Supplementary Material – ECVP 2021

Smooth Pursuit Eye Movements Alter the Contrast Sensitivity for Drifting Achromatic Gratings

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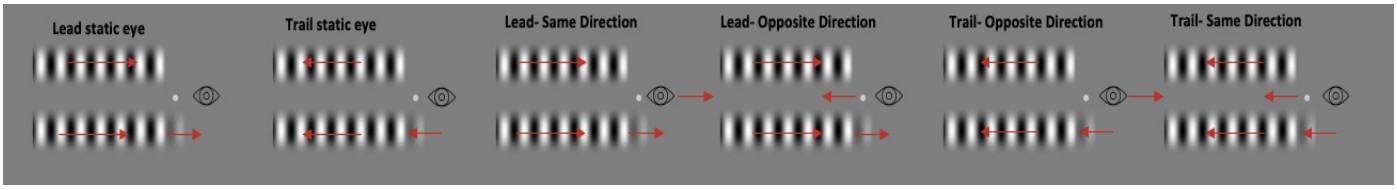

Figure 1. Stimulus configurations. The first two configurations represent the conditions where the eyes were steady on a fixation point. According to the drift direction of the gratings, the target could either be at the leading or at the trailing edge of inducer motion. The last four configurations represent the conditions where the observers performed smooth pursuit eye movements. Same direction refers to the conditions that the drift direction of the gratings was the same as the pursuit. Opposite direction refers to the conditions that the drift direction of the gratings was opposite to the pursuit. During pursuit, the grating envelopes moved in parallel to the pursuit target. Thus, if the observers tracked the pursuit target accurately, then, the stimuli triggered the same retinal-image motion as in the fixation conditions.

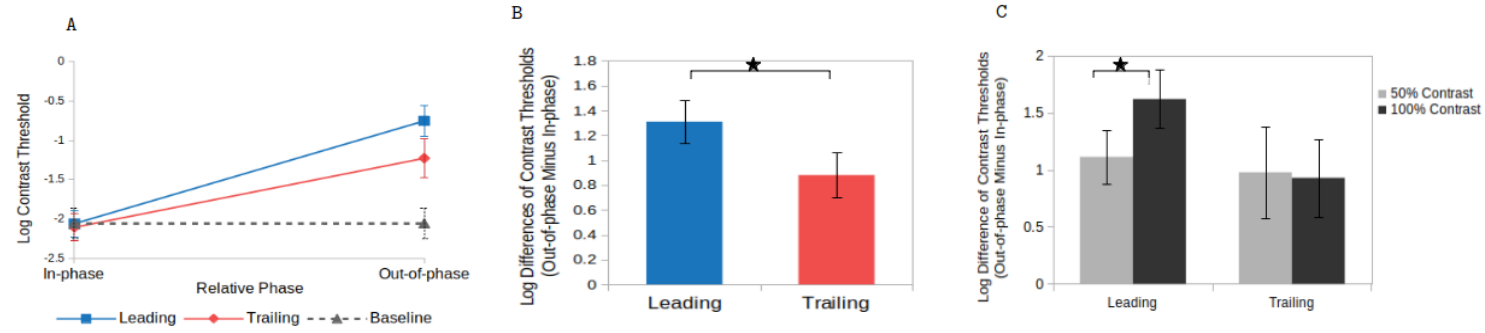

Figure 2. The phase-dependent modulation of the contrast sensitivity while the eyes were steady on a fixation point and the grating envelopes were stationary. A) The phase-dependent modulation of contrast sensitivity for the target positioned at the trailing (red line) and leading (blue line) edges of motion. Log contrast thresholds are plotted as a function of the relative phase. The dashed lines represent the baseline (no inducer) condition. The detectability of the target was impaired when the target and inducer were out of phase both at the leading and the trailing edges (*N*= 10). B) Mean differences between the out-of-phase and in-phase log contrast thresholds. The phase-dependent modulation was higher at the leading (blue bar) than at the trailing (red bar) edge of motion. C) The effect of inducer contrast on the phase-dependent modulation. Mean differences between the out-of-phase and in-phase log contrast thresholds. Dark gray bars represent the conditions with 100% Michelson contrast inducer gratings, and light gray bars represent the conditions with 50% Michelson contrast inducer gratings. The difference between the out-of-phase and the in-phase contrast thresholds was only reduced at the leading edge. The phase-dependent modulation is more dependent upon the inducer contrast at the leading edge, increases with the inducer contrast, and invariant to the changes in the inducer contrast at the trailing edge (*N*=4). Error bars indicate +/- 1 SEM.

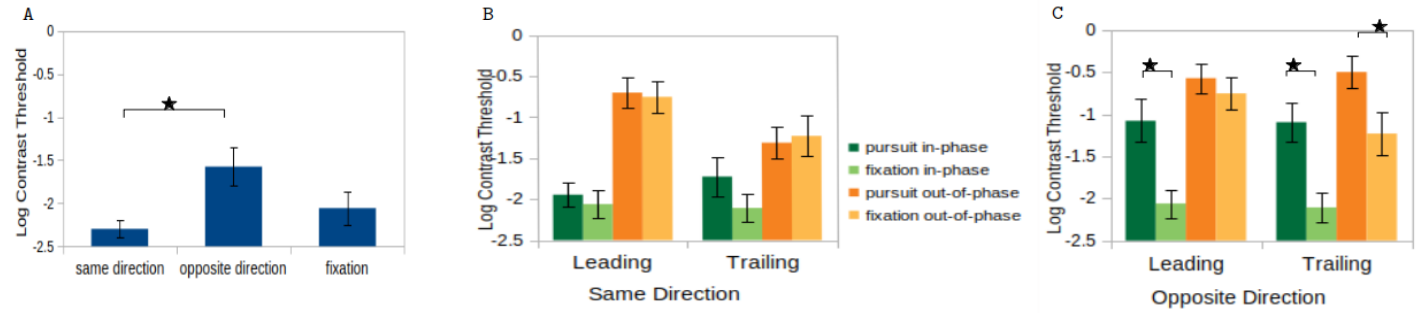

Figure 3. The phase-dependent modulation of the contrast sensitivity during pursuit (*N* = 10). A) Mean contrast thresholds of the baseline (no inducer) conditions. Contrast thresholds were elevated for the targets drifting in the opposite direction to the pursuit compared to those drifting in the same direction. B-C) The green bars represent the in-phase conditions, whereas the yellow bars represent the out-of-phase conditions. Darker bars represent the pursuit conditions, and the lighter bars represent the fixation conditions. Same direction refers to the conditions, where the gratings drifted in the same direction as the pursuit. Opposite direction refers to the conditions, where the gratings drifted in the direction opposite to the pursuit. B) Contrast thresholds in the pursuit conditions in which the target drifted in the same direction as the pursuit were not different from those in the fixation conditions. C) When the target drifted in the direction opposite to the pursuit, contrast thresholds were elevated compared to those in the fixation. This effect occurred in all target and relative phase conditions except for the out-of-phase target at the leading edge, also implying a decrease in the phase-dependent modulation at the leading edge. Error bars indicate +/- 1 SEM.

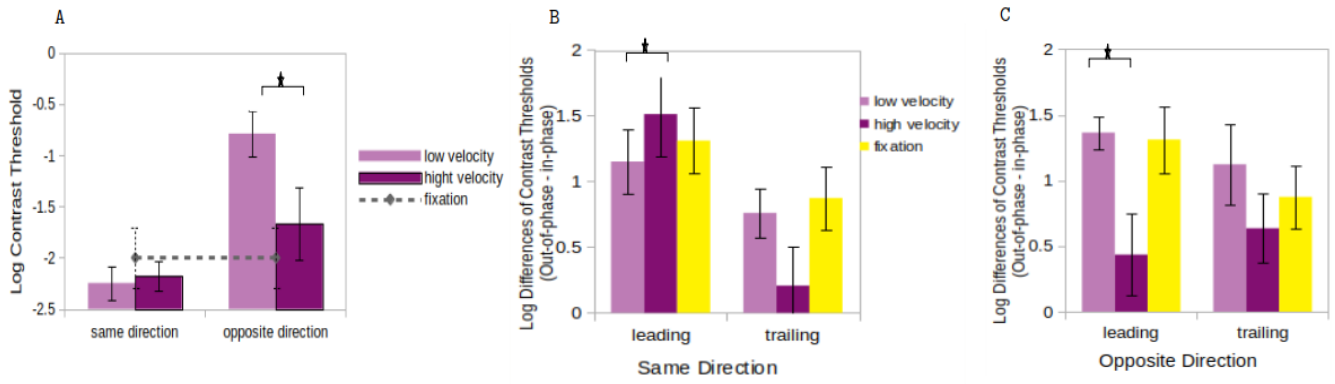

Figure 4. The effect of pursuit velocity on the contrast thresholds and the phase-dependent modulation. A) The effect of the pursuit velocity on contrast thresholds in the baseline conditions (no inducer). Mean contrast thresholds at high (10.56º/s) and low (4.29º/s) pursuit velocity conditions. When the target drifted in the opposite direction to the pursuit, contrast thresholds decreased with increasing pursuit velocity. Dark purple bars represent the high pursuit velocity, whereas lighter bars represent the low pursuit velocity conditions. The dashed line represents the fixation condition. B-C) The effect of the pursuit velocity on the phase-dependent modulation. Purple bars represent the pursuit conditions (i.e. light purple indicates the low velocity, whereas dark purple indicates the high pursuit velocity). B) When the gratings drifted in the same direction as the pursuit, the difference between the in-phase and out-of-phase thresholds increased with increasing pursuit velocity. C) When the gratings drifted in the direction opposite to the pursuit, the difference between the in-phase and out-of-phase thresholds decreased with increasing pursuit velocity. Error bars indicate +/- 1 SEM.