

illustrated in Figure 6. The relative footcandles for equal visibility shown in Table 1 are in agreement with this. In other words, dark, low-reflectance tasks can be given a reasonable visibility level and can be performed with relative ease if higher levels of illumination are made available. However, these added footcandles will not produce excessive brightnesses because of the inherently low reflectances of these more difficult tasks.

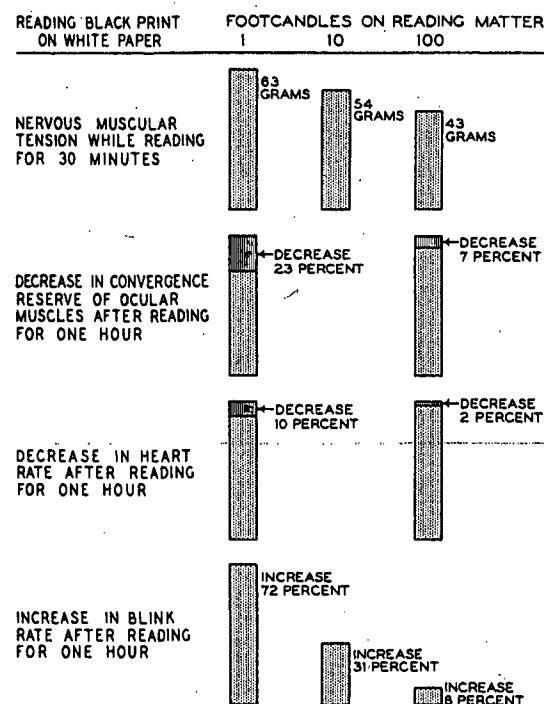


Figure 6. A summary of the results of several researches relating to ease of seeing, as evaluated by four of the effects of visual effort.

IV. Quality of Lighting

As the brightness of a visual task is increased by higher footcandle levels the eyes become more sensitive in their ability to see. It follows that if they are more sensitive foveally, they should become more sensitive peripherally. Therefore, the quality of lighting—the distribution of light upon the task and its surroundings and the distribution of brightness throughout the visual field—becomes increasingly important. Our tolerance of brightness in areas outside of the task

decreases as footcandles go up.²⁶⁻²⁸ These brightnesses and the relationships among them contribute favorably or unfavorably to the seeing conditions. They may influence the visibility of the task or they may result in decreased ease of seeing. Brightness and color are primary factors in perception, and brightness contrast is very generally of major importance in the visibility and recognition of details of objects. In other words, within the visual task, brightness contrast is a favorable factor in seeing. However, when the brightness of the central field or visual task differs greatly from that of the surrounding field, unfavorable effects on

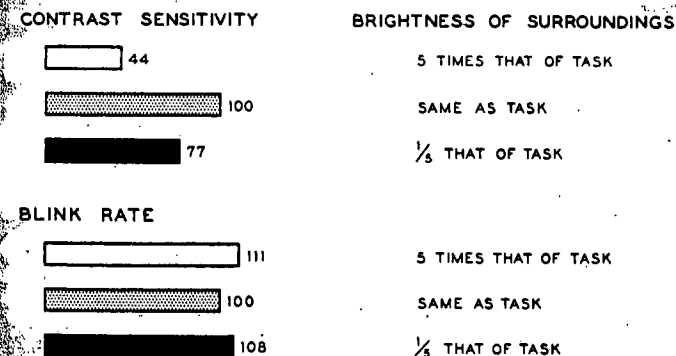


Figure 7. The effects of brightness of surroundings upon contrast sensitivity and blink rate, indicating the desirability of uniformity of brightness.

seeing are produced. Large brightness variations in the peripheral field also are undesirable. In this respect, brightness contrast is an unfavorable factor in seeing.

In Figure 7 are shown the effects of the brightness of surroundings upon contrast sensitivity²⁹ (ability to see) and blink rate³⁰ (ease of seeing). Sensitivity of the visual sense is greatest when the brightness of the surroundings is the same as that of the task. Similarly, ease of seeing is optimum when the work and surround brightnesses are the same. Studies of visual acuity³¹ and precision of seeing³²

²⁹ P. G. Nutting, Effects of brightness and contrast in vision, *Trans. Illum. Eng. Soc.*, 11, 339 (1916).

³⁰ J. C. Holladay, The fundamentals of glare and visibility, *J. Opt. Soc. Amer.*, 12, 271 (1926).

³¹ W. Harrison, What is wrong with our 50-footcandle installations?, *Trans. Illum. Eng. Soc.*, 32, 208 (1937).

³² W. Cobb, The effect on foveal vision of bright surroundings—IV, *J. Exptl. Psychol.*, 1, 640 (1916).

³³ M. Luckiesh and F. K. Moss, Brightness contrasts in seeing, *Trans. Illum. Eng. Soc.*, 34, 574 (1939).

³⁴ R. J. Lythgoe, The Measurement of Visual Acuity, Special Report No. 173, Medical Research Council, H. M. Stationery Office, London, 1932.

³⁵ W. Cobb and F. K. Moss, The effect of brightness on the precision of visually controlled operations, *J. Franklin Inst.*, 199, 507 (1925).