Glare-induced changes in visual performance in myopic and emmetropic subjects

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Glare – “the sensation produced by luminance within the visual field that is sufficiently greater than the luminance to which the eyes are adapted to cause annoyance, discomfort or loss in visual performance and visibility” (Illuminating Engineering Society of North America, ESNA)

Disability glare - the effect of stray light in the eye whereby visibility and visual performance are reduced.

Discomfort glare - glare that produces discomfort. It does not necessarily interfere with visual performance or visibility.

Veiling, dazzle, and scotomatic glare

Blinking, squinting, ocular aversion and fatigue
Glare and Myopia

Under mesopic viewing conditions relative contrast sensitivity for positive and negative contrast is different in myopes and emmetropes.

Mean contrast thresholds of myopes (M) and emmetropes (E) for negative (-) and positive (+) contrast.

Such contrast sensitivity profile at low luminance level may be important when performing visual tasks especially if glare is also involved (e.g. night driving with glare from oncoming traffic).

Therefore, we expected that myopes will be more affected by glare at mesopic environment and we studied comparatively:

(1) glare recovery time,

(2) subjective discomfort glare, and

(3) glare-induced changes in pressure pain threshold (PPT).
Methods - general

Response

80 cm

Monitor

α = ~19°

Flash

60 cm

α = ~ 8,5°

Chin and head rest

α = ~ 9°

Response pad

PPT

Glare stimulus
17 subjects participated in the study
— 6 emmetropes and
— 11 myopes
- spherical equivalent of myopia:
  -0.5 D to -4.5 D

All subjects had normal corrected visual acuity and wore their normal prescription
Each eye was studied separately

Screen luminance - ~ 2.5 cd/m²
Ambient room illumination - ~ 0.11 lx
Flash duration/ energy - 30 μs, 180 mJ
Glare recovery time is longer in myopes as compared to emmetropes.
Experimental procedure

Flashes were presented as a train of 50 within approximately 1 s

36 subjects participated in the study -
- 13 emmetropes
- 23 myopes (with spherical equivalent of myopia from −1.00 D to −8.25 D)
Compared to myopes, the emmetropes experience less glare discomfort as reflected by their DeBoer rating.
Glare-induced changes in pressure pain threshold

The dark screen was ~ 0.04 lx,

The bright field was ~ 345 lx

25 subjects participated:
• 10 emmetropes
• 15 myopes (-1.5 D to -7.0 D)
Pressure pain threshold over the belly of the *orbicularis oculi* muscle in myopic subjects increases immediately after a glare inducing stimulus while in emmetropes there is even a trend for changes in the opposite direction.
Conclusions

1. Under mesopic conditions myopic subjects are more vulnerable to glare which is indicated by their longer glare recovery time and higher subjective glare discomfort.

2. The squinting response in myopic subjects while improving initially visual performance, in the long run, may be responsible for the development of the symptoms accompanying discomfort glare.

3. Myopic and emmetropic subjects seem to behave differently with respect to their visual performance under mesopic conditions. This should be taken into consideration when performing visually demanding tasks in low luminance environment.
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- Discomfort glare – Mark Saad,
- Pressure pain thresholds – Jacqueline Chung

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