The benefits of reading outdoors

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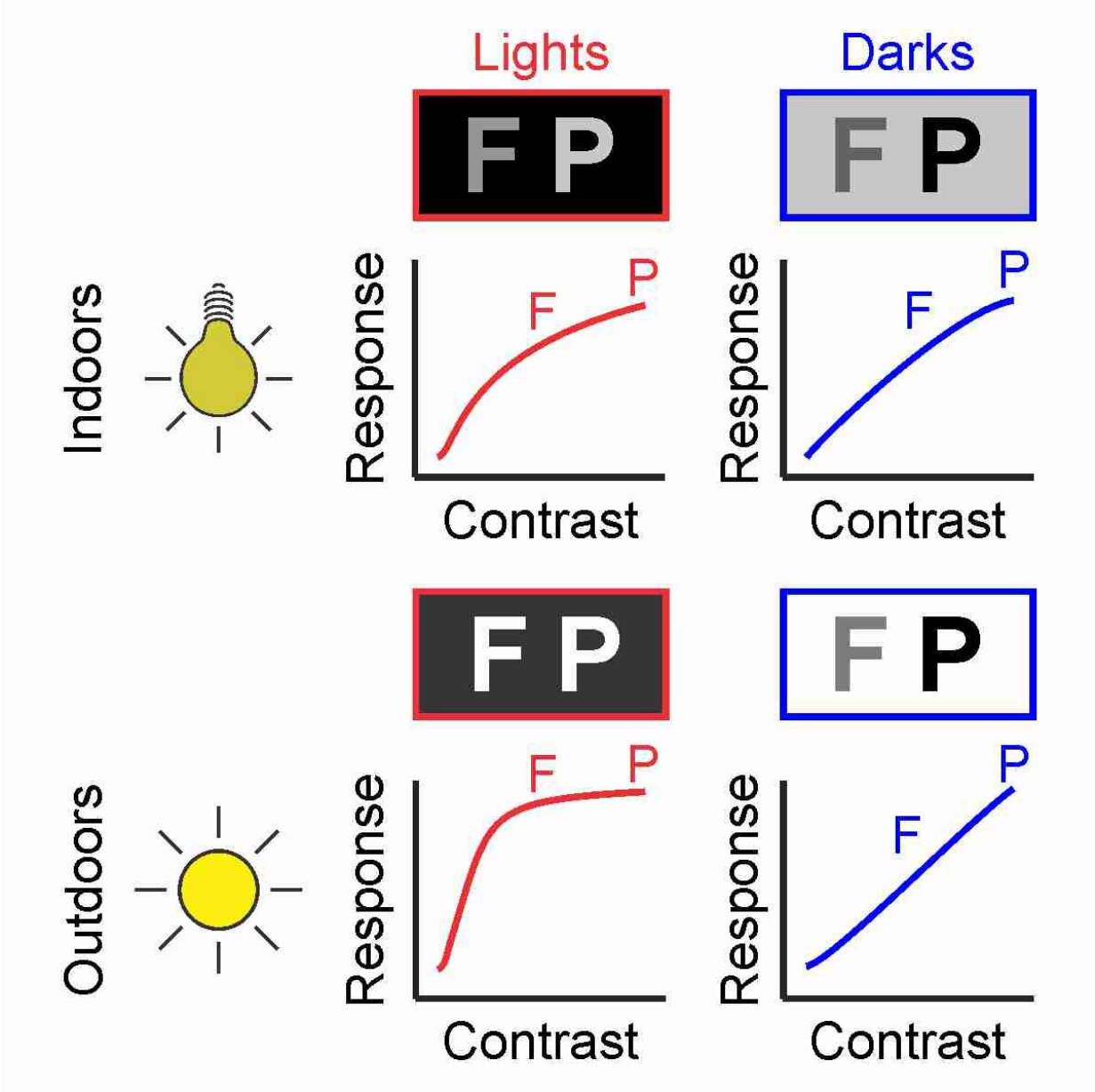

Credit: Jose Manuel Alonso

Contrast is a sensory property that makes stimuli stand out. Writers, designers, and musicians all use contrast to emphasize striking differences in text, visual displays and melodies. In vision, luminance contrast describes the difference in light intensity between a stimulus and its surround.

It is what makes a dark letter easier to read than a gray letter on a white page. Vision research has operated for decades under the assumption that luminance contrast does not change with light intensity. That is, a dark letter in a white page is assumed to have the same contrast outdoors (under the brightest light) than indoors (under the dimmest light). Such contrast constancy seemed obviously important. How could it be otherwise? If contrast was not preserved across different light intensities, a black letter indoors would become white outdoors because it reflects much more light.

State University of New York College of Optometry researcher Hamed Rahimi-Nasrabadi, Ph.D. and collaborators now demonstrate that this decades-old assumption is incorrect and can cause important measurement errors that have general implications in basic research, the eye clinic and the multiple disciplines that depend on accurate estimates of visual contrast.

For example, it can lead to inaccurate measurements of visual sensitivity in eye disease, the rendering of contrast in medical images or the architectural design of spaces for the visually impaired and elderly. The new findings demonstrate that, as visual acuity, contrast sensitivity is strongly dependent on the amount of light. Increasing the amount of light shifts the contrast sensitivity for dark and light stimuli (i.e. stimuli darker or lighter than their surround) in opposite directions. It improves the discrimination of the darkest contrasts (e.g. making it easier to see

subtle differences in eye shadow) while severely impairing the discrimination of the brightest contrasts (e.g. making it more difficult to discriminate luminance differences between the brightest specular reflections of a shiny car). The opposite shifts of dark and light contrast with light intensity can be demonstrated in neurons of the visual cortex, natural scenes, and appear to be well preserved across different species of mammals. The new findings can be also used to improve current algorithms of image processing and metrics of visual contrast.

Findings from the investigation conclude that you can now feel good when you decide to read your favorite book outdoors. You can say that it is scientifically proven that visual contrast increases outdoors and, therefore, reading under bright light stimulates your visual brain more effectively, allows you to see the letters better, and helps your eyesight.

The study is published in *Cell Reports*.

More information: Image luminance changes contrast sensitivity in visual cortex, *Cell Reports*, 2021.

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