# Cognitive Principles of Event Segmentation

Event perceptual processes help the brain to deal efficiently with the enormous amount of data that comes through different sensory modalities. Segmentation is one perceptual process that enables the observer to extract meaningful units from the stream of temporal and dynamic information by breaking them down into small distinct segments that are bounded in time and space. Brain imaging studies have indicated that segmentation occurs in an automatic manner; activity increases in the brain corresponding to event boundaries (Zacks, Braver, et al., 2001). Segmentation relies on sensory features that are processed based on a bottom-up strategy and also relies on conceptual features that are processed based on a top-down processing strategy. Segments establish the foundation for learning and memory (Zacks & Swallow, 2007).

One strategy for detecting event boundaries is by tracking sensory features of objects compromising the events. Perceptual information, whether static (color, shape) or dynamic (motion), is commonly adapted as guidance for identifying event boundaries. Boundaries are perceived when the salient features of the event changes. Zacks (2004) found that observers relied on the changes of movement features (distance, speed, acceleration) to segment the event. Color also has an effect estimation of duration, which is an essential component for event perception. Recent evidence suggests that the presentation of blue stimuli, compared to that of red, induces an over-estimate of duration (Thönes, Castell, Iflinger & Oberfeld, 2018). Figure 1 represents the life cycle of a butterfly. The figure presents a series of images each representing a critical stage of butterfly metamorphosis. Perceptual information (shape, color, texture, and size) is the main source for the learner in tracking changes from event to event without needing the assistance of arrows or text. The learner can also use other cues to understand the temporal order, for example, the spaces between images signaling event boundaries as well as the ordering of the periods from left to right, the direction in which English is read.

Conceptual features of the events such as cause-effect interaction and the actor's goal are other reliable sources of information for event segmentation. According to this view, observers can rely on prior knowledge and representations of events that form the basis for creating breakpoints when one segmented event ends and another begins. Event Segmentation Theory (EST) states that when experiencing an event, the working memory representations for such an event enhance perception and prediction. Identifying event boundaries then occur when prediction error about the event increases, which often accompanies an increase in the changes in the ongoing activity (Zacks, 2010). Programs that teach skills, cooking lessons for example, can benefit from such a principle by presenting steps that are congruent with the viewer's schema, in which prior-event knowledge is retrieved and employed for predicting ongoing activity, and that ultimately helps the observer to perceive the procedure hierarchically, and in discrete, organized chunks.

Event segmentation has consequences on learning and memory. Evidence suggests that memory performance for the visual component of the event is better for those who segment the event at appropriate breakpoints (Zacks, Speer, Vettel & Jacoby, 2006). Educational programs would do well to place critical data at ideal breakpoints of the lesson to enhance later memory for those materials. For example, a summary of target grammar rules could be inserted before and after the grammar exercise, or a story employing new vocabulary could be finished with a review of the target words.

Event segmentation is a powerful cognitive mechanism that helps individuals to organize a continuous stream of experience into meaningful events, based on data-driven and self-initiated processes, which boost learning and memory.

Reference:

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Figure 1