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The difference between "giving a rose" and "giving a kiss": Sustained neural activity to the light verb construction

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ABSTRACT

We used event-related potentials (ERPs) to investigate the neurocognitive mechanisms associated with processing light verb constructions such as "give a kiss". These constructions consist of a semantically underspecified light verb ("give") and an event nominal that contributes most of the meaning and also activates an argument structure of its own ("kiss"). This creates a mismatch between the syntactic constituents and the semantic roles of a sentence. Native speakers read German verb-final sentences that contained light verb constructions (e.g., "Julius gave Anne a kiss"), non-light constructions (e.g., "Julius gave Anne a rose"), and semantically anomalous constructions (e.g., *"Julius gave Anne a conversation"). ERPs were measured at the critical verb, which appeared after all its arguments. Compared to non-light constructions, the light verb constructions evoked a widely distributed, frontally focused, sustained negative-going effect between 500 and 900 ms after verb onset. We interpret this effect as reflecting working memory costs associated with complex semantic processes that establish a shared argument structure in the light verb constructions.

Introduction

Most theories of argument structure assume a tight coupling between syntactic and semantic structure, such that each noun phrase maps onto a single semantic role. And, indeed, in most sentences, this is the case. For example, in a sentence like "Julius gave Anne a rose", the giver (the Agent) is associated with the subject of the verb ("Julius"), the givee (the Recipient) is expressed as the indirect object ("Anne"), and the gift (the Theme) is expressed as the direct object ("rose").

However, consider a sentence like "Julius gave Anne a kiss"—the so-called light verb construction. These constructions are complex predicates whose verbs are said to be semantically "light", communicating only lexical and grammatical aspect, and the directionality of the action; the bulk of the predicative meaning stems from the event nominal within the construction (Butt, 2010; Wiese, 2006). While in a non-light construction such as "give someone a rose", the verb "give" means "to hand over", in "give someone a kiss", the verb "give" only denotes a general sense of transfer and the event nominal "kiss" conveys the action itself. Thus, Julius acts not only as the Agent of the verb "give", but also as the Agent of the direct object "kiss", while Anne is both the Recipient of "give" and the Patient of "kiss". This phenomenon is known as "argument sharing" (Baker, 1989; Butt, 2010; Durie, 1988; Jackendoff, 1974; Müller, 2010), and it violates the tight coupling of semantic and syntactic structure.

There have been several theoretical attempts to reconcile the lack of a direct correspondence between semantic

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and syntactic argument structure in the light verb construction (Hale & Keyser, 1993, 2002; Goldberg, 2003). In this paper, we follow the Parallel Architecture framework (Culicover & Jackendoff, 2005; Wittenberg & Piñango, 2011), which allows both syntactic and semantic structure to be built independently, though the two are linked through a grammatical function tier (for further discussion, see Müller & Wechsler, in press; Wittenberg et al., in press). According to this theory, when a verb appears in a light verb construction with certain event nominals, the process of argument sharing is triggered: the arguments provided by the verb (in the case of "give", the Agent, Patient, and Theme), and the arguments provided by the noun (in the case of "kiss", Agent and Patient) need to be aligned.

As a result of the mechanisms that, according to the Parallel Architecture, are engaged during argument sharing (Culicover & Jackendoff, 2005, pp. 222–225), we predict that light verb constructions should incur processing costs during comprehension. Note that this hypothesis goes against what might be predicted on the basis of the frequency of light verb constructions, which, despite their complexity, are commonly encountered in everyday language. For example, according to the PropBank corpus (Palmer, Gildea, & Kingsbury, 2005), the most common English verbs appearing within light verb constructions, such as *take*, *have*, *make*, *do*, and *give*, are among the twenty most frequent verbs in English. More importantly, these verbs are more frequently encountered within light than non-light verb constructions (Wittenberg & Piñango, 2011). Thus, in the absence of other factors, these frequency data alone would predict reduced processing costs in association with the more frequent light verb construction than the less frequent non-light construction.

There have been only a few behavioral experiments examining light verb constructions. First, in a recent study, Wittenberg and Piñango (2011) asked participants to listen to German light verb constructions (e.g. "Weil der Student seiner Kommilitonin vor dem Seminar eine Zusammenfassung gab, spendierte sie ihm letzte Woche einen Kaffee"; English literal translation: "Because the student to his fellow student before class a summary gave, she bought him coffee last week."). These light verb constructions were compared with non-light constructions using the same verbs (e.g. German: "Weil der Student seiner Kommilitonin vor dem Seminar einen Kugelschreiber gab, spendierte sie ihm letzte Woche einen Kaffee"; English literal translation: "Because the student to his fellow student before class a pen gave, she bought him coffee last week."), or the same nouns (e.g. German: "Weil der Student seiner Kommilitonin vor dem Seminar eine Zusammenfassung kopierte, spendierte sie ihm letzte Woche einen Kaffee"; English literal translation: "Because the student for his fellow student before class a summary copied, she bought him coffee last week."). The default Subject–Object–Verb (SOV) word order in German allowed the authors to probe processing costs at the critical verb where they predicted the effects of argument sharing would be most prominent. After these critical verbs, letter-string probes appeared on a screen and participants made a lexical decision about these probes. Participants were slower to respond to probes appearing 300 ms after the offset of the verbs in the light verb constructions, compared to the two non-light constructions. The authors interpreted this as evidence for an increased processing load in computing light verb constructions (see also Piñango, Mack, & Jackendoff, in press, for similar findings in English).

In another recent behavioral study, Wittenberg and Snedeker (in press) used a conceptual sorting task to explore the argument structure of light verb constructions in English. During a training phase, participants were trained to sort pictorial depictions of events by the number of thematic roles they encoded (e.g. a picture of man giving a woman some flowers would be classified as a 'three role' event: man, woman, flowers). They were then asked to sort a mix of pictures and written sentences into these different types of event structures (with different numbers of thematic roles). Despite the fact that they have three syntactic arguments, events described by light verb constructions (e.g. "The teenager is giving his rival a kick") were most frequently grouped with event structures with two semantic roles (Agent–Patient events, e.g. "The cowboy is taming the pony"). This suggests that light verb constructions do, indeed, typically involve a non-canonical mapping between semantic and syntactic event structure. However, in about a quarter of cases, the light verb constructions were grouped with three-role event structures (e.g. Source–Theme–Goal Events, like "The businessman is passing pamphlets to the pedestrians"). This in-between pattern provided indirect evidence for argument sharing; that is, light verb constructions may be intrinsically associated with two different argument structures that can be active at the same time: an Agent–Patient non-canonical argument structure in which the number of semantic and syntactic arguments mismatch, and a Source–Theme–Goal canonical structure in which the number of semantic and syntactic arguments match.

Together, these behavioral studies provide some evidence that both the processing and final interpretation of light verb constructions involve argument sharing. Nevertheless, there are some limitations in the interpretation of the results. First, Wittenberg and Piñango (2011) used a cross-modal lexical decision task, which imposes dual task demands, potentially altering participants' processing of the sentences (see Pickering, McElree, Frisson, Chen, & Traxler, 2006, for a critique of this method). Second, Wittenberg and Snedeker (in press) probed participants' final interpretation of these constructions, rather the time course of their online neural processing.

There has only been one study investigating neural activity associated with light verb constructions. In an MEG study, Briem et al. (2010) carried out three experiments in German. They contrasted light verbs like "geben" ("give") with non-light verbs like "erwarten" ("expect"), either by themselves (Experiment 1), presented together with a subject pronoun (Experiment 2), or in object-verb-subject order (Experiment 3). In all experiments, light verbs (e.g. "geben"/"give") evoked less activity than non-light verbs (e.g. "erwarten"/"expect").

The authors interpreted these findings as reflecting reduced lexical processing due to the semantic underspecification of light verbs. At first glance, these findings appear