# Perception of temporal continuity in discontinuous moving images.

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## Introduction

The perception of short visual durations is dependent on the internal and external allocation of attention. When attention is concentrated on a single visual event the perceived duration of that event will be longer than if attention is divided or distracted ('Watched Pot Illusion': Block, George & Reed, 1980). Similarly, when we perform voluntary saccadic eye movements to an object with a discernible temporal signature we perceive the first duration following the saccade as being longer than the subsequent duration ('Stopped Clock illusion': Yarrow et al, 2001).

These effects show how ecological time perception can lead to perceptual discontinuities. The opposite effect can be seen in motion picture perception: the perception of temporal continuity from discontinuous visual events. An action filmed from two different camera positions appears temporally continuous if two frames (83.3ms) of the action are overlapped during the cut between shots (Anderson, 1996). This technique of 'continuity editing' is well established yet the perceptual foundations for it have rarely been empirically investigated.

The aim of this study was to show how 'continuity editing' can be explained as the natural result of time perception under different viewing conditions (fixation, peripheral change, and saccadic eye movements).

## Methods

Twenty subjects (10 male, 10 female; 19-33 years) were shown animations depicting a series of letters within photo-realistic scenes and asked to judge whether the presentation duration of a target letter was longer or shorter than all other letters. A Modified Binary Search procedure (MOBS: Yarrow et al, 2001) was used to identify a presentation duration perceived by the subjects as being equal to 1000ms under nine viewing conditions: Saccade target relocation (3) x Background (3) (see Figure 1). The presentation order of the conditions was either blocked or randomized to create predictable and unpredictable viewing conditions.

## Results and Discussion

The following effects were identified in this study:

- Predictable viewing conditions lead to perceptual extension of fixation duration (estimate = 898ms; t=-3.096 df=9 p=.013). Unpredictable viewing conditions lead to accurate fixation duration perception (estimate=991ms).
- Unexpected peripheral change leads to perceptual shortening of fixation duration (duration = 1049ms; t=-3.180 df=9 p=.011). This effect disappears when coinciding with an unexpected saccade target relocation.

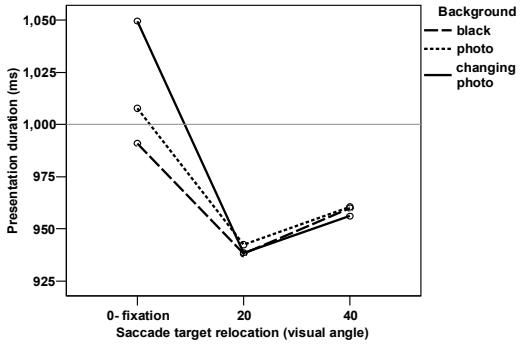


Figure 1: Presentation duration perceived as being equal to 1000ms under the nine randomized viewing conditions.

- Small saccade target relocations (20°) lead to the perceptual extension of post-saccadic durations (blocked: duration decrease=67ms, p=.041; random: duration decrease=53ms, p=.054, one-tail). Large target relocations (40°) only lead to a similar extension when they are unexpected (duration decrease = 57.2ms, p=.023).

These results show how involuntary capture of attention by peripheral change is perceptually under-compensated and voluntary redirection of attention (saccades) over-compensated when perceiving visual durations. These effects are moderated by expectancy.

This allows us to conclude in favour of and explain in more detail the ecological basis of 'continuity editing': perceived temporal continuity is created by overlapping one frame (42.5ms) of a visual event across a cut when the focus of attention remains in the same location but the periphery changes, and omitting one frame when the focus relocates.

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## References

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