verbs serve as ideal structures for investigating the interaction between semantic role assignment and the animacy effect. Due to their inherent properties, these verbs allow for a more transparent analysis of roles in a sentence. Previous research has addressed the general use of intransitive verbs—classified theoretically as unergative (subject-intransitive) and unaccusative (subjectless-intransitive)—in sentence constructions (see Acartürk, 2005; Nakipoğlu 2002). These uses can be briefly described as unergative verbs taking an agent semantic role (i.e., the subject) and unaccusative verbs taking an experiencer semantic role (see Chan et al., 2009). Within this framework, we create four experimental conditions and manipulate usage frequency from the perspective of Frame Semantics (see Fillmore, 2006), aiming to increase the cognitive load on working memory both syntactically and semantically. The key question of this study can be framed as follows: In sentence processing, when participants with higher working memory capacity and those with lower capacity are presented with stimuli, how much additional cognitive load is induced by manipulating verbs in terms of semantic role and animacy? If there is a difference in cognitive load, can it be attributed to working memory capacity? These interactions will be investigated by analyzing eye-movement data obtained from a silent reading experiment. As part of the experiment, a working memory assessment will be administered to participant. In the initial phase, the (forward) Digit Span Task (see Miller, 1956; Lamar et al., 2017), a commonly used measure in the literature, will be employed to evaluate participants' working memory capacity. This task allows for a clear measurement of forward memory capacity without heavily engaging cognitive control or other executive functions (see Monaco et al., 2013). The findings are expected to offer insights into the role of working memory in sentence processing, typological results concerning Turkish, and the variability in acceptability of intransitive verbs depending on the elements they interact with. Furthermore, they will contribute to theoretical explanations of semantic roles and animacy effects based on experimental data, thus providing a foundation for future research.

Keywords: Animacy effect, semantic roles, Turkish, working memory, eye-tracking