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ABSTRACT

The relationship between field independence, intelligence, and social class was investigated in a group of 150 kindergarten, second, and third grade children. The effect of social class upon field independence was also studied after controlling for intelligence. The Portable Rod and Frame Test was administered ten times using instructions developed for this age group. Intelligence was measured using the Otis-Lennon Intelligence Tests, and socioeconomic status was determined from the student's cumulative records and father's occupation. Low to moderate relationships were found among the two independent variables and field independence. Socioeconomic status correlated significantly with intelligence and with field independence. Intelligence correlated significantly with field independence. However, controlling for the effects of intelligence indicated that any positive relationship found between cognitive style and socioeconomic status was most likely exaggerated. It appeared that intellectual variables far outweighted socioeconomic differences in cognitive orientation. Data on the cognitive styles of students may have practical classroom applications. (Author/GDC)

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Predicting Field Independence from Intelligence and Socioeconomic Status: A Univariate and a Multivariate Scheme

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Predicting Field Independence from Intelligence and Socioeconomic Status: A Univariate and a Multivariate Scheme

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The purpose of the study was to determine: the relationship between field independence, intelligence and social class; the effect of social class upon field independence after intelligence was forced into the stepwise multiple regression scheme. The participants were 150 kindergarten, second and third grade children. Findings confirmed initial hypotheses that a simple relationship existed between field independence, intelligence and social class, however, intelligence accounted for 26% of the field independence variance while social class accounted for 1% of the total criterion variance. Results were integrated with previous research in the area and theory on the existence of a social class-perceptual-process relationship.

This study was undertaken to investigate whether: 1) there is a simple relationship between field independence and socioeconomic status; 2) the effect of socioeconomic status upon field independence would remain after controlling for intelligence; 3) the Portable Rod and Frame Test yielded similar results found in earlier studies when other field independence indices were employed.

The construct of field independence has led to a productive approach in the study of cognitive styles over the last twenty-five years. Witkin and his associates (1962) refer to the cognitive style of field independence as dimensions of individual functioning which interface learning, personality, and social behavior beyond perception and cognition. In a recent article, Witkin (1973) indicated that the notion of cognitive style is so pervasive throughout an individual's behavior that it is a mere reflection of personal style in the cognitive sphere. Witkin's measures of field independence were designed with the intent that freedom from adherence to the prevailing field resulted in a relatively accurate performance (field independence) while the less accurate individuals who have difficulty disengaging themselves from the field perform poorly (field dependent).

Recently Witkin (1977) has suggested that the field independence dimension may have the widest application to educational problems, among all cognitive styles previously identified. Current literature demonstrates that field independence may have extensive applications to learning in general (Goodenough, 1976) and cognitive functioning in particular (Nebelkopf & Dreyer, 1970). Some studies on field independence have indicated no relationship with race or socioeconomic status (Karp, Silberman & Winters, 1969) suggesting a culture fair measure of cognitive functioning (Witkin, 1973).

The role of environmental variables and their effect on cognitive functioning has been the focus of much research in the last 20 years in education. The influence of social class upon the educational and social development in individuals has been well documented (Hess, 1970). Indeed, Kohn & Rosman (1974) reported that socioeconomic status alone accounted for 6-22% of the total variance among a number of social and cognitive variables. This supports the notion that socio-economic status may play a major role in shaping an individual's cognitive and social behavior. Yet the present state of research on social status and the behavior of children is such that the few definitive statements that can be made are usually couched in imprecise terms. This follows in part from lacunae in theory yet it also results from a lack of clarity and methodological rigor in the studies themselves.

Although the issue of the relationship between social class and field independence has received attention nationally and cross-culturally the results are unclear. The initial test of the relationship between socioeconomic status and field independence found no significant differences (Karp, Silberman & Winters, 1969). Karp and associates studied both middle and lower class men and boys, using the Embedded Figures Test as a measure of field independence and the WISC as a measure of intelligence. Their findings supported the notion that social class, race, and intelligence do not influence field independence. There is some question over the true equivalence of the Rod and Frame Test and the Embedded Figures Test as determinants of the same perceptual behavior (Arbuthot, 1972; Vardy & Greenstein, 1972). Compounding this problem, Bergman & Engelbrektson (1973) found that the Rod and Frame Test loaded on a separate factor than other cognitive style indices and the Rod and Frame Test and Embedded Figures Test shared nly 4-16% common variance. This indicates the need to examine the socio-economic status - field independence question using the Rod and Frame Test as the dependent measure. Since Weisz, O'Neill & O'Neill (1975) indicated, 52% of the field independence

variance may be accounted for by mental age and suggested that studies with children which have reported relationships between the field independence construct and socioeconomic status are suspect, the present investigation controlled for intelligence.

Mumbauer & Miller (1970) found that when comparing advantaged and disadvantaged 4 year old children on the Children's Embedded Figures Test there was a significant difference favoring the advantaged. Results indicated both mean error score and mean latency score were lower for the advantaged children. These findings contradict the Karp, et al (1969) study.

Cross-culturally, a recent study (Cecchini & Pizzamizlio, 1975) demonstrated significant differences in Embedded Figures Test scores for Italian children by social class. The difficulty with the Cecchini & Pizzamizlio research was not controlling for intelligence. As Goodenough & Karp (1961) pointed out there is some evidence that a common factor may underly intellectual and cognitive style tasks. Indeed, Vernon (1972) postulates the correlation between field independence and intelligence indices ranged from .30 - .50. These factors being considered the Cecchini & Pizzamizlio results must be addressed with caution. In another cross-cultural investigation, Nedd & Schwartz (1977) indicated that socioeconomic status was primarily independent of cognitive style across four ethnic subcultures of Trinidad. Using the Group Embedded Figures Test they found father's education predicted field independence in a racially mixed group. Unfortunately Nedd & Schwartz (1977) did not indicate the level of significance nor the amount of criterion variance explained. These results then do not make these relationships any clearer than previous studies. Furthermore, none of the socioeconomic status - field independence studies cited employed a multivariate design. The present study bridged

both a methodological (controlling for intelligence) and a statistical (employing regression) gap. It was expected that there would be a simple low order correlation between all three variables (socioeconomic status, intelligence and field independence). However, after intelligence has forced in and the socioeconomic status variable entered the prediction scheme, it has hypothesized that a smaller amount of criterion (field independence) variance would be attributed to the socioeconomic status variable.

Methodology: Oltman's (1968) Portable Rod and Frame Test (PRFT) was used as the measure of field independence. The particular model used has come to be known as an experimenter-operated apparatus because the experimenter controls the positioning of the rod. Oltman reported a correlation of .89 between this apparatus and Witkin's original stationary version of the Rod and Frame Test.

The PRFT was placed on a table in a well lighted and secluded room in each of the two schools. The apparatus was placed in such a position that the child was not able to see either end of the apparatus upon entrance to the room, thus minimizing any possibility of cues from the structure and calibration of the instrument.

The experimenter was a female graduate student with extensive prior experience in the administration of the PRFT. The children were tested individually over periods of one week in May and June.

The PRFT instructions were adapted for use with children of kindergarten age. A model of the rod-and-frame stimulus was built in order to demonstrate the task for the children. In addition, the number of eight trials unsed by Oltman (1968) was increased to ten trials. The last two trials were a replica of the first two trials and were added because pretests indicated that for some children understanding of the task came only after performing the first two trials. In defining and demonstrating the task to the child, it was emphasized that the purpose of the task was to determine how well the child could

make the rod "straight up and down like a flagpole or telephone pole outside". The child was told that when the curtain was opened, he would see the square frame and the rod similar to the model and that these could be tilted to either side by E either separately or together to the same or to opposite sides. The child was given directions and, after opening the curtain, E turned the rod in three degree steps as instructed by the child until the child indicated that the rod was "straight up and down like a flagpole or telephone pole outside". Ten trials were given with frame and initial rod tilts of 28^{o} in the sequence: frame, LLRRLLRRLL; rod, RLLRRLLRRL. The individual's score on the PRFT was determined by summing the deviations from the vertical over the last eight trails regardless of sign. This method of scoring has been demonstrated as the most appropriate scoring system (Pawelkiewciz & Dreyer, Note 1).

Otis-Lennon intelligence tests, forms J and K, were employed. These were group administered by the experimenters to children in the study. Socioeconomic status was determined by perusal of the children's cumulative record folder, then by assigning a weight based upon father's occupation (Hollingshead & Redlich, 1958). This occupational scale yielded a value from one to seven with an individual receiving a one considered highest in social position and an individual receiving a seven considered lowest in social position.

The sample consisted of the kindergarten, second, and third graders of a middle class public school in Western Connecticut and a lower class public school in Eastern Connecticut. Children were randomly selected with the sample stratified by grade, sex, and SES (N=75, females; N=75, males).

Results: The Pearson Product Moment correlations indicated low to moderate relationships among the two independent and the dependent variables. Socioeconomic status correlated significantly with intelligence ($r=.37$, $p < .01$) and field independence ($r=.27$, $p < .01$). Intelligence correlated significantly with field

independence ($r=.51$, $p<.01$). To determine the amount of field independence variance accounted for by intelligence and socioeconomic status the stepwise multiple regression technique was used. To predict field independence criterion, the intelligence predictor was forced in first, and the socioeconomic status predictor second (see Table 1 .

TABLE 1

MULTIPLE REGRESSION COEFFICIENTS FOR FIELD INDEPENDENCE (N=150)

Rank	Variable	R	R	Increase in R	F-ratio
1	Intelligence	.51	.26	.5100	40.70
2	Socioeconomic Status	.52	.27	.0100	20.97

Both predictors produced a multiple regression equation of .52 in predicting field independence. The intelligence variable independently yielded a multiple regression coefficient of .51, with socioeconomic status introduced into the prediction scheme the multiple regression equation increased to .52.

Discussion: The results of the correlational analysis indicated significant relationships among all the variables in the study. However, the regression component of the analyses revealed the nature of the relationship of the two predictors (intelligence and socioeconomic status) upon the criterion (field independence) in a multivariate context was not as straightforward as in the univariate correlational framework. Indeed, although both intelligence and socioeconomic status contribute to the prediction of field independence, when considered in concert, socioeconomic status contributed a statistically significant but small percentage. These findings, unlike Karp's, indicate that there is indeed a statistically significant relationship

between socioeconomic status and cognitive style. These results support Mumbauer & Miller (1970) and Cecchini & Pizzamizlio, (1975). However, from a practical standpoint, the relationship is minimal and would provide little additional information in contrast to the time and expense involved and in relation to the information obtained by intellience testing. These results indicate that the vast majority of purported differences between cognitive style and SES are subsumed within the heavily weighted variable of intelligence. Thus a more precise picture of the relationships between cognitive style, intelligence, and socio-economic status has been obtained. By controlling for intelligence, we found that any positive relationship found between cognitive style and SES is most likely exagerated. These findings suggest the necessity to re-evaluate previous research such as Mumbauer & Miller (1970), Nead and Schwartz (1977), and Cecchini & Pizzamiglio (1970),where no such control was exercised. Previously higher correlations found between cognitive style and SES were in fact capitalizing on shared variance. Specifically the results from this analysis suggest the importance of a multi-variate design in determining total variance among a number of social and cognitive variables. These findings suggest that socioeconomic status has significantly less effect on an individual's cognitive style when intelligence is controlled for. Specifically, the assumption that different socioeconomic groups have different perceptual mechanisms seems unfounded based on the amount of variance accounted for by the SES variable. It would appear from our results that intellectual variables far outweigh SES differences in cognitive orientation.

Different cognitive styles are found within as well as between SES groups. Determining cognitive style among school-age children may well lead to improved learning and teaching. Ramirez, Herald, and Castaneda (Note 2) suggest that field independence variables affect adaptation to teaching styles, curriculum materials, type of feedback, frequency of reinforcement, and learning environments. Goodenough (1976)

discusses significant differences less directly related to intelligence including the areas of defenses and controls and reaction to criticism. Witkin also discusses personality characteristics. For field dependent children, learning appears to be facilitated by presenting an overview of materials, providing structured group-learning environments and a nurturant teacher. Field independent children prefer detail, less structure, independent discovery learning situations, and a formal attitude from their instructor.

"Knowledge of cognitive maps based on a careful study of cognitive styles may provide a sensitive basis for placement". (Witkin, 1969) by identifying strengths and by weaknesses in a child's cognitive makeup, present instruction methods may be better utilized for all children. Finally, the importance of pairing teachers' cognitive style with similarly evaluated students becomes equally important. Herold, Ramirez, and Castaneda (Note 2, Note 3) have provided behavioral checklists for the purpose of evaluating students as well as teachers in terms of cognitive style within a typical classroom setting.

Standardized psychological tests have proved to be of limited utility in assessing exceptional children in terms of specific academic areas. As Keogh (1974) states, current measures of intelligence do not allow for easy translation into educational or remedial programs for children with special educational needs. Interpretation of test score results for practical application might be improved with information obtained from evaluation of cognitive style. Witkin (1966) notes that with the current use of individualized intelligence tests, "the verbally handicapped child is not only more likely to be referred for testing...but when tested, he is likely to earn a low IQ... the child with particular impairment in the analytical area, but with relatively better verbal comprehensive competence, may [be more likely to] escape the selection filter which leads to classification as retarded".

Consideration of cognitive styles may assist in identifying those children impaired in analytic areas who might have performed relatively well on an individual intelligence test and been misdiagnosed. Use of such data would also directly lend itself more to practical classroom applications. Consideration of characteristics of the instructional program as interactive with children's learning styles may become the first step in remedial planning. Determination of cognitive style may well facilitate learning in the school system when used in conjunction with presently used evaluative measures.

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