More data and arguments for partial failure of Emmert's law under conditions of size constancy and veridical distance perception: Rejoinder to Teghtsoonian's comments*

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According to Dr. Teghtsoonian (Teghtsoonian, 1971), our recent examination of Emmert's law (Furedy & Stanley, 1970) depends on two assumptions which we have accepted as true, but which may both be false. In that case, our data would not, indeed, bear out our conclusion that the law, in terms of "strict proportionality" of apparent size to distance, does not "hold under conditions where both complete size constancy obtains and distance estimates are veridical [Furedy & Stanley, 1970, p. 167]." However, the essence of the present rejoinder is that, of the two assumptions which Dr. Teghtsoonian considers, further data suggest that it is likely that the first assumption was tenable, while several direct quotes from our 1970 paper indicate that the second assumption that is attributed to us is an assumption which we did not make.

The first assumption which Dr. Teghtsoonian considers is that of *size constancy*, that "size constancy is demonstrated by the paired-comparison data from Experiment 1 [Teghtsoonian, 1971]." We agree that, very strictly speaking, the paired-comparisons data of Experiment 1 (Furedy & Stanley, 1970) do not demonstrate size constancy, although the high percent frequency (98.5) at which the larger object was judged larger did suggest to us at the time that size constancy probably did obtain in our Experiment 2. On the other hand, Irwin's (1969) data, which Dr. Teghtsoonian quotes as constituting evidence against the tenability of the size-constancy assumption in our experiments, are unlikely to be directly relevant, because certain important physical

conditions (such as level of illumination) of Irwin's study did not even approximate those of our experiments. Rather than argue further, however, we agree with Dr. Teghtsoonian that "comparable data for real objects [Teghtsoonian, 1971]" would be more fruitful for resolving this issue, and portions of a recently performed experiment¹ do provide such data. The data are based on magnitude estimations by 14 Ss of direct images placed at the same physical distances as those used for the furthest four points (72, 90, 108, and 126 in.) in Furedy and Stanley's (1970) Experiment 2. The diameters of the direct images at each distance exceeded (by about 39%) those used in Experiment 1 (the paired-comparisons direct-image experiment), but the general level of illumination was the same, and the luminances of the direct images were matched in terms of apparent brightness with those of the afterimages used in the two

experiments of Furedy and Stanley (1970). The results of the direct-image magnitude estimations are shown in Fig. 1. A statistically reliable, but probably psychologically meaningless, outcome is the overestimates of the direct image diameters at each of the four distances. The more important outcome is that the slope of the line of best fit for the apparent-size direct-image function in Fig. 1 was 40 deg 20 min, which does not differ from the 40-deg slope of the theoretical function predicted on the basis of strict proportionality between direct-image size and physical distance, $t < 1$. Hence, while Dr. Teghtsoonian is correct in pointing out that our original size-constancy assumption—the claim that strict size-distance proportionality obtained for direct images—was not completely defensible in terms of the data we previously gathered, the present data do suggest that, under our low-illumination conditions, size constancy did indeed hold.

The second assumption that is attributed to us, and on which our conclusion about Emmert's law is said to depend, is that "distance perception was normal [Teghtsoonian, 1971]." However, we assumed nothing about "normal" distance perception. We were concerned with *veridical* distance perception, as is clearly indicated by the following quotes from our paper (Furedy & Stanley, 1970): (1) "distance estimates were completely veridical [p. 165]"; (2) "distance estimates are veridical [p. 167]"; (3) "clearly veridical judgments of distance [p. 167]." So, in terms of what we wrote, our assumption was not that distance perception was "normal," but that it was veridical, "as indicated by the correspondence between estimated and physical distance [Teghtsoonian, 1971]," and, as this last quote indicates, Dr. Teghtsoonian agrees with us that the veridical perception of distance assumption was true in our experiment. The normal perception of distance assumption which she raises, on the other hand, was not one that we made.

To summarize, then, we have found Dr. Teghtsoonian's comments to be valuable, but the data and arguments we have presented in this rejoinder suggest that our original conclusion should stand: Emmert's law did fail in the sense of size-distance proportionality under conditions of size constancy and veridical distance perception. This is not to say, of course, that *other* assumptions which we made and which Dr. Teghtsoonian has not criticized may not turn out to be false, in which case we *would* want to modify our 1970 conclusion. At

Fig. 1. Mean apparent direct-image sizes as a function of physical distance. (Vertical lines crossing each point indicate 1 sigma unit at that distance.)

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present, however, we consider that Dr. Teghtsoonian's comments do not force such a modification, although we are indebted to her for help in both enabling us to clarify our conclusion regarding Emmert's law as regards veridical distance perception, and to base our conclusion about size constancy on more directly relevant data.

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NOTE

1. Stanley, G., & Furedy, J. J. A comparison of projected direct- and afterimages as a function of distance. In preparation.

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