
The effect of short-term monocular deprivation depends on the duration of deprivation: evidence from binocular rivalry and binocular combination.

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Résumé

The ocular dominance (OD) shift observed after short-term monocular deprivation (MD) is a widely used measure of visual homeostatic plasticity in adult humans. Binocular rivalry and binocular combination techniques are used interchangeably to characterize homeostatic plasticity, sometimes leading to contradictory results. Here we directly compare these two techniques by investigating the impact of the MD duration on OD in adult humans.

We measured the effect of 15 minutes and 120 minutes of MD in 25 adult volunteers. OD was assessed either by binocular rivalry (BR, orthogonal gratings: size 2°x2°, SF: 2 cpd, contrast 60%) or binocular phase combination (BC, sinusoidal gratings, size: 3.5°x3.5°, SF: 1 cpd, base contrast: 50%). Each subject underwent four deprivation sessions (2 durations x 2 conditions) in separate days and in a counterbalanced order.

We found that the effect of MD exhibited a strong dependence on the deprivation duration (BR: 15min vs. 120min: $F(1,24)=34.146$ $h^2=0.302$, $p < 0.001$; BC: $F(1,24)=49.080$ $h^2=0.295$, $p < 0.001$), with longer deprivation inducing a stronger and longer-lasting effect for both techniques. We found that the mean OD measurements post-deprivation correlate strongly across participants for both durations (15 minutes: $r=0.74$, $p < 0.001$; 120 minutes: $r=0.654$, $p < 0.001$), while the effect of MD does not (15 minutes: $r=0.173$, $p=0.41$; 120 minutes: $r=0.235$, $p=0.26$).

Taken together, our results show that the effect of short-term MD strongly depends on the duration of deprivation for both BR and BC, but that each technique may capture different aspects of the effect of MD on OD.

Mots-Clés: ocular dominance plasticity, binocular rivalry, binocular combination, bistable perception, short term monocular deprivation

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