Some scientists believe that we could reduce the amount of light used in many commercial and industrial applications, while maintaining similar visual performance, if the applications used light sources that produced smaller pupil sizes. This argument is based on the belief that smaller pupil sizes will improve the performance of visual tasks, even with less retinal illuminance, because smaller pupils lead to a greater depth of field and a better quality retinal image. This Lighting Research Center (LRC) study tested this belief under realistic task and lighting conditions.

Experimental Conditions
Two groups of subjects, one aged 18 to 28 years and a second aged 61 to 78 years, performed a Landolt ring task. For this task there were

- Eight different gap sizes (1.5 to 14 minutes of arc),
- Two different illuminances (344 and 500 lux), and
- Two lamp spectra: scotopic/photopic ratios of 1.3 and 2.1 having correlated color temperatures (CCT) of 3000K (warm) and 6500K (cool), respectively.

Results
For both age groups

- Illuminance and lamp spectrum modify pupil size,
- Speed and accuracy of task performance were determined by Landolt ring gap size and, to a much lesser extent, by illuminance,
- Lamp spectrum does not affect task performance, and
- The lamp spectrum with the higher scotopic/photopic was ratio perceived as brighter at the same illuminance.

Conclusion
There is no support for the belief that smaller pupil sizes lead to better task performance under realistic task and lighting conditions.

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