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Light intensity in the rod-and-frame test reconsidered

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Abstract.—Previously collected data (Nyborg, 1972) on the perception of the vertical in the Rod-and-Frame Test (RFT) were reanalysed according to the method of signed errors presented by Nyborg (1974). Regression analysis showed no systematic relationship between light intensity and frame dependence and that the effect of light intensity on the perception of vertical in the RFT in general is negligible, thus confirming the conclusions drawn originally.

Light intensity of the stimulus field has been shown to influence perception of verticality in a variety of tests (Mann, 1952; Curran & Lane, 1962). Nyborg (1972) studied the effect of light intensity on the perception of vertical in the Rod-and-Frame Test (RFT). He concluded that radical changes in light intensity of the visual field fail to appreciably influence perception of the vertical in the RFT. However, subsequent work has shown that the unsigned-error method used to score the RFT is questionable (Nyborg, 1974; Nyborg & Isaksen, 1974). Consequently, conclusions based on that method of scoring the RFT may be incorrect. In the present study, the new method that takes the effect of tilt of the frame and the response consistency of the subject into account was used to reanalyse the original RFT data from Nyborg (1972).

METHOD

The method of scoring described in Nyborg (1974) was applied to the RFT data obtained from 56 subjects by Nyborg (1972). Briefly, the direction of the deviation of the rod from physical vertical was noted. The frame dependence parameter (φ) was determined and was further corrected according to the response consistency (σ) of the subject in question at each level of light intensity. Regression analysis was performed to determine whether the corrected φ-values in each subject were linearly related to the level of light intensity. The result of the regression analysis for the performance of each subject in the RFT was classified in terms of whether the relationship between the corrected φ-values and the intensity of light on the frame was linear and positively sloped (Group I), linear and negatively sloped (Group II), linear but non-sloped (Group III), or non-linear (Group IV). According to this classification, it can be said that light intensity failed to systematically influence the adjustments of the rod to vertical in the subjects in Groups III and IV.

RESULTS AND DISCUSSION

The majority of the 56 subjects were classed in Group III and IV. Thirty-five were in Group III and 8 were in Group IV. Thus, the level of light intensity failed to systematically influence the degree of frame dependence in 43 out of 56 subjects, or 76.8% of the subjects. This supports the conclusion reached earlier that changes in light intensity of the visual field do not appreciably influence perception of the vertical in the RFT (Nyborg, 1972).

But a linear relationship between the corrected φ-values and light intensity did occur in the 4 subjects classed in Group I and the 9 in Group II. The subjects in Group I adjusted the rod farther away from the physical vertical as the light intensity level increased while those in Group II adjusted it nearer to physical vertical as the light intensity increased. Since the φ-values are corrected for response consistency (Nyborg, 1974), even quite small changes in the error scores between the weakest and the strongest level of light intensity may be sufficient to classify subjects that respond in a consistent manner in the RFT as significantly influenced by the changes in light intensity. In fact, the mean increase or decrease in error scores in the subjects in Group I and II did not exceed 2.8 degrees. Thus radical changes in light intensity had a systematic effect

on the adjustment of the rod to vertical in 23.2% of the subjects and then only a small effect. Evidently, changes in the level of light intensity exert little if any influence on the frame dependence of subjects in the RFT. Investigations with the RFT can now proceed considering the importance of changes in light intensity to be negligible.

It is noteworthy that the performance of one subject in Group I as well as those in Group II did not support the hypothesis that error scores will increase as light intensity increases (Nyborg, 1972). In addition, the performance of all 56 subjects could not be accounted for in terms of their frame dependence scores. In fact, all four groups included both frame dependent and frame independent subjects. The present findings thus demonstrate that changes in light intensity have a negligible effect in both types of subjects and this fact leads to rejection of the hypothesis that changes in light intensity will exert a greater effect in frame dependent than in frame independent subjects (Nyborg, 1972).

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