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**Psychology Education Title**

**Multiple Object Tracking**

**Overview:**

In a staggeringly complex and engaging world it is crucial to selectively process some stimuli at the expense of others. Experimental psychologists call this ability ‘attention’. Visual attention, specifically, refers to the ability to selectively process aspects of a visual scene.

Many paradigms used to study visual attention involve brief, punctuated, and repeated trials (as do many paradigms in experimental psychology, broadly). However, everyday situations often place sustained demands on attention, as opposed to requiring only brief focus. For example, compare driving through busy city streets, which demands sustained attention, with crossing a busy street, which demands just a few moments of caution. To investigate sustained visual attention, experimental psychologists often rely on a paradigm called ‘multiple object tracking.’

This video demonstrates standard procedures for investigating sustained visual attention through multiple object tracking.

**Procedure**

1. **Stimulus design (Figure 1)**
   1. The basic design of a multiple object tracking (MOT) trial is relatively straightforward. A trial begins with some number of identical objects in a display, such as blue discs. Typical trials include eight discs in total, but varying the number is a crucial manipulation.
   2. A randomly selected half of the discs turns yellow. Turning yellow indicates to the participant which discs are the targets.
   3. After they turn yellow, all the discs become identically colored again, and all, including the nontargets, move about the display randomly, usually for about ten seconds.
   4. The participant’s task is to mentally track the target discs.
   5. After the motion period is complete, all the discs stop moving, and the participant uses the mouse to click once on each disc they believe is a target.
2. **Procedure**
   1. The above procedure is repeated using several different tracking loads (number of targets a person is asked to track), for example, 2, 3, 4, 5, 6 and 7 (and equal numbers of nontargets).
   2. 10 trials with each load are conducted in total.
3. **Analysis**

**3.1** Compute the number of targets correctly identified in each trial —i.e. the number of items selected as targets that were actually targets. On each trial, the result is an accuracy score between 0 and 100%. Averaging these scores together for all trials with the same tracking load gives the experimenter a sense of the number of targets the individual can track.

**Representative Result**

The results of the experiment include several subjects, and that average performance for the group of participants is reported as a function of tracking load. Graphing those data looks like this (**Figure 2)**:

**Applications**

For the last 25 years, multiple object tracking has been one of the primary methods for investigating the limits of human sustained attention, and the causes of those limits. It can be used to investigate differences in attentional abilities between individuals in different populations, such as those with ADHD compared to age-matched controls. And it can be used to investigate the efficacy of interventions for improving sustained attention, for instance, the effects of drugs such as Ritalin or Adderall.

One area in which the paradigm has been used especially productively and influentially is investigating the human ability to multitask. When a person is driving a car down the highway —a task that clearly requires sustained attention— what will the impact be of talking on a cell phone, for example? Asking people to do this for the purpose of an experiment is ethically questionable. Instead, researchers have used multiple object tracking to investigate the impacts of engaging secondary tasks on the performance of sustained attention, including the secondary task of talking on a cell phone. The result, perhaps unsurprisingly, is that participants make significantly more tracking errors when asked to engage in a conversation over the phone with an experimenter in another room.

**Legend:  
Figure 1 – Schematic depiction of a typical multiple object tracking trial. A participant tracks a subset of discs that moves randomly among a group of identical nontargets.**

**Figure 2 – A depiction of typical tracking performance as a function of target load. Researchers often find that participants perform relatively accurately with only two to four targets to track, then suffering large costs when asked to track more than four or five.**