Francisco Costela, PhD

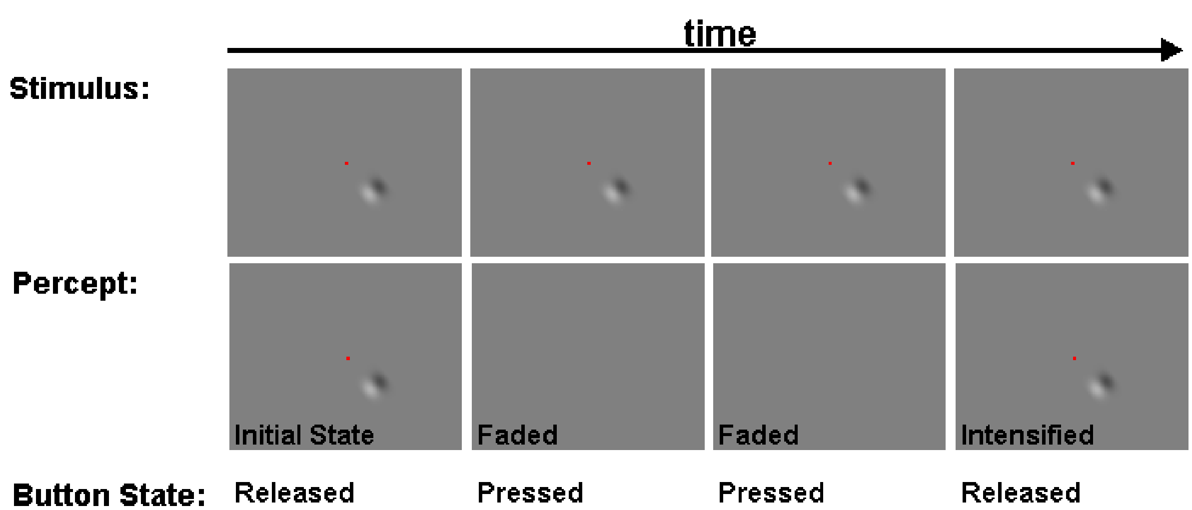
Laboratory of Visual Neuroscience
Barrow Neurological Institute

Selected experiments programmed in Matlab/PsychToolBox (description and screenshot)

Fading Stimuli 2

While fixating a small red spot (0.5º diameter) on the center of the screen, subjects continuously reported whether a stimulus was faded/fading (button press) or intensified/intensifying (button release). The stimulus was a Gabor patch with a peak-to-trough width of 2.5º (Gaussian standard deviations of x = 1.5º and y = 1º; sine wave period of 5º; sine wave phase of 0) (See Figure below). The Gabor was presented at the periphery at a eccentricity of 6º, and five possible frequency levels (0.375 cpd, 0.75 cpd, 1.5 cpd, 3 cpd and 6 cpd), sustaining a maximum contrast of 40% from peak-to-trough and the same average luminance (50%) as the background. The position of the Gabor varied randomly across trials at one of the eight points of the compass to control for possible contrast adaption effects across trials. The orientation of the Gabor also varied randomly between 0º and 360º in each trial, to control for orientation adaptation effects. To start the trial, subjects pressed a key and the stimulus appeared on the screen. Subjects were instructed to release the button as soon as they saw the stimulus. After 30 seconds, the stimuli disappeared and the trial ended.

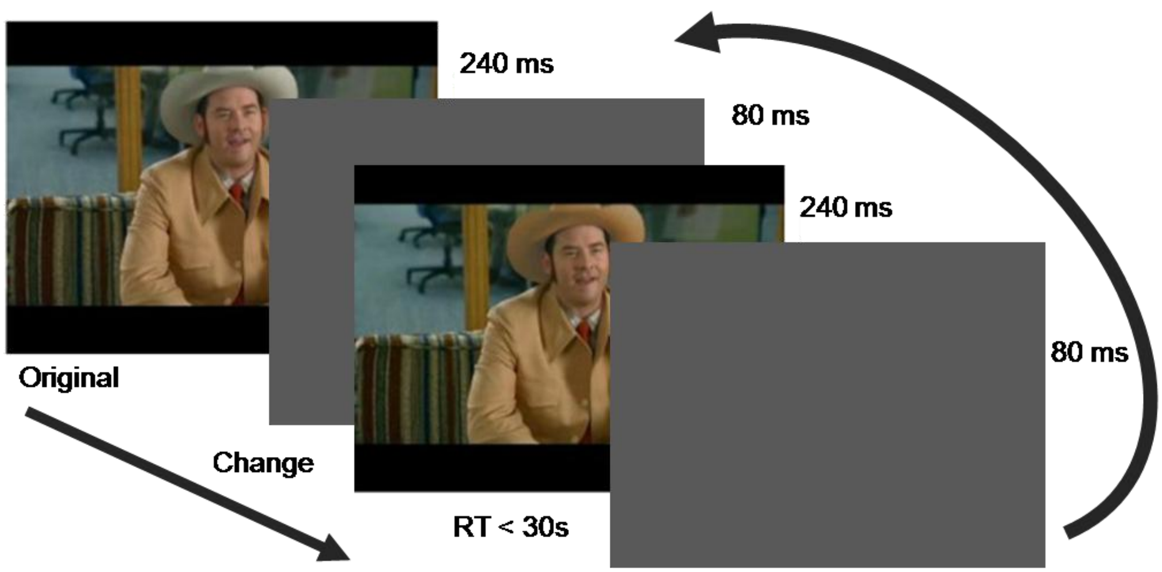
This experiment is a follow-up from one of my published articles, "Microsaccades restore the visibility of minute foveal targets", Costela et al., PeerJ, 2013.



Humor Horror Flicker

This is the control task for an experiment in preparation that involves the viewing of edited clips, extracted from horror and comedy Hollywood movies. Each edited clip contains photorealistic continuity errors distributed across the total duration of the clip.

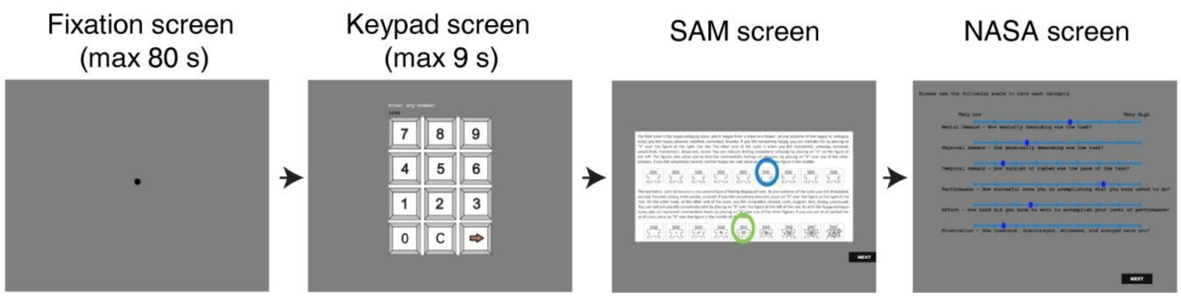
Trials began with an instruction screen (not shown), followed by a flicker sequence alternating between an original and a modified image (240 msec each). In the example shown here, the original image (character with a beige hat) and modified image (gray hat) alternated with interlaced medium gray fields (80 msec). The trial ended when the observer pressed the keyboard response key (indicating reaction time and detection), or 30 sec elapsed (failed detection), whichever came first. Subjects clicked with the mouse in the region of the screen where they perceived the modification.



Mental Workload

In this experiment an instruction screen indicating the task to perform preceded each trial. Participants were instructed to look at the center of a black circular target (0.05º diameter) presented at the center of the monitor's screen, on a 50% grey background, in each task. During the Control task, participants performed no mental arithmetic (i.e. they fixated the central target solely). During the Easy task, participants were instructed to count forwards mentally, as fast and accurately as possible, in steps of 2 starting at a random 3-digit even number (same random numbers for each subject). During the Difficult task, participants were instructed to count mentally backwards, as fast and accurately as possible, in steps of 17 starting at a random 4-digit number (same random numbers for each subject). A numeric keypad appeared on the screen, and asked the participant to enter a number at three random times during each trial, and then again at the end of the trial (minimum of 15 sec and maximum of 80 sec between keypad screens). Participants filled in subjective questionnaires (NASA-TLX and SAM) after the last keypad. All the keypad buttons, rating slides, and mannequin options were programmed to be selected via mouse button press.

The results from this experiment were published this year: "Task Difficulty in Mental Arithmetic Affects Microsaccadic Rates and Magnitudes". Siegenthaler, Costela et al., European Journal of Neuroscience, 2014.



Bar Acuity

This experiment involves a vernier task in which a pair of vertically oriented and aligned bars flickered with varied duty-cycles for a total duration of 600 ms. Every cycle of flicker had a constant off-time of 16 ms whereas the on-time varied between 17-500 ms. The subjects' task was to determine if the bottom bar was shifted towards the left or right compared to the top bar. The results of this experiment were presented in Vision Sciences Society 2014 meeting ("The Broca-Sulzer effect contributes to visual acuity", Rieiro, Costela et al., 2014).

Aging Snakes

This experiment is currently in preparation and is a follow-up from the study "Microsaccades and blinks trigger illusory rotation", Otero-Millan et al., 2012. The figure below explains the display of stimuli. **A.** Set of disks for the main experimental condition (Rotating Snakes Illusion). The "snakes" will appear to rotate. ***B***, An epoch of a trial from the main experimental condition. Top, Schematic representation of the stimulus, which will not change over time. Middle, Perception of the stimulus: the disks intermittently rotate and stop. Bottom, Subjects' report of their perception. ***C***, Set of disks to be used in the control condition (physical rotation). The "snakes" will appear stationary. ***D***, An epoch of a trial from the control condition. Top, Schematic representation of the stimulus, which will physically rotate and stop in intermittent fashion. Middle, Perception of the stimulus: subjects with unimpaired perception of physical motion will identify the stimulus rotation easily. Bottom, Subjects' report of their perception. ***A***, ***C***, Fixation dot not to scale. ***B***, ***D***, Fixation dot and "snakes" not to scale.