A comment on "The apparent size of 'projected' afterimages under conditions where size-constancy holds"

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Furedy and Stanley (1970), in a recent paper in this journal, reported testing Emmert's law by scaling apparent size and distance. In a first experiment, Ss made paired comparisons of the apparent diameters of disks, or of circular afterimages, presented at or projected to different distances. In a second experiment, Ss estimated the diameter (in inches) of circular afterimages and the distance (in feet) of the projection screen. In both experiments, viewing was monocular, in a "feebly illuminated" room. From the outcome of the first experiment—paired comparisons of the apparent relative diameters of the disks corresponded to their physical relative diameters in 98.5% of cases—Furedy and Stanley concluded that size constancy prevailed in their viewing situation. From the outcome of the second experiment—estimated distance corresponded fairly closely to physical distance, while estimated diameter of afterimage increased only slightly with increasing distance—Furedy and Stanley concluded that Emmert's law does not (always) hold under conditions in which size constancy prevails.

This conclusion does not follow as a necessary consequence from their data, and an alternative interpretation is available. Their argument depends, first, on the assumption that size constancy is demonstrated by the paired-comparison data from Experiment 1. But, while those data generate an ordinal scale, they do not give an interval or ratio scale of apparent size. The high percentage of occasions on which the larger disk was identified tells us that Ss could discriminate among the variously sized disks presented at various distances, but does not tell *how* different their sizes looked from each other. If the apparent size of objects decreases with

distance, but not as rapidly as their retinal-image size decreases, it is quite possible for Ss to identify the physically larger of two objects consistently while failing to exhibit size constancy. Just such a situation may have prevailed in the Furedy and Stanley study, where viewing was monocular with a low level of illumination, reducing cues to distance.

This possibility gains plausibility from the results of a study by Irwin (1969), in which Ss estimated the height (in inches) of rectangles, and of rectangular afterimages, under two viewing conditions, one of which presented fewer distance cues than the other. When size constancy was maintained, Emmert's law also held; when size constancy was eliminated by reducing distance cues, so that size judgments depended only on retinal-image size, Emmert's law no longer held. Furedy and Stanley's data for estimation of afterimage diameter resemble Irwin's data for reduction viewing much more closely than they do his data for normal viewing; had they obtained comparable data for real objects, a failure of size constancy similar to that obtained by Irwin might have been observed.

A second assumption on which Furedy and Stanley's conclusion depends is that distance perception was normal, as indicated by the correspondence between estimated and physical distance in Experiment 2. We have recently summarized evidence for the proposition that apparent distance in normal full-cue indoor viewing is an accelerated function of distance (Teghtsoonian & Teghtsoonian, 1969); for a ratio of maximum to minimum distance roughly comparable to that used by Furedy and Stanley, Künnapas (1960) reported a power relation between

apparent and physical distance with an exponent of 1.47. On the other hand, under reduced viewing conditions, Künnapas (1968) reports much lower exponents, .8-1.0. In view of these findings, Furedy and Stanley's scale suggests not normal, but reduced-cue, distance perception.

In summary, Furedy and Stanley have explored a promising approach and have presented some interesting data, but their rejection of Emmert's law is premature. An alternative hypothesis is available to account for their results: Their viewing situation presented reduced cues to distance, and the apparent size of afterimages was correspondingly less sensitive to manipulations of distance. This alternative is supported, first, by the fact that their data on judged disk size do not rule out the possibility of less than constancy, and second, by the fact that their data on judged distance do not indicate normal full-cue distance perception. This hypothesis reconciles Furedy and Stanley's findings with those of Irwin (1969), who in his more complete study demonstrated that the availability of distance cues has the same influence on apparent size of real objects as on apparent size of afterimages.

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