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A SIZE-CONTRAST ILLUSION WITHOUT PHYSICAL SIZE DIFFERENCES

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A stereogram of equally sized circles produced a size-contrast illusion in 11 of 12 observers, providing evidence that the illusion is of central origin and occurs sometime after the operation of the constancy mechanism.

One of the size-contrast illusions best known is the Ebbinghaus figure (frequently referred to as Titchner's circles). In this figure a circle surrounded by small circles is seen as larger than a circle surrounded by large circles. Although frequently reproduced in elementary texts, very little work has actually been done on this configuration, and an adequate explanation of its effect is still lacking.

Ohwaki (1960), Springbett (1961), Day (1961), and Schiller and Wiener (1962) have shown, however, that the illusion is probably not of retinal origin, since the test and inducing elements can be placed into different eyes and the illusion still seen in the fused image. Further evidence that central processes may be involved is found in the demonstration shown in Figure 1. When stereoscopically fused the top configuration appears as a central disc with four surrounding circles imaged some distance behind the plane of the central test circle; the lower configuration has the central disc at the same stereoscopic distance as the test disc in the first group, but the surrounding circles are seen as considerably closer. By the operation of size constancy the surrounding circles that are apparently closer appear smaller than the surrounding circles that are apparently farther away, although all of the circles in the figure are physically the same size.

The relevant question has to do with the apparent size of the central circles in Figure 1, those circles which are stereoscopically at the same distance. Twelve observers were used, all with normal or corrected visual acuity of 20/25 or better and with normal stereopsis as measured on a Keystone telebinocular. They viewed the figures through a lens stereoscope and were asked to judge the relative size of the central discs in a forced-choice paradigm. After the first judgment, the left and right views were interchanged so as to reverse the disparities and the

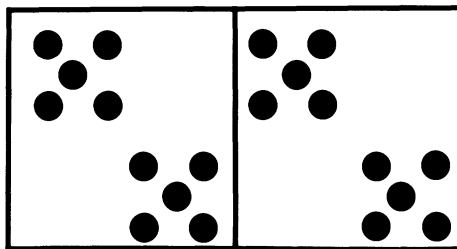


Fig. 1. A stereogram that produces a size-contrast illusion without physical size differences

subjects were required again to judge the relative size of the central circles. In 11 out of the 12 observers, the central disc surrounded by the apparently larger circles appeared smaller than the central disc surrounded by the apparently smaller circles. This is significant, with $p < .01$ by a sign test.

This finding would seem to indicate that this size-contrast illusion is not only of central origin but occurs sometime after the operation of the constancy mechanism. Although there is no immediate explanation for the phenomenon, it is interesting that Gregory's theory of illusions (1966) requires that illusionary distortions occur at the same level or after the operation of constancy scaling. This demonstration indicates that size-contrast illusions may occur *beyond* that level.

Notes

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