

12 Using Repetition Detection to Define and Localize the Processes of Selective Attention

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12.1 INTRODUCTION

Overview

In our repetition-detection task, subjects search a rapid sequence of thirty frames for a stimulus that is repeated within four frames. Successful detection implies that a match occurs between an incoming item and a recent item retained in short-term visual repetition memory (STVRM).

We test selective attention to physical features in a single location within which successive items alternate in color, size, or spatial frequency. For example, in the size condition, large and small items strictly alternate, and subjects attend selectively to *small* (or to *large*) items. Selective attention to *small* facilitates detecting small-small repetitions and impairs detection of large-large repetitions (the benefit and cost of selective attention). In a control condition, the *large* items are replaced by blanks. The size of the attention benefit for small relative to the control performance gives the efficiency of attentional filtering relative to perfect optical filtering.

Whereas selective attention (relative to equal attention) facilitates homogeneous (e.g., small-small) repetition detections, it usually impairs heterogeneous detections (large-small or small-large). Comparisons of attention costs and benefits for homogeneous and for heterogeneous detections admit the following inferences: physical features are represented in STVRM; attentional filtering occurs before stimuli are recorded in STVRM; in some conditions, some subjects use strategies that encode the attention state of an item in STVRM.

Background: Early versus Late Selective Filtering

Theories of selective attention postulate that the human information processing system is limited in its capacity and that attention serves to select information to be processed from other, competing information (e.g., Broadbent 1958; Deutsch and Deutsch 1963; Norman 1968). Indeed, selective filtering of unattended information has been proposed as a mechanism in numerous visual processing tasks.

