

Influence of central and peripheral natural retinal defocus on multifocal electroretinogram responses

- [Satish Kumar Gupta](#)
- [Ranjay Chakraborty](#)
- [Pavan Kumar Verkicharla](#)
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Abstract

Purpose: As the mechanisms regulating ocular growth are known to operate locally in a selective manner across the retina, we investigated the effect of naturally occurring retinal defocus on the multifocal electroretinogram (mfERG) responses at central to peripheral retina in emmetropes and myopes.

Methods:

A total of 20 emmetropes ($\pm 0.50D$) and 24 low myopes ($-0.50D$ to $-6.00D$) participated. Central and peripheral refraction using an open-field autorefractor and mfERG responses using a Metrovision electrophysiology stimulator was obtained for right eyes. The local N1, P1, and N2 components of mfERG waveform were compared with the best-matched natural defocus at its corresponding locations: fovea (0°), horizontal ($\pm 5^\circ$, $\pm 10^\circ$, and $\pm 25^\circ$) and vertical meridians ($\pm 10^\circ$ and $\pm 15^\circ$).

Results:

The mean mfERG amplitudes were similar in both emmetropes and myopes ($p > 0.05$) with maximum at fovea. Myopes reported reduced mfERG amplitudes than emmetropes at peripheral eccentricities. Mean differences in N1, P1 and N2 amplitudes (nV/deg^2) between emmetropes and myopes were -100 ± 16 , 161 ± 26 , and -150 ± 31 , respectively at temporal 25° ($p < 0.05$) and -128 ± 11 , 145 ± 11 , and -130 ± 10 , respectively at nasal 25° ($p < 0.05$). The mfERG responses did not show any trend with relative peripheral hyperopia or myopia at peripheral eccentricities ($p > 0.05$). The peripheral median mfERG amplitudes were reduced by 44-70%, than foveal, despite both regions experiencing an equal magnitude of natural defocus along both meridians.

Conclusions:

Myopes exhibited reduced mfERG amplitudes in peripheral retina across all types and magnitudes of natural defocus, indicating that peripheral retinal responses may not be affected with natural defocus for upto measured peripheral meridians ($\pm 25^\circ$).