Comment on Stanley's Paper "Magnitude Estimates of Distance Based on Object-Size"

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Stanley (1967) had subjects make magnitude estimates of size and distance based on size. He found that the distance estimates were larger than distances predicted from the size estimates together with the assumption that the ratio of perceived size to perceived distance is proportional to retinal image size (the size-distance invariance hypothesis). In discussing this result Stanley indicates that his prediction depends on the assumption that subjective space is Euclidean. In stating that his results "are congruent with the notion that the subjective space is non-Euclidean," he appears to assume the converse, i.e., that the failure of his prediction implies the space is non-Euclidean. Neither assumption is correct. The question of the intrinsic geometry of the visual space is independent of the question of the validity of the size-distance invariance hypothesis. Further, Stanley's attempt to test the hypothesis that the visual space is hyperbolic by fitting a hyperbolic function to his data reflects a completely erroneous interpretation of what that hypothesis implies. The hypothesis that the visual space is hyperbolic implies nothing about the relation between distance estimates and predicted distance estimates based on size.

Stanley found an overestimation of distance relative to size. If we combine this finding with the finding that estimates of visual angle are approximately veridical (Foley, 1965) and assume constant curvature, it follows that space is elliptic rather than hyperbolic. This result is at variance with the Luneburg-Blank theory and the large body of data which supports that theory. However, this conclusion is perhaps not so surprising when it is recognized that the Luneburg-Blank theory is concerned with *binocular* perception (Blank, 1959; Luneburg, 1947), while the nonpreferred eye of Stanley's subjects was covered. Equally important is the fact that the Luneburg theory as revised by Blank does not attempt to represent absolute perceptual magnitudes, but only relative magnitudes in the same configuration (Blank, 1959).

References

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Reply to Foley's Comment

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Foley's (1968) comment on the discussion section of my paper (Stanley, 1967) points to some ambiguity which needs further clarification. In order to maintain a fixed visual angle the physical size of a series of stimuli must be proportional to the physical distance. This law of visual angle is a Euclidean property of physical space. The size-distance invariance hypothesis asserts a perceptual invariance analogous to this physical invariance (cf., Hochberg, 1964, p. 56). Foley is correct in asserting that the size-distance invariance hypothesis does not presuppose Euclidean space, since the hypothesis only requires that apparent size and apparent distance are parallel functions of their physical correlates. For example, size-distance invariance could occur if both apparent size and apparent distance were hyperbolic functions, respectively, of physical size and of physical distance. However, in the case of the earlier study, apparent size was found to be a linear function of physical size, and this together with size-distance invariance, implies that apparent distance should be a linear function of physical distance (i.e., the perceptual space should be Euclidean).

There is independent evidence to suggest that visual space is hyperbolic. It was not the object of the former study (Stanley, 1967) to test this assertion, but its implication that distance estimates should be a hyperbolic function of physical distance was invoked as a possible explanation of the data obtained, viz, that apparent distance appeared to be something like a hyperbolic function of predicted distance.

Foley's derivation of perceptual space as elliptic suggests a misinterpretation of the original data, since this did not reflect simply overestimation of distance relative to size. As may be seen in Fig. 1 (Stanley, 1967, p. 288) it is only the intermediate distances which are markedly overestimated. The extremes are close to values expected on the basis of size-distance invariance.

In conclusion, it should be noted that in the original paper it was suggested as a strong possibility that the results may arise from error specific to the judgmental task. Considering the somewhat unusual nature of the task it is not surprising that later research (Stanley, 1968) has strengthened this alternative interpretation.

References

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Note

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