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Journal

Proceedings of the Annual Meeting of the Cognitive Science Society, 48(0)

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Publication Date

2026

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Peer reviewed

Recent linguistic experience influences event role identification

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Abstract

While events can be identified based on both perceptual and higher-level information, the contribution of language-related factors remains unclear. Here, we examine whether recent linguistic experience modulates event role identification scenes by asking whether verbs with different argument and thematic structures cue abstract event representations that guide subsequent event cognition. Participants briefly viewed agent–patient events (for 300ms) preceded by a transitive verb, an intransitive verb, or a nonsense word control, and then completed a probe-based role identification task. Transitive verb primes facilitated recognition of event roles, yielding faster responses in role-matching trials relative to intransitive and control conditions. These findings show that linguistic cues influence event role identification, especially when their argument and thematic structure aligns with event structures.

Keywords: event cognition; scene apprehension; language and cognition; brief exposure

Introduction

We understand the world by structuring everyday experiences into meaningful units known as *events*. Events unfold over time and space and involve participants (e.g., people or objects) as well as the relations between them. Events can be identified and represented based on various sources of information, including perceptual features (Kurby & Zacks, 2008; Radvansky & Zacks, 2014), higher-level conceptual information (e.g., goal structure, familiarity or prior knowledge; Mathis & Papafragou, 2022; Wang et al., 2022, 2024; Zacks, 2004). One such cue that can create expectations about events is language. For instance, different linguistic construals of the same event can influence viewer’s sensitivity to the temporal features of events (Misersky et al., 2021; Vurgun et al., 2024). Here, we investigate whether linguistic cues have similar effects on the way viewers extract event participants and their roles from brief visual displays.

Agents and Patients are linguistic notions proposed to capture the relationship between a verb and its constituents (i.e., ‘who-did-what-to-whom’) (Dowty, 1991; Fillmore, 1968), though there is considerable evidence for their psychological reality (Rissman & Majid, 2019). Adults identify Agent and Patient roles from brief displays of both simple (Hafri et al., 2013) and complex events (Ünal et al.,

2024). In more explicit tasks, they use who the Agent and the Patient is to categorize events (Rissman & Lupyan, 2022). Sensitivity to Agent–Patient roles has also been observed across development and species, including infants (Papeo et al., 2024), young children (Bariş & Ünal, 2025; Ünal et al., 2021), and non-human animals (Meewis et al., 2025). These findings suggest that cognition offers structured representations of events that are similar to the structure proposed to characterize events in language (Ünal, Ji, & Papafragou, 2021; see Jackendoff, 1990 for the initial formulation of this proposal).

This similarity raises an interesting issue from the perspective of linguistic encoding of Agents and Patients and its consequences for non-linguistic apprehension of event roles. One issue is language-specific encoding preferences for Agents. One cross-linguistic study compared young learners of English with Turkish—a language that permits omission of agentive subjects (Ünal et al., 2021). Turkish-speaking children mentioned Agents less often in verbal descriptions than English-speaking children, but both groups were equally accurate at detecting Agent changes in a non-linguistic task. Another study compared speakers of Spanish and Basque—a language that marks agentive subjects (Isasi-Isasmendi et al., 2023) and found that attention to Agents over Patients persisted across linguistic and non-linguistic tasks, though its strength can vary cross-linguistically. Importantly, these studies focused on spontaneous event encoding rather than directly testing whether linguistic labels influence the extraction of event roles.

Another issue concerns how packaging choices regarding agent and patient saliency within a single language influences attention to subsequently viewed (unrelated) events (Sauppe & Flecken, 2021). Participants produced either active or passive descriptions of a cue event before briefly viewing an unrelated two-participant event while their eye movements were recorded. Although first fixations typically landed on Agents, this bias was reduced for events following passive sentence production. These findings indicate that recent linguistic experience creates expectations that further modulate how attention is allocated to event participants in subsequently viewed events.

An open question concerns the limits of such linguistic modulation: specifically, whether similar effects can arise in

the absence of full event descriptions. While prior work has shown that producing sentences with different packaging choices can shape attention to participants of subsequently viewed events, it remains unclear whether similar expectations can also be driven by more minimal linguistic input, without explicit reference to Agents and Patients.

It seems reasonable that event participants corresponding to Agent and Patient roles are represented as abstract categories that generalize across events and the entities that fill these roles. Across a wide range of event types, Agents denote entities that initiate or carry out actions (e.g., in pushing or eating events), whereas Patients denote entities that are affected by those actions. Crucially, this abstract participant structure is encoded in the argument structure of verbs, which specifies the number of event participants and the roles licensed by a predicate. Transitive verbs license two arguments corresponding to an Agent and (including but not limited to) a Patient, whereas intransitive verbs license a single argument, most often associated with an Agent role. If verb argument structure rapidly evokes an abstract event structure, it may drive expectations about upcoming event structure even in the absence of explicit event descriptions.

Importantly, verbs encode not only syntactic information about participant number and event roles, but also semantic information about the specific relation that holds between event participants. Thus, any modulation of expectations could be driven by argument structure alone—highlighting structural parallels between linguistic input and visual events (e.g., a transitive verb activating expectations for a two-participant Agent–Patient event)—or could additionally be shaped by verb-specific semantic relations. For example, although verbs such as drag and push both license two participants in Agent–Patient roles, they differ in the nature of the interaction they encode. Such semantic information may further constrain expectations about events and event participant roles, beyond expectations about participant number and role structure.

The present study takes a first step in testing these possibilities by examining whether argument and thematic structure encoded by verbs influence event role recognition. Participants are briefly exposed to Agent–Patient events that are preceded by one of three types of primes: (1) transitive verbs describing that event, which license two syntactic arguments/thematic roles and were semantically congruent with the target; (2) intransitive verbs, which license a single argument corresponding to an Agent role and were not semantically congruent with the target; or (3) a neutral prime consisting of nonsense words. Immediately after each briefly presented event, participants complete a role recognition task. Of interest is whether the congruency between the verb’s argument and thematic role structure and the event structure in the pictures will facilitate event role recognition. If so, event role recognition should be facilitated by transitive primes whose argument and thematic role structure matches the two-participant structure of Agent–Patient events. In contrast, intransitive should interfere with event role recognition as they encode a one-participant structure.

Method

Participants

Data were collected from 40 adult native speakers of Turkish (26 females, Mean age = 21.4, range = 19–26). All were undergraduate students at Özyeğin University and received course credit for their participation.

Stimuli

Stimuli included linguistic cues, target pictures and probe pictures. Linguistic cues were presented as primes prior to each target picture and fell into three categories. Transitive primes included 12 verbs describing the transitive event shown in the target picture for that trial (e.g., pushing, kicking). Intransitive primes included 12 verbs referring to intransitive actions depicted in filler images shown at other points in the experiment but not during the current trial (e.g., jumping, running). Neutral primes were made up of 12 pseudowords. Each contained three syllables and was constructed in accordance with Turkish vowel harmony rules. All linguistic cues appeared in capital letters, displayed in white font against a black background. Transitive and intransitive primes were presented in their infinitive form.

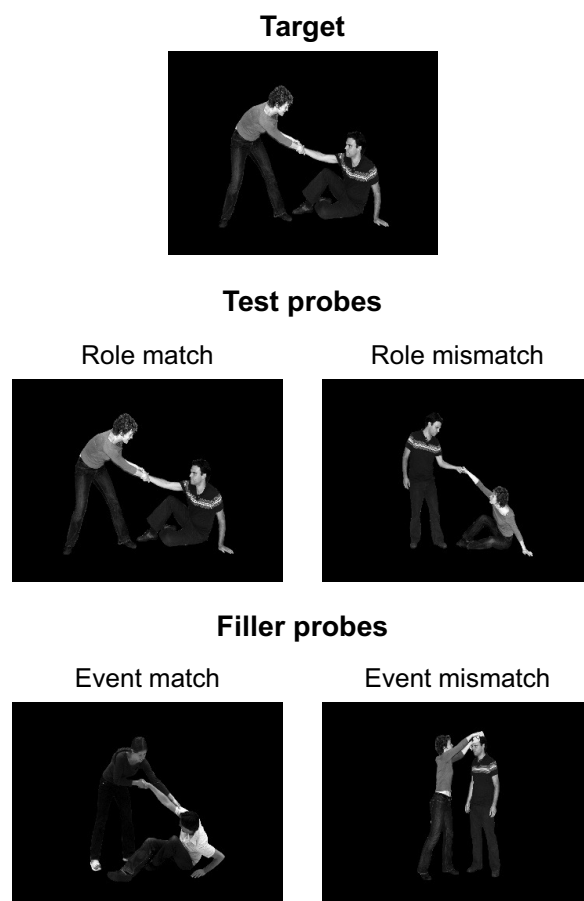


Figure 1: Examples of target and probe pictures in the recognition task.

Target pictures comprised 12 photographs depicting transitive events between an animate agent and an animate patient (selected from Segaert et al., 2011). Each event was portrayed by one of three actor pairs (two adult pairs and one child pair), with each pair depicting four different events. In half of the images, the agent was female and the patient male, while the reverse configuration was used for the remaining images. The agent's position (left or right) was counterbalanced across trials. Each target image appeared 12 times during the experiment, once per block: four times preceded by a transitive prime, four times by an intransitive prime, and four times by a neutral prime (Figure 1).

Probe pictures were selected from the same stimulus set as the target images and were presented in two conditions (see Figure 1). In the *role-match* condition, the probe image was identical to the target image. In the *role-mismatch* condition, the probe depicted the same event and the same actors, but with the agent and patient roles reversed. The gender configuration of the agent and patient remained unchanged, and the spatial position of the agent (left or right) was identical to that in the target image. Within each block, each probe type was presented three times: once following a transitive prime, once following an intransitive prime, and once following a neutral prime.

Two additional types of probes served as fillers. *Event-match* probes showed the same event with a different pair of actors, while maintaining adult-child and gender configurations. *Event-mismatch* probes showed the same actor pair engaging in a different event. These filler probes were included to ensure that participants could reliably detect changes in the event or the actors, rather than focusing solely on role reversals.

In order to increase the variation in the stimulus set and to present a visual depiction of the transitive primes, 12 additional photographs of a single animate agent performing an intransitive event were included as fillers. These stimuli were drawn from the same stimulus set as the target images. Each transitive picture appeared once per block (12 times total), equally often following transitive, intransitive, and neutral primes and across screen positions. Probe images for these stimuli included *match* trials and *mismatch* trials in which either the actor or the action changed.

Procedure

Participants were tested individually in a quiet laboratory room using a PsychoPy experiment displayed on a 15.6" monitor, viewed from approximately 60 cm. Each trial consisted of a fixation screen (850ms), followed by the prime that remained on the screen until participants read it aloud and pressed a button to initiate another fixation screen (850ms). Then, the picture of an event appeared in one of the four quadrants on the screen (300ms), followed by a visual mask (500ms). Finally, the probe picture appeared on the center of the screen and remained until participants pressed a button to indicate whether it matched the target picture (green button = yes, red button = no).

The experiment consisted of 12 randomized blocks of 24 trials each, including equal numbers of transitive target trials and intransitive filler trials. Trial order was semi-randomized to avoid more than two consecutive trials of the same type, cue, or probe. Participants could take self-paced breaks every two blocks. The session lasted approximately 30 minutes.

Results

Data were analyzed with linear mixed-effects models with random intercepts for Subjects and Items. To assess the statistical significance of the fixed effects and their interactions, we used a chi-square test of the change in -2 restricted log likelihood between models with and without the effects and interaction of interest. Follow-up tests for pairwise comparisons used simultaneous single-step corrections.

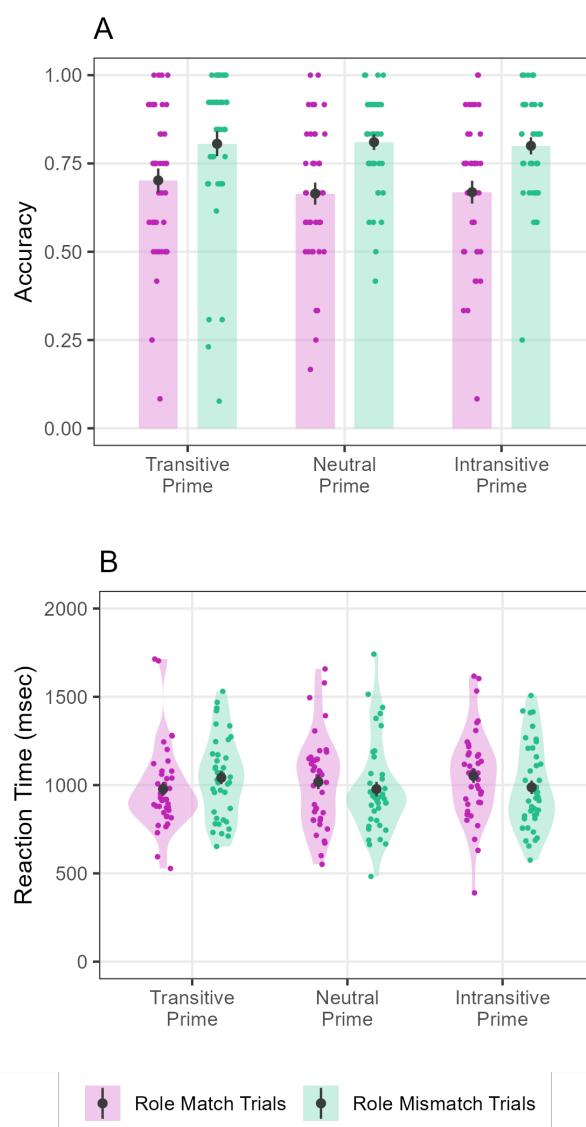


Figure 2: Accuracy (A) and reaction times for accurate responses (B) in the probe recognition task.

First, we tested whether the accuracy of the responses to the probe changed across probe types and prime conditions (Figure 2A). We tested the fixed effects of probe type (role match, role mismatch) and prime (transitive, intransitive, neutral) and their interaction on accuracy of probe recognition (1 = accurate, 0 = not accurate) at the item level. Probe recognition was more accurate when the roles of the agent and patient reversed ($M = 0.81$, $SE = 0.001$) as opposed to when they remained the same ($M = 0.68$, $SE = 0.002$; $\chi^2(1) = 68.266$, $p < .001$). No other effects or interactions were statistically significant.

Next, we tested whether how fast participants responded to the probe changed across probe types and prime conditions (Figure 2B). Data from inaccurate trials were excluded from the analysis (12.3% of all trials). Reaction times which were more than 3 SD from the mean were also excluded from the analysis (2% of the accurate trials). We tested the fixed effects of probe type (role match, role mismatch) and prime (transitive, intransitive, neutral) and their interaction on the reaction times for accurate responses at the item level. The model revealed a significant interaction between probe type and prime type ($\chi^2(2) = 10.932$, $p = .004$). Follow-up tests revealed that participants were faster in responding to a matching probe when the briefly presented picture was preceded by a transitive prime compared to when it was preceded by an intransitive prime ($\beta = 83.26$, $SE = 31.98$, $t = 2.603$, $p = .025$). However, this advantage for transitive primes was not observed for matching probes in which the roles of the agent and patient were reversed ($\beta = -55.28$, $SE = 29.04$, $t = -1.904$, $p = .138$). No other pairwise comparisons were statistically significant.

Finally, to ensure that the participants did not have difficulty in recognizing the event or the people involved in it, we checked the responses to the filler probes. Overall, participants were highly accurate and fast for both types of filler probes. However, responses to the probes were more accurate ($\chi^2(1) = 61.117$, $p < .001$) and faster ($\chi^2(1) = 36.068$, $p < .001$) when the event changed but the agent and patient remained the same (Accuracy $M = 0.97$, $SE = 0.001$; RT $M = 861.94$, $SE = 4.61$) compared to when the event remained the same but the agent and patient had changed (Accuracy $M = 0.90$, $SE = 0.002$; RT $M = 938.63$, $SE = 5.29$). The prime that preceded the briefly presented picture had no effect on recognition performance.

Discussion

In the current study, we examined whether linguistic cues influence the way viewers identify event participants and their roles from brief visual displays. We found that the argument and thematic role structure of verbs shown prior to briefly presented Agent-Patient events influenced event role recognition. That is, when Agent-Patient events were preceded by transitive verb primes whose argument and thematic structure was congruent with the internal structure of the event, viewers were faster in recognizing the roles of the event participants compared to when they were preceded

by intransitive verb primes whose argument and thematic structure was incongruent with the internal structure of the event. This finding complements prior evidence on the role of linguistic cues creating expectations and thereby modulating attention allocation to event participants in subsequently viewed events (Saupe & Flecken, 2021). It also extends previous findings by showing that such expectations may be driven in the absence of full event descriptions and from more minimal linguistic input such as relational and structural information encoded in single verbs, without explicit reference to agents or patients.

These findings cohere with recent evidence on language-related effects on other core components of event cognition. For instance, grammatical aspect in linguistic descriptions cueing different viewpoints on an event's temporal structure (e.g., completed or ongoing) influences viewers' sensitivity to object states (Misersky et al., 2021). Further, linguistic construals of the very same event as having an inherent endpoint or not influences viewer's sensitivity to the internal temporal structure of the event (Vurgun et al., 2024). Together these findings highlight the role of linguistic information in creating expectations about the internal structure of events, specifically event participants and temporal features.

In the present study, briefly presented events were preceded by semantically related verbs. As a result, the argument and thematic role structure of the verbs paralleled the event structure in terms of the number of participants and the roles they licensed, and the verb meanings also specified the nature of the relation between these participants. Consequently, the current findings do not allow us to distinguish whether the observed modulation arises from argument structure alone, or from a combination of argument structure and lexical semantics. An open question is whether similar effects can emerge from even more abstract linguistic input such as argument and thematic structure in the absence of semantic information. If so, similar effects should persist even when briefly presented events are preceded by transitive verbs that refer to unrelated Agent-Patient events. This is because under such conditions, the parallelism between linguistic structure and event structure would be preserved in terms of participant number and role licensing, while the specific relational content contributed by verb meaning would be eliminated. We are currently testing this prediction in ongoing work.

Another question raised by the current findings is whether verb-based linguistic influences generalize to other classes of events with different internal structures and event roles. There is considerable empirical evidence for the psychological reality of (linguistic) Agent and Patient roles and the correspondence between their linguistic and conceptual representation (Rissman & Majid, 2019; Ünal et al., 2021, 2024). However, it remains to be seen whether similar effects extend to more peripheral event roles, such as Instruments, which exhibit substantial variability in both their conceptual organization (Rissman et al., 2015) and their patterns of linguistic encoding (Moser et al., 2024).

Acknowledgments

This research was supported by TUBITAK 1001 Grant 121K259 awarded by The Scientific and Technological Research Council of Turkey to E.Ü. Thanks to Tuğçe Açıklım, Yiğit Yargılı and Zeynep Bolluk for assistance in data collection.

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