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A RELATIONSHIP BETWEEN FIELD-DEPENDENCY-INDEPENDENCY AND SET: A WESTERN AND SOVIET VIEW *

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ABSTRACT

Students were classed as field dependent or field independent using Witkin's Rod and Frame and the Embedded Figures Test. In addition, each of the 269 grade 8 subjects performed Uznadze 's set tasks. The number of trials required for excitation and extinction in the haptic and visual modality were noted. The field-dependent-independent groups, based on each test, were compared with their ability to excite and extinguish a set. A Chi-square was used to test statistical significance. It was found that the field dependent and field independent groups differed in their ability to extinguish a set but not to excite a set. The differences were interpreted as supporting Witkin's hypothesis involving Einstellung.

Soviet and Western psychological literature often contains terms which appear to have synonymous meanings. As a rule, there has been little attempt to experimentally test the similarity of theory or concepts described by psychologists. Recently, Hritzuk (1968, 1969, 1970) has attempted to relate set or ustanovka, one aspect of Soviet psychological theory, to Western psychological concepts. It is the purpose of this paper to examine some aspects of Witkin's work and relate it to the work that has been done by Uznadze in the U.S.S.R.

As early as 1949, Witkin has been involved in the field-dependence-independence dimension of perceptual functioning. One of the situations devised for evaluating individual differences along this dimension was the body adjustment test. One situation involves a small room which the experimenter can tilt to any degree and a chair for the subject, that also can be tilted to the left or right. With the room and chair tilted by set amounts, the experimenter can move the chair at the subject's direction until the subject reports his body to be upright in relation to the tilt of the room.

A second test, the Rod and Frame, enables one to study an individuals perception of the "straightness" of objects other than their own bodies. In a tilted or upright chair, a subject directs the experimenter to upright a rod within a tilted frame.

In a third situation, the Embedded Figures Test, the subject is asked to locate a simple geometric figure hidden within a large complex figure designed to obscure it.

All these situations require the individual to separate some item (body, rod, design) from its background or context. The label field independent was applied to people who, in each situation, showed the ability to perceive objects apart from the context in which they occur, or to overcome an embedding context. Conversely, field dependent referred to performance which reflects dominance of perception of an item by the organization of the prevailing field, relative inability to separate item from field or to overcome an embedding context. Performances do not fall into two distinct types, but range in a continuum between extreme field dependence and field independence.

Furthermore, Witkin (1964) adds that the field dependence dimension has now been identified in many perceptual situations. For example, the same essential kinds of individual differences in mode of perceptual functioning described for the body adjustment, rod and frame and embedded-figures tests have now been observed in classical perceptual situations such as illusions, constancies, and reversible perspective.

Uznadze (1961) describes set or ustanovka as a phenomenon in which prior events or activity condition a subject to perceive or react to stimuli which follow in a predetermined manner. The model of behavior which Uznadze presents is that of a dynamic relationship between the individual and his environment. Furthermore, the emergence of set presupposes the following conditions: a need, a situation, and a basic level of perception.

Uznadze defines needs as the states of the psychophysical organism which are concerned with the changing of the environment, providing impulses indispensable for the aim of activity. There are three types of needs: the substantial (viscerogenic) needs, the functional (neurogenic) needs, and the intellectual (cognitive) needs.

There are two basic levels of human behavior; the impulsive level where man is stimulus bound, and the intellectual level where behavior is determined by objectification (reflection). Cognition develops by means of objectification. Because language plays an important role in objectification, man can imagine problem situations, possible solutions, and develop a definite set to activity without recourse to reality.

The experimental procedure used in the study of set usually involves investigations based on the haptic and visual modalities. A blindfolded

subject is presented with two spheres of equal weight but unequal size, for example, the larger sphere in the right hand and the smaller sphere in the left hand. He is allowed to feel them momentarily and is asked to reply as to which feels larger or smaller. These are the set tests. After several trials, the subject is presented with two equal spheres. Again the subject judges their size. These are critical tests. A subject usually experiences two types of illusions; contrast and assimilative. In a contrast illusion, the subject experiences one of the equal spheres (critical tests) as larger in that hand which held the smaller of the two spheres in the set test. The opposite is true of assimilation illusions. If after several presentations of the spheres the illusions are produced, one assumes that the subject fixated a set. Equal and unequal circles are used to test for set in the visual modality.

In addition, set may be fixated in the haptic modality and tested for its occurrence in the visual modality. This phenomenon is called irradiation.

Luchins (1942, 1954, 1955) has investigated Einstellung which he translates as set, mental set and habituation. His experiments focus on problem solving, and in particular whether in solving a series of problems one develops mechanization of behavior, a rigidity or a tendency to continue the solution of problems in a manner similar to subsequent solutions. Luchins says:

> Einstellung--habituation--creates a mechanized state of mind, a blind attitude toward problems; one does not look at the problem on its own merits but is led by a mechanical application of a used method . . . . Einstellung produces a surprising failure to solve a simple problem . . . . as it "blinded" subjects to direct solutions (Luchins, 1942, 15).

Luchins (1946) describes several methods which he uses for the Einstellung test; however, the water jug problems and the Hidden Word Test are most commonly used.

In the water jug problem, there are eleven problems to solve. For example, the student is given an empty 21 quart jar (A), an empty 127 quart jar (B), and an empty 3 quart jar (C); he is required to measure out 100 quarts of water. The following water jug problems are used:

1. problems 1 to 6 create the set;
2. problems 7 and 8 are the critical tests which test for the existence of set;
3. problem 9 tests for experimental extinction;
4. problems 10 and 11 test for recovery from Einstellung.

Problems 2 to 6 are solved by the formula B-A-2C; they are called the E problems. Problems 7, 8, 10, and 11 are solved by the E method and also by A-C (for problems 7 and 10) or A+C (for problems 8 and 11). Problem 9 is solved only by A-C method.

There appears to be a relationship between Luchins' concept of Einstellung and Uznadze's concept of set or ustanovka (Hritzuk, 1970).

Furthermore, Witkin (1960) discusses the relationship between Einstellung and field dependency. He indicates that one may expect that persons who are field independent would show greater capacity for breaking the set in the Einstellung situation. He adds:

> We would further anticipate, since only the extinction problem provides an effective test of set-breaking ability, that the expected relation would be found with performance on the extinction problem, and not necessarily with performance on the critical problem (Witkin, 1964, 178).

Witkin notes that one may consider the set breaking process in terms of the ability to overcome embeddedness. Set breaking in Uznadze's terms refers to the extinction of set in the haptic and visual modalities Witkin notes that the field dependence dimension cuts across sense modalities. Uznadze's set incorporates both haptic and visual modalities as well as irradiation, the transfer of set from one modality to the other.

Because there appears to be a relationship between field dependency and Einstellung as well as set (ustanovka) and Einstellung, it is further the purpose of this paper to examine the relationship between subjects' performance on Witkin's field-dependency-independency tests and on Uznadze's set trials (excitation and extinction) in both the haptic and visual modalities.

METHOD

Subjects

To compare field-dependence-independence and ustanovka, 269 grade 8 students were chosen from Calgary schools. The ages varied from 12.4 years to 17.0 years, with a median age of 13.11.

Procedure

The following tests were given:

(1) Set tests: Each subject was presented with equal and unequal spheres to test for set excitation in the haptic modality. When the minimal level of trials was established, the critical tests were repeated to test for set extinction. Individual scores were recorded in a category of trials required for set excitation or extinction. The category of trials were 1-5, 6-10, 11-15, and 16-20. The test for set excitation and extinction in the visual modality was conducted immediately following the haptic tests. Equal and unequal circles were flashed for 1/10 of a second on a tachistoscope. Again, the minimal number of trials for excitation and extinction were noted.

(2) Rod and Frame Test: Like the set tests, this is an individual test. Subjects are given a score in terms of the deviation of the rod from the vertical. For example, a score of 0 indicates no error. Eight trials were given and the total of the scores gave the error score for the individual.

The error scores were then converted to a 10 point scale. The bottom fifth (score 3 or less) constituted the field independent group, while the top fifth (score 6 or more) constituted the field dependent group.

(3) Embedded Figures Test. Each subject was asked to look at a simple figure drawn on a folder. He then attempted to locate the simple figure which was embedded in a more complex figure. If he located the figure, he was given a score of 1. There were 24 figures to locate. The total score was converted to a 10 point scale. The top fifth (score 7 or more) was the field independent group while the bottom fifth (score 3 or less) constituted the field dependent group.

ANALYSES

Responses were categorized for each subject on the Embedded Figures Test, the Rod and Frame Test and for Uzandze's set tests.

The hypotheses tested was that no difference exists between the observed and expected frequencies on excitation and extinction trials between

(i) Field dependent and field independent groups based on Witkin's Rod and Frame Test.

(ii) Field dependent and field independent groups based on Witkin's Embedded Figure Test.

The Chi-square was used for the statistical test (Siegel, 1956) with a .05 level of significance.

The first analyses compares the number of subjects who excite and extinguish a set in the haptic modality with the high and low scores on the Rod and Frame Test. Results are reported in Table I.

Insert Table I about here

There were no individuals who extinguished a set and achieved veridical perception in less than 5 trials, thus the 1-5 category is not present in the extinction group. Although $X^2 = .2097$ is not statistically significant for the excitation trials, the $X^2 = 28.286$ is statistically significant for the extinction trials. Thus the high scores (field dependent group) and the low scores (field independent group) differ in the number of trials required for set extinction.

The second analyses compares the number of subjects who excite and extinguish a set in the visual modality with the high and low scores on Rod and Frame Test. Results are reported in Table II.

Insert Table II about here

There are 99 subjects in Table II analyses compared to 108 in Table I. Nine subjects did not excite a set and thus did not have a set present to extinguish. A $X^2 = 8.893$ is statistically significant for the excitation trials. The field dependent and field independent groups differ in the number of trials required to fixate a set. The $X^2 = 15.811$ is statistically

TABLE I

GROUPS SCORING HIGH AND LOW ON THE ROD AND FRAME TEST COMPARED FOR SET EXCITATION AND EXTINCTION TRIALS IN THE HAPTIC MODALITY

	Excitation Trials				Extinction Trials		
	1-5	6-10	11-15	16-20	6-10	11-15	16-20
High	52	2	0	0	6	3	45
Low	51	3	0	0	18	18	18

$\chi^2 = .2097$

$\chi^2_{.05}(3df) = 7.82$

$\chi^2 = 28.286$

$\chi^2_{.05}(2df) = 5.99$

TABLE II

GROUPS SCORING HIGH AND LOW ON THE ROD AND FRAME TEST COMPARED FOR SET EXCITATION AND EXTINCTION TRIALS IN THE VISUAL MODALITY

	Excitation Trials				Extinction Trials		
	1-5	6-10	11-15	16-20	6-10	11-15	16-20
High	34	10	3	1	5	5	38
Low	21	21	6	3	21	9	21

$\chi^2 = 8.893$

$\chi^2_{.05}(3df) = 7.82$

$\chi^2 = 15.811$

$\chi^2_{.05}(2df) = 5.99$

significant for the extinction trials. The field dependent and field independent groups differ in the number of set extinction trials.

The third analyses compares the number of subjects who excite and extinguish a set in the haptic modality with the high and low scores on the Embedded Figures Test. The Results are reported in Table III.

Insert Table III about here

A X^2 = .2099 is not statistically significant for excitation trials. The high scores (field independent group) and the low scores (field dependent group) do not differ in set excitation trials. A X^2 = 6.81 is statistically significant for the extinction trials. The field dependent and field independent group differ in set extinction trials.

The final analyses compared the number of subjects who excite and extinguish a set in the visual modality with the high and low scores on the Embedded Figures Test. The results are reported in Table IV.

Insert Table IV about here

A X^2 = .7602 for the excitation trials and X^2 = 1.436 for the extinction trials are not statistically significant. The field dependent groups and the field independent group do not differ in the number of trials required to excite and extinguish a set in the visual modality.

TABLE III

GROUPS SCORING HIGH AND LOW ON THE EMBEDDED FIGURES TEST COMPARED FOR SET EXCITATION AND EXTINCTION TRIALS IN THE HAPTIC MODALITY

	Excitation Trials				Extinction Trials		
	1-5	6-10	11-15	16-20	6-10	11-15	16-20
High	51	2	1	0	14	9	31
Low	50	3	1	0	5	6	43

$\chi^2 = .2099$

$\chi^2_{.05}(3df) = 7.82$

$\chi^2 = 6.81$

$\chi^2_{.05}(2df) = 5.99$

TABLE IV

GROUPS SCORING HIGH AND LOW ON THE EMBEDDED FIGURES TEST COMPARED FOR SET EXCITATION AND EXTINCTION TRIALS IN THE VISUAL MODALITY

	Excitation Trials				Extinction Trials		
	1-5	6-10	11-15	16-20	6-10	11-15	16-20
High	26	12	5	3	16	8	22
Low	28	11	3	4	11	8	27

$\chi^2 = .7602$

$\chi^2_{.05}(3df) = 7.82$

$\chi^2 = 1.436$

$\chi^2_{.05}(2df) = 5.99$

DISCUSSION

In general, the hypotheses that were stated were substantiated by the experimental analysis of the data. The work of Luchins' Einstellung and Uznadze's ustanovka are closely related to Witkin's work on field-dependency-independency. Although Uznadze (1961) makes no mention of Witkin, and Witkin (1960) makes no mention of Uznadze, there is similarity in their psychological theorizing.

Although Witkin does not give an explanation, he states that extinction of Einstellung would provide an effective test of set breaking ability. The field dependent and field independent groups differentiated in their extinction set trials except the groups with high and low scores on the Embedded Figures Test and set extinction trials in the visual modality. The set extinction corresponds to the subject's ability to experience veridical perception; this would correspond to the the vertical rod in the Rod and FrameTest or the figure in the Embedded Figure Test.

The Embedded Figures Test and Rod and Frame Test do not yield identical results in terms of set trials. One reason may be due to the different procedures used in each test. The Embedded Figure is a group test where the subject's performance appears to be more closely related to intelligence, particularly to the memory factor. The Rod and Frame is an individual test, with verbal instruction and positive reinforcement.

This is similar to Uznadze's set tests which are individually given with verbal instruction, involving little cognitive activity other than the instruction offered by the experimenter.

Both of Witkin's tests and Uznadze's tests are heavily based on perception. However, results from both the haptic and visual modality are not always identical. As a rule, excitation and extinction proceed with greater ease in the haptic modality. Probably the emphasis on manipulation as the initial basis for the emergence of set reinforces the idea of the importance to grasping in the evolution of the species and in the evolution of the individual. Furthermore, the visual modality involves less active participation with the environment as compared with motor manipulation.

The experimental procedure used in the analyses involved the minimal level of set excitation and extinction. This refers to the minimum number of trials required to excite a set (formation of an illusion) and extinguish a set (veridical perception). Another procedure of testing involves the use of optimum trials, that is, the greatest number of trials required for the longest duration of an illusion.

The comparisons of two theories, especially Western and Soviet psychological work are often very difficult to undertake, due mainly to the lack of Russian literature or correct translations. However, further experimentation involving Soviet material may add possible enlightenment to previous psychological works and to possible future theorizing.

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