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Implicitly Learned Sequences Structure the Perception of Human Activity

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Introduction
People are able to learn and use temporal sequences to guide their perception and behavior. This ability has been demonstrated in visual search tasks (Olson & Chun, 2001) and is present in infants as young as eight months (e.g., Saffran, Aslin, & Newport, 1996). Does seeing the same sequence of activity repeated in different contexts cause that sequence to be treated as a coherent perceptual unit? If temporal sequence learning influences the perception of others’ activity, observers should be able to use sequences of activity to prepare for an event predicted by those sequences. Furthermore, these sequences should have a direct effect on the structure people perceive in others’ activity: implicitly learned sequences of activity should be perceived as units of activity. The goal of this study was to determine the consequences of temporal sequence learning for the way observers understand the actions of others.

Experiment 1
The first experiment addressed the hypothesis that participants can learn sequences of human activity and use those sequences to aid in a target detection task. A series of pictures (presented for 750 ms with no ISI) of a man with his arm in six different positions and forming thirteen different hand gestures were presented to participants. Eight participants were asked to monitor the gestures and press the correct button whenever they saw either of two target gestures. Within the series of pictures a sequence of seven arm positions was repeated 320 times. Each repetition of the sequence was separated by two to twelve pseudo-randomly selected arm positions. For the first three-quarters of the task, a target gesture immediately followed the sequence. In the last quarter of the task the sequence did not predict when the target would appear. Response times steadily decreased while the target followed the sequence but then increased once the target was no longer predicted by the sequence. None of the participants discovered the sequence nor were they able to demonstrate knowledge of the sequence in a cued-generation recognition test.

Experiment 2
The first experiment demonstrated that observers learn sequences of human activity and use this knowledge to prepare for important, task-related activity. In a second experiment we sought to determine whether these learned sequences of human activity are treated as perceptual units and, if so, whether this perception depends upon the predictive value of the sequence. Twenty-four participants performed the same target detection task described in the first experiment. However, the predictiveness of the sequence was manipulated across two groups (predictive and nonpredictive groups) and the task was shortened. The performance of these two groups was significantly different: The group for whom the sequence was predictive showed better task performance than the group for whom the sequence was not predictive. Participants also performed a segmentation task in which they were asked to identify boundaries between units by pressing a button when one natural unit of activity ended and another began (Zacks & Tversky, 2001). This task used the stimuli and sequence from the target detection task (though no target gestures were presented). As they performed the segmentation task both groups of participants chose boundaries relative to the sequence of activity they learned in the first task.

Conclusions
As observers watch others perform everyday activities they build up structured representations of their behavior (Zacks & Tversky, 2001). These structured representations influence how they break behavior into smaller units of activity. The results of these experiments suggest that the structure people impose on their experience is in part due to implicitly learned sequences of human activity. These sequences are learned and used to predict the occurrence of important events. Moreover, these sequences influence the way we subsequently perceive the actions of others.

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