

What language says about the psychology of events

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Despite the variety of verb meanings, linguistic research on their syntax and semantics has shown that they can be categorized into a finite and surprisingly small number of event types. More recently, research in the psycholinguistics of language acquisition and processing has emphasized the relevance of event type. The wider implication of these findings is that the conceptual fluidity of verbal concepts is confined by the fundamental structures of mental grammar, shedding light on this important interface between cognition and syntactic organization.

Languages contain a vast number of verbs, which can be categorized into classes according to different aspects of their linguistic behavior (e.g. transitive/intransitive). Here, we review the importance of a classification of verbs according to the type of event they express; this kind of information has recently been discovered to play a crucial role in the syntactic and semantic behavior of verbs in sentences, and also in the way verbs are learnt by children, and used in sentence processing.

Aristotle noticed that named events come in two varieties: those that continue in much the same way from their beginning to some arbitrary stopping point, such as *walking*, and those that progress inexorably towards a culmination, beyond which the event does not continue, such as *closing*. In recent work in linguistics and psychology, this distinction has been shown to be relevant to explaining phenomena in syntax, semantics, processing and acquisition.

Philosophers and linguists have expanded upon this basic distinction, discovering several sub-classifications of events with semantic and syntactic consequences. In particular, since Vendler's work [1], verbs are said to divide into four classes, a class of states and three classes of events:

- (i) *Activities*: events that go on for a time, with homogenous sub-parts and without a necessary endpoint (e.g. *run*, *scribble*);
- (ii) *Accomplishments*: events that have a process portion that proceeds towards a logically necessary endpoint (e.g. *close*, *melt*);
- (iii) *Achievements*: events that occur at a single moment and therefore lack a previous process portion (e.g. *die*, *trip*).

One crucial question, then, is whether these semantic distinctions have effects on the syntax of these verbs. The answer seems to be that they indeed do.

Objects and culminating events

Let us consider the connection between the presence of an object and a culminating endpoint with certain kinds of verb [2]. The key observation connecting event structure and argument structure is that the direct object is a crucial factor in determining the temporal extent of the event. With certain verbs a homomorphic (i.e. direct) relationship is established between the unfolding of the event and the physical extent of the object undergoing the event. Prototypical verbs that exhibit this effect are verbs of creation and consumption:

- (1) a. John wrote in the library for hours.
- b. John wrote a letter in the library in an hour.

In (1)b, there is a direct relationship between the extent of the writing event and the letter being created. The culmination point is reached when the letter is finished [3] – that is to say, with an object present, the writing event is 'telic'. When the same verb has no direct object, however, as in (1)a, the event denoted has no inherently fixed endpoint – it is 'atelic'.

The connection between the grammatical status of direct objects and the structure of the event denoted by the verb has been shown to have distinct reflexes in many typologically distinct languages. For instance, in Finnish, a direct object marked with an accusative case suffix leads to a culminating (telic) interpretation of the described event, whereas a direct object marked with partitive case gives an ongoing, non-culminating (atelic) interpretation. Similar effects have been observed in Russian [4], Bengali and Scottish Gaelic [5] and Icelandic [6]. Interactions between telicity and other grammatical phenomena have been observed in Urdu [7], Hebrew [8], Dutch [9], and many other languages.

Unaccusative verbs and culmination

The importance of the object argument for event structure (and vice versa) can also be seen in the two major classes of intransitive verbs, as has been recognized by syntacticians since the 1970s [10]. Certain intransitive verbs (*unaccusatives*) such as *arrive*, *collapse* and *grow* tend to share grammatical features with passive forms of transitive verbs – for example, the single argument of these verbs is an undergoer rather than an agent, as is the subject of passive sentences. Other intransitive verbs (*unergatives*), such as *run*, *sing* and *jump*, show no such similarity to passive transitive verbs and their single argument is typically an agent. Because of their similarity to passives, unaccusative verbs are often treated in grammatical theories as having an object argument at some level

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of representation. Interestingly, these verbs also tend to have a different event structure from the other intransitives: unaccusatives nearly universally describe culminating, telic events, whereas unergative verbs nearly universally describe non-culminating, atelic events [11]. Thus, an independent proposal concerning the presence of an unseen object in argument structure turns out to correlate with the telic/atelic distinction in event structure.

The object/telicity correlation has been incorporated into several linguistic theories in some form or another (e.g. [8,12] among many others). This immediately raises the question of whether evidence for the correlation can be isolated in online tasks of processing or production, or in stages of first- or second-language acquisition.

Psychological reality of linguistic event structure

Several researchers have recently begun to investigate this question, and initial findings suggest that telicity has psychological repercussions in both processing and acquisition. In the realm of processing, O'Bryan showed that telicity of the verb in a multiply-parsable reduced relative clause has a significant effect on the ease with which the sentence is disambiguated (E. O'Bryan, PhD Thesis, University of Arizona, 2003). O'Bryan's results show that in structures in which ambiguity resolution depends on postulating an object, telic verbs are disambiguated more easily than atelic ones.

In language acquisition studies, initial results suggested that children learning Dutch could make the appropriate distinction between telic and atelic events when the latter were described with verb-particle constructions (as in *'The white mouse ate up his cheese'*) but not when the distinguishing factor was the presence or absence of an object (*'The white mouse ate'* versus *'The white mouse ate his cheese'*) [13]. More recent studies by Wagner and Carey, however, suggest that children in fact have good mastery of telicity as early as 3 years old [14]. In those studies, children were asked to count events in a video, which were ultimately culminating (e.g. *'paint a flower'*) but in the video were accomplished in two or three fits of activity, with pauses in between. Children were asked either *'How many times does the girl paint?'* or *'How many times does the girl paint a flower?'* – they showed sensitivity to the presence or absence of the object in the question in their counting behavior, counting only the whole culminating event more often when the object was present, and counting the fits of activity more often when it was absent.

Further support for the early relevance of telicity in children's language use comes from their use of verbal morphology in English. Children typically use perfective-marking morphology (such as the past tense suffix *-ed*) with telic verbs like *make* or *break*, and typically use imperfective morphology (the progressive suffix *-ing*) with atelic verbs like *play* or *ride* (e.g. [15,16]). That is, it seems that children have initially treated telicity as the main conditioning factor in inflecting verbs, even if this is not appropriate in the adult grammar (see [17] and references therein for a useful summary and discussion). The importance of telicity in second language acquisition has also been the topic of significant study (e.g. [18,19]).

Next steps

The relevance of event structure for theories of linguistic structure and use has been clearly established by work in several domains. Nevertheless, many questions remain for future investigation. For example, the correlation between telicity and transitivity, although robust, is not perfect: certain transitive verbs (like *pushed* in *'John pushed the car'*) are inherently atelic. Similarly, certain effects which have been argued to depend on telicity, such as the use of a direct object with normally intransitive verbs like *waltz* (as in *'John waltzed Matilda across the floor'*), in fact seem to depend instead on the syntactic presence of a path-denoting constituent, not the telicity of the overall construction (consider *'John waltzed Matilda around and around the room for hours'*). Finally, although it is clear that the event structure of verbs is used during language processing, it is not understood in what way telicity is encoded, nor is it known what the nature of its effects on the processor are. The goal of understanding the interface between cognition and syntactic structure is still far off.

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