

Figural Aftereffects and Validity of the Hoffer-Osmond Diagnostic Test

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One problem confronting diagnostic tests is the extent to which different diagnostic groups obtain similar scores, or the degree to which patients with the same diagnosis obtain extreme scores on a test. An example of the latter is the Hoffer-Osmond Diagnostic Test or HOD on which approximately 70 percent of schizophrenic patients obtain relatively high scores (above established cutoff points) and 30 percent low scores (Kelm, Hoffer and Osmond, 1981; Kelm and Osmond, 1975). The fact that approximately 30 percent of schizophrenic patients obtain relatively low scores is usually interpreted as a weakness of the Test (Stewart and Mahood, 1963; Task Force, 1973). In one sense this is correct, but there is also the possibility that schizophrenics with high HOD scores may actually have different perceptual experiences than low scorers, and that the HOD is differentiating between perceptual styles in schizophrenic patients who may have different disease states requiring correspondingly appropriate therapies.

One way of examining this possibility is to test these two groups (high and low HOD-scoring schizophrenic patients) on an independent perceptual test that appears to measure similar perceptual styles as the HOD. One such test is the visual figural aftereffect or VFA (Kelm, 1962, 1968; Kelm and Hall, 1967; Kelm, Jensen and Ramsay, 1963; Koehler and Wallach, 1944; Prysiaz-niuk and Kelm, 1965; Wertheimer, 1954; Wertheimer and Jackson, 1957; Wertheimer and Wertheimer, 1954). Figural aftereffect phenomena have been studied in various sense modalities and are regarded as a measure of the central nervous system's modulation of the sensory environment (McEwen, 1958; Petrie, 1967).

The perceptual style which the HOD purports to measure is instability of perception: high scores suggesting perceptual instability; low scores, perceptual stability (Hoffer, Kelm and Osmond, 1975). (The HOD also examines thought and mood changes, but these will not be referred to in this paper.) The corresponding perceptual style in the VFA is what Petrie (1967), using a kinesthetic figural aftereffect, has called a "stimulus-governed" pattern. A stimulus-governed pattern or style as it applies to the visual VFA used in

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the present study may be described as one in which a figure in the visual field (called the test-figure) is phenomenally displaced a relatively great distance away from another figure (called the inspection-figure) which had previously been fixated; then with further exposures of the test-figure (called test-time) the phenomenal distance between these two figures shrinks. In other words, following the fixation of a figure (inspection-figure) and the presentation of another figure (test-figure) the phenomenal distance between them first expands and then contracts with repeated exposures of the test-figure. The stimulus-governed individual shows a greater magnitude of expansion and contraction than the nonstimulus-governed person. The stimulus-governed individual is described as experiencing a sensory environment that is expanding and contracting markedly, or is experiencing a lack of "perceptual homeostasis" (Petrie, 1967, p. 75) compared with the person who shows significantly less expansion-contraction.

Two other perceptual styles which Petrie (1967) calls **augmenting** and **reducing** have been reported in figural aftereffect studies (Kelm, 1962, 1968; Kelm and Hall, 1967; Kelm, Jensen and Ramsay, 1963; Pressey and Kelm, 1966; Prysiazniuk and Kelm, 1965). The augmentser is one who tends subjectively to increase his/her sensory environment (expansion of inspection-test-figure distance), while the reducer decreases it (contraction of inspection-test-figure distance). Schizophrenic patients as a group are reducers (Kelm, 1962, 1968; Wertheimer, 1954; Wertheimer and Jackson, 1957). Phenomenal expansion and contraction not only alter size perception but also affect the individual's perception of depth or distance (Koehler and Wallach, 1944). Figural aftereffect phenomena also include changes in perceived intensity (Koehler and Wallach, 1944) with the reducer perceiving stimulus events as being less intense than the augmentser. Changes in intensity also contribute to alterations in depth perception.

It is predicted that if the HOD is discriminating between perceptual styles within schizophrenic patients, then high and low HOD-scoring schizophrenics should show different magnitudes of figural displacement. Secondly, if the HOD is a

measure of perceptual instability, then high-scoring schizophrenic patients should show a stimulus-governed VFA contrasted with low-scoring. The purpose of the present study was to examine these predictions.

METHOD Subjects

A total of 21 patients who had not received any medication for at least 48 hours were tested within three days of admission to a psychiatric hospital. Of this number, 12 later received a confirmed diagnosis of schizophrenia and represent the sample used in this study. These 12 patients were divided into two groups: those with Short Form (SF) HOD scores of 0 to 4 (mean 1.4) consisting of three females and two males whose average age was 33.4 years; and the second group with SF scores above 4 (mean 6.6) which included two females and five males with a mean age of 33.6 years. The distribution of sub-types (acute-chronic, paranoid, etc.) was similar in both groups.

Apparatus and Procedure

The apparatus and procedure used to measure the VFA were the same as in earlier studies (Kelm, 1968; Kelm and Hall, 1965; Prysiazniuk and Kelm, 1965, Experiments 2 and 3) which permitted the measurement of three phenomenal displacements: immediately, 30 seconds and 60 seconds (called test-time) following 30 seconds visual fixation of the inspection-figure.

The HOD was administered in the usual manner using the card form of the test, but only the SF score was used to divide the patients into two groups. Both tests were administered within 30 minutes of one another. The HOD was administered by a psychiatric nurse and the VFA by a technician trained to measure this phenomenon.

RESULTS

The VFA immediately, 30 seconds and 60 seconds following fixation of the inspection-figure was .009, -.001 and -.007 cm respectively for the low HOD-scoring group of schizophrenic patients, and .082, .008 and

-.011 cm respectively, for the high-scoring group. A summary of an analysis of variance is shown in Table 1. This analysis shows that these two groups have significantly different VFAs ($p < .025$) and also a significant change

in phenomenal displacement as a function of test-time ($p < .005$). The significant interaction ($p < .005$) indicates that both groups differ in the rate of change of phenomenal displacement following fixation of the inspection-figure.

TABLE 1

SUMMARY OF ANALYSIS OF VARIANCE FOR THE HIGH AND LOW HOD-SCORING SCHIZOPHRENIC PATIENTS WITH THREE TEST-TIMES

SOURCE	SS	df	MS	F
A: (HOD scores)	6032.50	1	6032.50	7.29'
Error (a)	8277.00	2	827.70	19.29'' 7.78''
B: (Test-time) AXB	24421.50	2	12210.75	
Error (b)	9846.50	20	4923.25	
Total • $p < .025$	12663.00	35	633.15	
"pC005	61240.50			

DISCUSSION

The analysis of variance (Table 1) shows that schizophrenic patients separated into two groups by the SF score of the HOD have significantly different magnitudes of phenomenal displacement which supports the first prediction that these two groups have different perceptual styles. The significant change in the VFA as a function of test-time is expected in figural aftereffect phenomena. The second prediction which stated that if the HOD is a measure of perceptual instability, then patients with high scores should be characterized by a stimulus-governed VFA compared with low-scoring, was also confirmed. An examination of the means for the low-scoring schizophrenic group shows that the difference between maximum expansion (immediate test-time) and contraction (60 second test-time) was .016 cm, compared with .093 cm for the high-scoring. This suggests that the size and depth perceptions of the latter group are changing to a much greater degree than those experienced by the former group. Petrie (1967) has referred to this perceptual style as being "turbulent",

providing such individuals with an "...unpredictably expanding and contracting sensory environment" (p. 78).

An analysis of variance of the VFA of the low HOD-scoring schizophrenic patients and a normal group of five subjects shows, as in other studies (Kelm, 1962, 1968; Wertheimer, 1954; Wertheimer and Jackson, 1957), that the former group has significantly smaller VFAs (reducers; $F=15.01, 1 \text{ \& } 8 \text{ df}, p < .005$). The magnitudes of phenomenal displacement at the immediate, 30 second and 60 second test-times for the normal group are .088, .054 and .071 cm respectively. Also these groups do not differ in the rate of change of phenomenal displacement as a function of test-time ($F=0.52, 2 \text{ \& } 16 \text{ df}, p > .25$): the spread between maximum expansion and contraction is .016 cm for the schizophrenic group and .017 for the normal group. An analysis of variance of the VFA of the high HOD-scoring schizophrenic patients and the normal subjects shows that these patients have an overall smaller VFA

($F=7.89$, 1 & 10 df, $p<.025$), and display the characteristic stimulus-governed pattern ($F=5.63$, 2&20 df, $p<.025$).

Thus, neither normal subjects who are characterized by low HOD scores (Kelm, Hoffer and Osmond, 1981), nor low HOD-scoring schizophrenics show the stimulus-governed perceptual style. In other words, both these groups seem to have relatively stable perceptual experiences as measured by both the HOD and VFA. The small VFA in the schizophrenic group is regarded as a generalized tendency toward reducing the sensory environment, thus avoiding excessive sensory bombardment or overload (Buchsbaum, 1975, 1976; Landau et al., 1975), enabling such patients to maintain perceptual stability. However, such an extreme level of reducing may, as Petrie suggests, "...become unbearable—not because of what it contains, but because of what it does not contain" (1967, p.66).

The schizophrenic patient with the stimulus-governed perceptual style begins to augment the sensory environment (immediate test-time) to a level not significantly different than the normal group, but then switches quickly to a drastic reducing reaction. Thus it seems that the central nervous system's control mechanism of the stimulus-governed individual is operating erratically, resulting in unpredictably changing perceptual experiences.

As mentioned earlier, figural aftereffect phenomena involve not only figural displacements as measured in the present study, and thus changes in size perception, but also include alterations in perception of depth and intensity (Koehler and Wallach, 1944). If the "distance paradox" which is another aspect of figural aftereffect phenomena is also applied (see Kelm, 1960 and Koehler and Wallach, 1944), then it is reasonable to expect that perception of shape will be changed as well. Thus, the stimulus-governed individual seems to be experiencing a sensory environment that is shifting in size, intensity, location and shape. On the other hand, the extreme reducer's perception of size, intensity, depth and shape are relatively stable, but distorted when compared with normal subjects.

Studies of figural aftereffects and Average

Evoked Response techniques, both of which are significantly correlated and measure augmenting and reducing, have reported that these perceptual styles are partly genetically determined, and that extreme forms of these styles may indicate biological disease (Buchsbaum, 1975, 1976; Landau et al., 1975; Petrie, 1967; Schooler et al., 1976). It seems possible that the stimulus-governed style in high HOD-scoring schizophrenic patients and the extreme reducing in low-scoring patients may indicate the presence of different diseases, thus requiring different therapies. Phenothiazines, frequently used in the treatment of schizophrenia, are associated with augmenting (Inderbitzen et al., 1970; Petrie, 1967; Silverman 1972). Lithium-carbonate, for example, moves augments toward the reducing end of the continuum (Silverman, 1972). Silverman (1972) suggests that phenothiazines are effective in the treatment of schizophrenia because they reduce sensory overload, removing the need for reducing. This might indicate that phenothiazine therapy may be most effective with the low HOD-scoring VFA reducing schizophrenics, although at this point it cannot be predicted with certainty what effect phenothiazines or different dosages/combinations might have on the high HOD-scoring stimulus-governed schizophrenic patients who are both augmenting and reducing. However, it would appear that the most effective therapies for these two groups would not be the same. Users of the HOD have indicated that patients with markedly different HOD scores respond best to different therapies (Hoffer, Kelm and Osmond, 1975). A fruitful area of research may be an examination of the relative effectiveness of phenothiazine and other therapies with patients having these perceptual styles.

SUMMARY AND CONCLUSIONS

Instead of regarding the clinically diagnosed schizophrenic patients who obtain low scores on the HOD as a weakness of the Test, the present study has shown that high and low HOD-scorers have different perceptual

styles. These perceptual styles also found and extended in figural aftereffect and Average Evoked Response studies, are to some extent genetically determined, and seem to indicate different biological diseases which may require correspondingly appropriate therapies. Thus, instead of regarding low HOD scores found in a minority of schizophrenic patients as a weakness of the Test, the present study may be regarded as enhancing the validity and usefulness of the HOD Test.

The HOD has been referred to repeatedly as an easily administered screening tool (Hoffer, Kelm and Osmond, 1975). It may thus be used to detect individuals suffering from perceptual instability associated with the stimulus-governed VFA (high-HOD scorers), and then only patients having low HOD scores may be examined for other perceptual styles using tests such as the VFA which require more effort and time.

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