

Smartphone making your eyes tired?

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Several reports indicate that prolonged viewing of mobile devices and other stereo 3D devices leads to visual discomfort, fatigue and even headaches. According to a new *Journal of Vision* study, the root cause may be the demand on our eyes to focus on the screen and simultaneously adjust to the distance of the content.

Scientifically referred to as vergence-accommodation, this conflict and its effect on viewers of stereo 3D displays are detailed in a recent *Journal of Vision* article, *The Zone of Comfort: Predicting Visual Discomfort with Stereo Displays*.

"When watching stereo 3D displays, the eyes must focus — that is, accommodate — to the distance of the screen because that's where the light comes from. At the same time, the eyes must converge to the distance of the stereo content, which may be in front of or behind the screen," explains author Martin S. Banks, professor of optometry and vision science, University of California, Berkeley.

Through a series of experiments on 24 adults, the research team observed the interaction between the viewing distance and the direction of the conflict, examining whether placing the content in front of or behind the screen affects viewer discomfort. The results demonstrated that with devices like mobile phones and desktop displays that are viewed at a short distance, stereo content placed in front of the screen — appearing closer to the viewer and into the space of viewer's room — was less comfortable than content placed behind the screen. Conversely, when viewing at a longer distance such as a movie theater screen, stereo

content placed behind the screen —appearing as though the viewer is looking through a window scene behind the screen — was less comfortable.

"Discomfort associated with viewing Stereo 3D is a major problem that may limit the use of technology," says Banks. "We hope that our findings will inspire more research in this area."

The team of investigators suggests future studies focus on a larger sample in order to develop population-based statistics that include children. With the explosion of stereo 3D imagery in entertainment, communication and medical technology, the authors also propose guidelines be established for the range of disparities presented on such displays and the positioning of viewers relative to the display.

"This is an area of research where basic science meets application and we hope that the science can proceed quickly enough to keep up with the increasingly widespread use of the technology," adds Banks.

Provided by Association for Research in Vision and Ophthalmology

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