THE ZAGORA ROD TEST*

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CERTAIN mechanical operations in industry are possible only to persons with visual perception of the highest order. These high visual standards are of paramount importance to maximum production and to the prevention of occupational injuries. The practically simultaneous perception of depth and height is of special interest, for although such perceptions have a physiological basis, they are not innate, and some people with high visual acuity in each eye and normal fusion, have poor depth and height perception and cannot readily estimate distances.

Apparatus and Procedure

This test belongs to the rod-tests since the objects compared are three vertical rods each 10 mm. in diameter, two being stationary and the third movable. The apparatus stands on a table at eye-level (Figure). The first fixed rod is set at a distance of 6 m. from the subject and is placed 3 cm. to the right of the mid-line. The second is placed 3 cm. to the left of the mid-line and 6 cm. further away from the subject. Above the two stationary rods is suspended a movable one. All three rods are dull black and must have the same reflectivity. They are observed through an aperture 20 cm. wide and 12 cm. high in a screen placed 30 cm. in front of the first fixed rod.

FIGURE.—Arrangement of apparatus and position of patient.

The subject's chin is placed on a chin-rest to prevent lateral movements of the head, so that motion parallax cannot furnish auxiliary clues to the relative positions of the three rods. The subject sees the rods as black silhouettes against a background of pearl glass, trans-illuminated at a level of 25 millilamberts. This level of background illumination should be kept constant throughout the examinations.

If the subject usually wears glasses for distant vision he should wear them during the test.

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The movable rod is controlled by the subject by means of a double string, one end of which is attached to the rod and the other to a wheel. This enables him to move the rod in three directions: up and down, from side to side, and to and fro.

At the beginning of a trial the administrator should place the movable rod at some distance nearer to or farther away from the subject than the stationary rods. This initial positioning is an essential factor in the procedure, because it may have a significant influence on errors of alignment and must be tested if accurate results are to be obtained (Wilner, Weymouth, and Hirsch, 1950).

The subject is required first to bring the movable rod forwards or backwards to align it laterally with the first stationary rod, then to move it sideways to align it vertically, and then to lower it so as to bring the ends of the two rods together to form a single vertical line. The starting position of the movable rod influences the final adjustments to apparent verticality, the apparent vertical tending to be closer to the first position in which the movable rod was set.

The subject is then required to carry out the same procedure with the second stationary rod.

The subject's powers of depth and height discrimination may be measured by his errors in aligning the rods, the stationary rods serving as points of reference. From a scale on the apparatus, the readings of successive attempts in the horizontal plane are noted in millimetres and the average reading is recorded. For vertical readings a narrow millimetre rule made of transparent plastic material has been devised. An average error greater than about 20 mm. on the vertical scale and about 30 mm. in the horizontal and lateral scales is indicative of subnormal powers of depth and height estimation. A single test-run comprising twelve adjustments of the movable rod should be allowed to accustom the subject to the apparatus. These initial readings are not a true indication of the subject's powers of depth and height discrimination. Reliability should not be sacrificed to speed or else the effort of testing may be useless.

From the twelve adjustments of the movable rod two independent scores may be computed: the average degree of accuracy obtained and the range of error about this average. The mean of the distribution expressed in millimetres gives the best estimate of the subject's powers. The standard deviation represents the degree of precision with which the subject approaches perfection.

In the Howard-Dolman test, the rods are viewed against an illuminated background through an aperture which conceals from view the ends of the rods. In the Zagora test, the lower end of the movable rod and the upper ends of the stationary rods are seen and therefore certain empirical clues to position are not eliminated.

The Zagora rod-test has been developed for determining the subject's fitness to undertake work in which a high degree of accuracy of binocular function and precision in depth and height perception and estimation, together with efficient ocular and manual co-operation are important.

The effects of artificial aniseikonic errors on this moving-rod test will be the subject of a future communication.

REFERENCE

WILNER, B. I., WEYMOUTH, F. W., and HIRSCH, M. J. (1950). *Arch. Ophthal. (Chicago)*, **44**, 365.