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A Correlational Study of Cognitive Style Measured by the Myers-Briggs Type Indicator and the Witkin Group Embedded Figure

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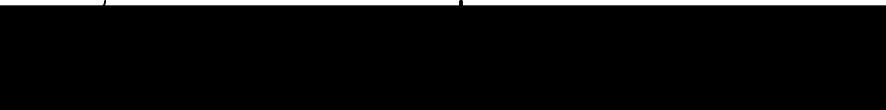
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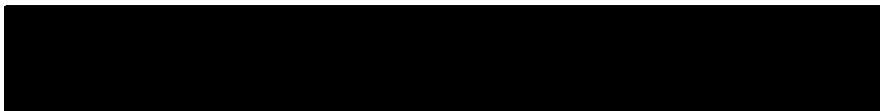
AN ABSTRACT OF THE THESIS OF Leith Wood Muessle for the
Master of Science in Psychology presented July 18, 1989.

Title: A Correlational Study of Cognitive Style Measured
by the Myers-Briggs Type Indicator and the Witkin
Group Embedded Figures Test.

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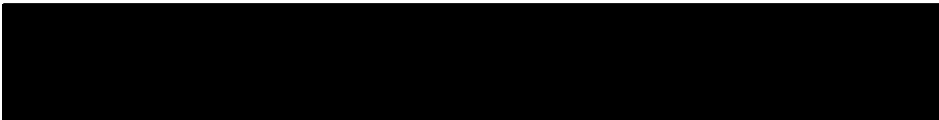
Gerald Guthrie, Chair



Nancy Perrin



Frank Wesley



Harjorie Terdal

A review of the literature suggests a coincidence of
personality characteristics among the cognitive styles
defined by Field Dependence-Independence and the Myers-Briggs
type preferences. This thesis proposed these independent
measures of cognitive style tap common cognitive processes
and hypothesized the Myers-Briggs dimensions of Extraversion-

Introversion (EI), Sensing-Intuition (SN), and Judgment-Perception (JP) would correlate positively and Thinking-Feeling (TF) would correlate negatively with the dimension Field Dependence-Independence (FD-FI) as measured by the Group Embedded Figures Test (GEFT). The relationships of gender, age, and intelligence to the prediction of field-dependence-independence were also tested. The Myers-Briggs Type Indicator (MBTI) and the Group Embedded Figures Test (GEFT) were administered to 202 undergraduate students. Significant relationships were found for the GEFT and the MBTI variables, SN ($r = .3121$, $p = .0022$) and JP ($r = .2236$, $p = .0303$), and for the GEFT and intelligence ($r = .4970$, $p = .0003$), but for males only. SN and JP correlated significantly ($r = .3820$, $p = .0001$) for the male group as did TF and age ($r = -.2186$, $p = .0343$). For the females, significant intercorrelations were found for SN and JP ($r = .4222$, $p = .0001$), SN and TF ($r = .1867$, $p = .0530$) and JP and TF ($r = .3868$, $p = .0001$). Patterns revealed through a comparison of the present study with the Corman-Platt (1988) and Lusk-Wright (1983) studies suggest time allocated to cognitive processing may account for the variance shared by the GEFT and the SN dimension of the MBTI.

A CORRELATIONAL STUDY OF COGNITIVE STYLE MEASURED BY
THE MYERS-BRIGGS TYPE INDICATOR AND
THE WITKIN GROUP EMBEDDED FIGURES TEST

by

LEITH WOOD MUESSLE

A thesis submitted in partial fulfillment of the
requirements for the degree of

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in
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July, 1989

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INTRODUCTION

Cognitive research originated within diverse approaches to the study of human behavior resulting in a de facto sectarianism among thought and theory regarding cognition and cognitive styles. Although current investigations continue to reflect or relate primarily to their traditional fields of origin, the broad and intriguing assortment of data produced by these various sources is increasingly subjected to comparative studies by pragmatists willing to shift perspective from the theoretical differences among the approaches to a consideration of their prominent commonality --that each probes the same sphere of intellectual functioning. In time, this convergence of research should integrate and clarify many of the issues pertaining to cognitive science; it may minimize duplication of effort and stimulate an even more fruitful and collaborative investigation into cognitive process.

Among the constructs emerging from research in cognitive styles are an array of bipolar continua representing dimensions of individual cognitive preferences or abilities. Bipolar or dichotomous properties of cognition have been indicated by investigations into the dual nature

of memory (Alper, 1987), the differentiation of the cerebral hemispheres (Sperry, 1982), field dependence-independence (Witkin & Goodenough, 1977), and the dimensions of Jungian typology (Myers & McCaulley, 1985). The similarities in constructs derived from these different areas of research into cognition suggest they tap a common factor within the nature of our cognitive functioning and invite further review and comparison.

Also of interest are the similarities in behaviors associated with certain dimensions of the various approaches. A correlation between right hemispheric activity and field dependence was inferred from data indicating left-gazers share similar personality attributes with field dependents and was subsequently demonstrated in laboratory studies (Devitt & Averill, 1976; Gur, Gur & Harris, 1975; Kocel, Galin, Ornstein & Merrin, 1972). Other compelling similarities of descriptive data are found between two separate bodies of work in cognitive styles, field dependence-independence and Jungian typology. These types of similarities reoccur too consistently throughout the literature generated by these two fields of research to appear accidentally coincident and have prompted this thesis that field dependence-independence and the dimensions of Jungian typology are related.

REVIEW OF THE LITERATURE

The field-dependent-independent and the Jungian formulations of cognitive styles differ primarily in origin and focus. The work leading to the concept of field dependence-independence began in the laboratory of the Gestaltist, Max Wertheimer, and was furthered by studies conducted by Herman Witkin throughout the period beginning in the early 1940's until his death in 1979 (Goodenough, 1986). The properties associated with field dependence-independence emerged from observations of subjects' range of ability in recognizing the upright or perpendicular in ambiguous situations which did not provide the usual visual cues of the upright found in everyday environments. The most common testing apparatus in this early period was the Rod and Frame Test (RFT). Subjects who consistently aligned the rod with the nonupright frame in order to approximate a true perpendicular were considered field dependent; those who consistently manipulated the rod into an upright position independently of the cues provided by the frame were considered field independent. Extensions of these studies indicated disembedding tasks, particularly those requiring the identification of a simple design within a more complex design, shared variance with the RFT; as a result, the Embedded Figures Test (EFT) and the Group Embedded Figures Test (GEFT) became popular instruments for assessing field

dependence-independence. A theory of psychological differentiation slowly accumulated about the data derived from these tests. Yet, as late as 1963, the work in field dependency was referred to in terms of "a measure in search of a theory" (Zigler, 1963).

The second approach, based on Carl Jung's theory of psychological types (1921, 1971), was developed by a mother-daughter team, Katherine Briggs and Isabel Briggs-Myers. Like field-dependence-independence research, the Jungian or Myers-Briggs approach relies upon a particular measure to provide indications of the behavioral distinctions requisite to its theory of cognitive styles. This instrument, the Myers-Briggs Type Indicator (MBTI), assesses four dimensions of cognitive preference: (a) attitude in terms of extraversion or introversion, (b) perception in terms of sensing or intuition, (c) judgment in terms of feeling or thinking, and (d) mode of dealing with the outside world in terms of perception or judgment. Unlike the investigation of field dependence-independence which slowly generated a theory of psychological differentiation, the Myers-Briggs dimensions were predicated by Jungian theory and developed as a means of utilizing that theory rather than testing it.

Several investigators unaffiliated with either the Witkin or the Myers-Briggs groups have been impressed by the implications that the measures for field dependency and the MBTI do seem to assess factors integral to human cognition

and behavior. For these independent researchers, however, the question of just what is being measured remains open. One such pair, prompted by a critique of the MBTI which suggested the Extraversion-Introversion (E-I) dimension related more to ease of interpersonal contact than affinity to ideation (Mendelsohn, 1965), hypothesized and demonstrated that extraverts would be more likely to score as internals on the Rotter Locus of Control Scale and introverts would be more likely to score as externals. They noted that "more attention should be given to . . . empirical relationships among preference instruments than to their alleged theoretical bases per se" (Eliot & Hardy, 1977, p. 430). Another team of investigators also suggested that, although the scales of the MBTI provide a measure of surface characteristics, they "do not necessarily measure the intended psychological constructs, and thus the uses of the scales must be empirically rather than theoretically derived" (Carskadon & Knudson, 1978, p. 483). A critic of the theory of psychological differentiation acknowledges that, nevertheless, "there has been the undeniable suggestion in Witkin's work that his instruments are somehow tapping the very wellsprings of behavior . . ." (Zigler, 1963, p. 134). There is also the argument that Pavlov, Eysenck, and Witkin have each described the consequences of neural patterning, but have done so in different ways (Robinson, 1983). And, we are warned that a failure to maintain distinctions between

instruments and their theories can lead to erroneous conclusions--particularly for instruments such as the EFT and the MBTI which are most often involved in correlational studies (Wachtel, 1972).

It is noteworthy that these two separate bodies of endeavor with distinctly different origins and distinctly different instruments of measurement have come to share theoretical similarities. Both are "type" theories which assume humans are born with or begin to acquire at an early age a propensity to favor certain cognitive functions over others. Myers and McCaulley, in their reformulation of the Jungian orientation, explain that "children are . . . motivated to exercise their dominant function, becoming more skillful, adept, and differentiated in its use" (1985, p. 14). They further observe that as individuals with differing preferences develop along divergent lines, each becomes "relatively differentiated in an area where the other remains undifferentiated."

The theory of psychological differentiation as initially reported by Witkin, Dyk, Fateron, Goodenough, and Karp (1962) was less succinct. Zigler noted that "it is precisely here, in their theoretical efforts that the Witkin group promises so much and delivers so little" (1963). However, in 1976 Witkin explained that "People with field-dependent or field-independent cognitive styles are different in their interpersonal behavior in ways predicted by the

theory of psychological differentiation" (Witkin & Goodenough, 1976, p. 661). His last word on differentiation, written shortly before he died, explains that:

...differentiation is a major formal property of an organismic system. A less differentiated system is in a relatively homogeneous state; a more differentiated system is in a relatively heterogeneous state. A system that is more differentiated shows greater self-nonsel segregation, signifying definite boundaries between. . .self. . .and the outer world. In a less differentiated system, . . .there is greater connectedness between self and others. (Witkin, et al., 1979, p. 1127)

Both theories also emphasize the neutral value of the cognitive styles described by each. The Witkin group clarifies that "with regard to value judgments, cognitive styles are bipolar . . . each pole has adaptive value under specified circumstances, and so may be judged positively in relation to those circumstances" (Witkin, Moore, Goodenough & Cox, 1977, p. 16). A reviewer of the Myers-Briggs typology echoes the Witkin group, "No one preference or type is thought of as being qualitatively superior to another. . . each preference and type has its strengths and implied weaknesses, though the positive perspective is encouraged . . ." (Willis, 1984, pp. 483-484).

SUGGESTED RELATIONSHIPS BETWEEN FIELD DEPENDENCE-INDEPENDENCE AND THE MYERS-BRIGGS TYPE DIMENSIONS

This study does not directly address the theoretical assumptions surrounding the Witkin and the Myers-Briggs

instruments, but asks if the instruments derived from these two approaches measure common elements of the same cognitive processes. The literature suggests they do. As presented in Figure 1, patterns of definitionally dichotomous preferences, abilities, or predispositions arising from research using the Witkin or the Myers-Briggs measures appear to parallel each other in a predictable fashion. Field dependence appears to share variance with the extraversion (E), sensing (S), feeling (F), and judgment (J) poles of the MBTI; and field independence appears to share variance with their polar opposites, introversion (I), intuition (N), thinking (T), and perception (P).

Field Dependence and Extraversion

Descriptions of the personal attributes associated with the Myers-Briggs and Witkin types are one of the first indications that these styles may be related. Field-dependent persons have been described as sociable, gregarious, affiliation oriented, socially outgoing, participative, friendly, helpful, concerned for others, and having a wide acquaintanceship (Loveless, 1972; Pemberton, 1952; Sousa-Poza & Rohrberg, 1976; Sousa-Poza, Rohrberg & Schulman, 1973). Similar terms used to describe extraverted persons include "interests wide, enthusiastic, forgiving, sociable, energetic, outgoing, frank, talkative, spontaneous,

Affiliation Oriented								→
				Concept Oriented				→
Socially Accommodating								→
				Intelligence/Aptitude				→
Intolerance Ambiguity								
				Sensation Seeking				
Emotional Awareness								
				Creativity				
Drug Dependence								
				Depression				
More Females								
				More Males				
E	S	F	J	I	N	T	P	
↑ FIELD DEPENDENCE ↑				↑ FIELD INDEPENDENCE ↑				

Figure 1. Suggested correlations: Myers-Briggs Type Preferences and Field Dependence-Independence.

aggressive, quick, [and] assertive" (Brooks & Johnson, 1979, p. 747).

Field Independence and Introversion

At the other ends of these two dimensions, field independents have been described as preferring solitary activities, individualistic, cool and distant in relations with others, aloof, uninterested in humanitarian activities,

valuing cognitive pursuits and philosophical issues, concerned with ideas and principles rather than with people, task-oriented, and having work-oriented values such as efficiency, control, competence, and excelling (Loveless, 1972; Pemberton, 1952; Sousa-Poza & Rohrberg, 1976; Sousa-Poza, Rohrberg & Schulman, 1973). Introverted persons are reportedly "quiet, reserved, shy, defensive, mild, careless, inhibited, silent, withdrawn, wary, tense [and] timid" (Brooks & Johnson, 1979, p. 747). A Myers-Briggs assessment of the personalities of 2165 chessplayers ascertains the chessplayers were "significantly more introverted, intuitive and thinking and conversely less extraverted, sensing and feeling than general population norms" (Kelly, 1985, p. 282).

Conflict, Hostility, and Conformity

Research exploring methods for managing conflict and hostility has also described parallel differences of style between the types. Although field-independent people presented themselves as able and willing to direct hostility against others, field dependents were found to avoid direct expressions of hostility (Dengerink, O'Leary & Kasner, 1975). Field dependents also demonstrated greater consideration for the emotional content of situations than field independents (Westbrook, 1974). A study using the MBTI reported extraverted individuals' combined scores on conflict-mode

tests indicated a tendency toward integration, assertiveness and cooperation, and that a preference for feeling (F) on the thinking-feeling (TF) scale significantly correlated to accommodation in a conflict situation (Killman & Thomas, 1975). In another study, extraverted-feeling (E/F) and extraverted-sensing (E/S) types together exhibited significantly more conforming behaviors than did introverted-thinking (I/T) and introverted-intuitive (I/N) types (Mathevs, Miller & Carskadon, 1981).

Intelligence

Both the INTP poles of the MBTI and the Witkin dimension of field independence appear to be more correlative with intelligence or aptitude measures than are their counterparts. Although Witkin's Embedded Figures Test (EFT) has been shown to correlate with performance on standard intelligence tests, a factor analytic study indicates it loads on an uncorrelated factor as well. Users are cautioned that the scale may yield misleading and ambiguous information (Robinson, 1983). Wachtel comments that "indeed, the tests of field independence most commonly used correlate just as highly with the Block Designs, Object Assembly, and Picture Completion subtests of the Wechsler Adult Intelligence Scale as they do with each other" (1972, p. 181). The INTP poles are the only ones which consistently and significantly correlate with various intelligence and aptitude tests;

however, INTJ is most frequently correlated with academic achievement measures (Myers & McCaulley, 1985). It is noted that J's tend to overachieve and P's to underachieve.

Ambiguity

To activate many of the field-dependent responses, ambiguity must be introduced into a situation. Field-independent individuals appear more comfortable than field-dependent individuals in circumstances in which an interpretation of stimuli is not immediately apparent. Field dependents are believed to perceive ambiguous situations as sources of psychological discomfort or threat because they are more likely to look to or seek out others for information to dispel the ambiguity (Witkin & Goodenough, 1977). In educational settings, field-dependent students have been found to have greater difficulty in learning relatively unstructured material than field-independent students. When the material to be learned is presented in well organized form, both types appear to learn it with equal ease (Witkin, Moore, Goodenough, & Cox, 1977). When MBTI-type preferences were tested against scales for intolerance of ambiguity, sensing (S) and judging (J) correlated significantly with intolerance for ambiguity (Myers & McCaulley, 1985). Being disconcerted by ambiguity may lead to the use of black-and-white solutions, categorization, premature closure, and, of course, avoidance of ambiguous situations (Chappelle &

Roberts, 1986); this in itself could preclude superior performance in the intellectual realm dominated by field independence and the INTP preference.

Sensation Seeking

Another variable which may correlate with field independence and the intuition (I) preference of the MBTI is sensation seeking. In studies using the Rod and Frame Test (RFT) (Zuckerman & Link, 1968) and the Embedded Figures Test (EFT) (Zuckerman, Kolin, Price & Zoob, 1964), sensation seeking was found to correlate with field independence for males but not for females. Research employing the MBTI reported sensing (S) preferences correlated negatively and intuition (N) preferences correlated positively with the Arousal Seeking Tendency Instrument and the general Sensation Seeking Scale (Goldsmith, 1950) for both males and females.

Creativity

The finding that field-independent persons as a group are more creative than field-dependent persons has been discussed in the context of a "mobility-fixity" dimension which suggests a capacity for flexibility in style may exist for some field independents, but not for others (Witkin, et al., 1971, p. 11). The data from research using the MBTI which indicates creativity is related to introversion (I) and intuition (N) could assist in exploring the mobility-fixity notion.

Drug Dependence

When the RFT performance of 562 subjects hospitalized for treatment of alcoholism was compared to that of normal and psychiatric groups, the alcoholic sample was clearly the most field dependent (Jacobson, Van Dyke, Sternbach & Brethauer, 1976). MBTI assessments of the characteristics of drug abusers have reported a significantly larger percentage of extraverts than introverts within drug-addicted samples (Bisbee, Mullaney & Osmond, 1982; Devinne & Johnson, 1976). It was further noted that, relative to normal populations, ISFJ, ISFP, and ISTJ types were overrepresented in groups of patients with diagnoses of depression, schizophrenia, substance abuse, and bipolar-manic disorder (Bisbee, et al., 1982).

Gender Differences

A sensitive issue is the consistency with which field-independent males outnumber field-independent females (Witkin, et al., 1971). This unevenness of representation is reflected in the MBTI dimensions as well. The percentage of females showing a preference for introversion (I) is consistently lower than that for males. The greater discrepancy in type between the sexes, however, is the preference for feeling (F) over thinking (T) exhibited by females. Of a sample of 5,632 male and 9,616 female

traditional-age college students, 56% of the males indicated a thinking preference contrasted to 28% of the females (Myers & McCaulley, 1985, pp. 46-48).

A search of the literature has yielded only two published studies which directly compare the Witkin field-dependence-independence dimension with the MBTI dimensions. The first of these studies (Lusk & Wright, 1983) reported no significant correlations between the two tests and also noted that the literature contained no record of prior work comparing the GEFT to the MBTI. The second study (Corman & Platt, 1988) administered the two measures to undergraduate business students and reported a significant correlation between GEFT scores and the sensing-intuition (SN) scale of the MBTI for females only.

Compelled by the suggested relationships, the provocative data reported by Corman and Platt, and the dearth of comparative research using the Witkin and Myers-Briggs instruments, this study is undertaken to increase our inventory of cognitive style. The Myers-Briggs Type Inventory (MBTI) will be used to measure the Myers-Briggs type preferences and the Group Embedded Figures Test (GEFT) will be used to measure field dependence-independence.

HYPOTHESES

- H1: There will be a positive correlation between the MBTI extraversion-introversion dimension (EI) and field dependence-independence (FD/FI) as measured by the GEFT.
- H2: There will be a positive correlation between the MBTI sensing-intuition dimension (SN) and field dependence-independence (FD/FI) as measured by the GEFT.
- H3: There will be a negative correlation between the MBTI thinking-feeling dimension (TF) and field dependence-independence (FD/FI) as measured by the GEFT.
- H4: There will be a positive correlation between the MBTI judgment-perception dimension (JP) and field dependence-independence (FD/FI) as measured by the GEFT.
- H5: Field dependence-independence can be predicted by combinations of MBTI variables.
- H6: Relationships between field dependence-independence and the MBTI variables are not solely a function of age.
- H7: Relationships between field dependence-independence and the MBTI variables are not solely a function of intelligence.

- H8: There will be a gender difference in the prediction of field dependence-independence from the MBTI variables.
- H9: The equation for males will predict more variance in field dependence-independence than the equation for females.
- H10: The best predictor variables for field dependence-independence will be different for males and females.

METHOD

SUBJECTS

The MBTI and GEFT were administered to 202 undergraduate students, 108 females and 94 males, enrolled in undergraduate psychology courses at Portland State University. Half the subjects, 52 females and 49 males, also took the Wonderlic Personnel Test, Form II. Subjects' ages ranged from 18 to 58 with an average age of 24. They received extra credit in their psychology courses for participating in the study. No information regarding the thesis or the test instruments was provided to the subjects before testing.

INSTRUMENTS

Two test instruments, the Group Embedded Figures Test (GEFT) and the Myers-Briggs Type Indicator (MBTI) Form F were used to assess field-dependence-independence and the Myers-Briggs cognitive-style preferences.

The GEFT is a group administered, pencil-and-paper, speed test designed to approximate the individually administered EFT. It consists of three sections--a warm-up section of seven trials and two test sections of nine trials

each. For each trial, the subject is asked to find and trace, within the context of a more complex figure, the form of a previously presented simple figure. It takes approximately 20 minutes to administer. Two minutes are allowed for the warm-up section, and five minutes are allowed for each of the test sections. Each subject receives and completes the test within an individual test booklet. The GEFT score consists of the number of figures correctly identified.

Correlations between the scores from the first section of the GEFT with the scores from the second section corrected by the Spearman-Brown prophecy formula has produced a reliability estimate of .82 for both males (N = 80) and females (N = 97) (Witkin, et al., 1971). These reliability estimates are reported to compare favorably with those of the EFT.

The validity of the GEFT is based on its correlations with the EFT (-.82, -.63), with the Portable Rod and Frame Test (PRFT) (-.39, -.34), and with a measure of degree of body articulation (.71, .55), for males and females respectively. These correlations were based on small samples (N < 75) of male and female college undergraduates. The correlations with the EFT and the PRFT are negative because the tests were scored in reverse fashion (Witkin, et al., 1971).

A question of the validity of the EFT as a measure of

field dependence for females was raised in 1967 by Thornton and Barrett of Goodyear Aerospace Corporation. According to their analysis, the EFT scores for women had a correlation of .21 with the RFT compared to an EFT correlation of .64 with the RFT for men. They conclude it is an invalid measurement of field dependency for females.

The absence of replies to or citations of their article in the literature indicates the Thornton and Barrett question has not become a burning concern for the psychometric community. A recent review of the EFT (LaVoie, 1984) states that "extensive information is available; to summarize it briefly, the EFT has greater validity for males than females" (p. 264). The EFT is recommended as a solid test "with many immediate and potential applications."

The Myers-Briggs Type Indicator (MBTI) Form F, an untimed, self-report inventory, consists of a booklet containing 166 forced-choice items to which subjects reply on a separate answer sheet. Most of the questions have only two possible answers. Example: "Is it higher praise to say someone has (A) vision, or (B) common sense?" A portion of the MBTI contains word pairs from which the subject is asked to choose the word with the most appeal based on meaning. The MBTI preference scores are a reformulation of the difference scores for each dimension. They are converted to continuous scores for correlative studies by adding the

INTP scores to 100 and subtracting the ESFJ scores from 100.

The MBTI consistently receives passing marks as a reliable and generally valid instrument (Carlson, 1985). Carlyn notes that "estimated reliabilities of type categories appear to be satisfactory in most cases, although there is a rather wide range between conservative and liberal estimates of internal consistency" (1977, p. 465). Intercorrelations of type-category scores and intercorrelations of continuous scores both indicate relative independence between the type dimensions with the possible exception of the judgment-perception (JP) scale which appears to consistently correlate positively with the sensing-intuition (SN) scale. This is of particular theoretical interest because Jung postulated only three type dimensions, EI, SN, and TF. The fourth dimension, JP, was added by Isabel Myers (Myers & McCaulley, 1985). Carlyn's review of the MBTI's content validity, predictive validity, and construct validity pronounces it "a reasonably valid instrument" (1977, p. 471). It has received further support as an instrument which has "established an impressive record of reliability and validity when employed in appropriate research contexts" (Carlson, 1980, p. 802).

The Wonderlic Personnel Test, Form II, is a timed (12-minute), general measure of mental ability. It is not nominally designated as such in order to allay the test-taking anxiety which might be greater for an instrument

called an intelligence or mental abilities test than for one called a "personnel" test (Wonderlic, 1983).

PROCEDURE

The administration of the GEFT requires more subject control because it is a timed test. For this reason, it was the first instrument presented to the subjects. After the GEFT was collected, the subjects were given the MBTI to complete at their own pace. The specific sets of verbal instructions accompanying each instrument were read to the subjects by the experimenter.

The Wonderlic was administered as a follow-up test to the subsample of 101 subjects on a separate day.

RESULTS

The appendices contain three tables summarizing the sample in terms of MBTI and GEFT scores by gender. Appendix A presents means and standard deviations for the MBTI scales, the GEFT, intelligence as measured by the Wonderlic, and for the subjects' ages. Appendix B provides the polar distributions of the current study's scores for the four MBTI scales and the GEFT. Appendix C compares the percentages of this study's male and female subjects among the sixteen MBTI type categories to the percentages of types represented by the male and female samples of traditional-age college students from the MBTI Data Bank (Myers & McCaulley, 1985).

This study's ten hypotheses and corresponding test results are presented below. The correlations among all variables for all subjects are summarized in Table I.

H1: There will be a positive correlation between the MBTI extraversion-introversion dimension (EI) and field dependence-independence (FD/FI) as measured by the GEFT.

The correlation of EI and FD/FI was .0415, which is not significant at the alpha .05 level. Therefore hypothesis 1 was not supported.

H2: There will be a positive correlation between the MBTI sensing-intuition dimension (SN) and field dependence-independence (FD/FI) as measured by the GEFT.

TABLE I

PEARSON CORRELATIONS AMONG VARIABLES FOR ALL SUBJECTS

	GEFT	EI	SN	TF	JP	INTEL
EI	0.0415					
SN	0.1776*	-0.0097				
TF	-0.0553	0.0064	0.1029			
JP	0.1702*	0.0725	0.4027*	0.1106		
INTEL	0.3927*	0.0809	0.1550	-0.0867	0.1209	
AGE	-0.1108	-0.0572	0.0607	-0.0823	-0.1066	0.0534

N = 202 for all variables except intelligence n = 101

*p < .05

This hypothesis was confirmed with an $r = .1776$ ($p = .0114$) indicating subjects scoring as field independents are more likely to report a preference for situations in which they perceive things more conceptually than on a simpler, sensory basis.

H3: There will be a negative correlation between the MBTI thinking-feeling dimension (TF) and field dependence-independence (FD/FI) as measured by the GEFT.

This hypothesis was not supported by the nonsignificant $-.0553$ correlation.

H4: There will be a positive correlation between the MBTI judgment-perception dimension (JP) and field dependence-independence (FD/FI) as measured by the GEFT.

A correlation of $.1702$ for H4 was significant ($p = .0154$) indicating subjects scoring as field independents express a preference toward keeping issues open and remaining receptive to additional information rather than coming to quick conclusions or judgments.

H5: Field dependence-independence can be predicted by combinations of MBTI variables.

A significant relationship between field dependence-independence and a combination of MBTI variables postulated by H5 is indicated by a simultaneous multiple regression analysis yielding the equation:

$$\text{GEFT} = .006\text{EI} + .023\text{SN} - .018\text{TF} + .020\text{JP} + 8.58.$$

The R^2 of $.0511$ was significant ($F(4,197) = 2.65, p = .034$); however, only 5% of the variance in FD/FI can be accounted for by a combination of the MBTI scales. None of the regression weights were significant; therefore no single scale contributed uniquely, but, together, they significantly predicted field-dependence-independence.

A stepwise multiple regression analysis was employed to determine the ordering of the MBTI variables in terms of

variance accounted for in predicting FD/FI. It yielded the new equation:

$$\text{GEFT} = .023\text{SN} - .018\text{TF} + .021\text{JP} + 9.13$$

which contained only three of the four MBTI scales and accounted for only 5% of the variance in FD/FI. The R^2 of .0500 was significant ($F(3,198) = 3.47, p = .017$). The variables meeting the entrance criterion of .5 significance entered the equation in the following order: SN entered first, leading to an R^2 of .0315. Next, JP entered the model and increased the variance accounted for by 1% resulting in an R^2 of .0432. TF entered last, increasing the variance accounted for by an additional 1%, resulting in an R^2 of .0500. EI made no contribution above and beyond the other scales.

Both SN and JP have significant simple correlations with GEFT, so it is not surprising they entered the model first. However, they also correlate significantly with each other, $r = .4027$ ($p = .0001$), thereby appearing to account for some of the same variance in GEFT. TF and EI have very low correlations with GEFT with TF accounting for different variance in GEFT than the other variables. The stepwise shows that SN and JP play the most important, yet small, role in predicting field-dependence-independence as defined by the GEFT in this sample. These stepwise results should be interpreted with caution because the order of the two variables could change due to the correlation between SN and

JP and because of the relatively small sample size for a stepwise.

H6: Relationships between field dependence-independence and the MBTI variables are not solely a function of age.

The semi-partial correlation of the GEFT and the SN dimension with age taken out was .1847 ($p = .008$) indicating a significant amount of the variance common to both SN and the GEFT cannot be attributed to age. A relationship above and beyond age was also indicated for GEFT and the JP dimension by a semi-partial correlation coefficient of .1593 ($p = .023$).

H7: Relationships between field dependence-independence and the MBTI variables are not solely a function of intelligence.

This hypothesis was not confirmed. The semi-partial correlations of the GEFT and the SN and JP dimensions with intelligence taken out were not significant, indicating the GEFT and the SN dimension and the GEFT and the JP dimension share little common variance that is not also related to intelligence as measured by the Wonderlic Personnel Test.

H8: There will be a gender difference in the prediction of field dependence-independence from the MBTI variables.

The regression equations for predicting FD/FI from the MBTI scales were determined separately for males and females.

The analysis for males indicated a significant relationship between the GEFT and a combination of MBTI variables. It yielded the equation:

$$\text{GEFT} = .0201\text{EI} + .0444\text{SN} - .0323\text{TF} + .0170\text{JP} + 6.83$$

with an $R^2 = .1435$ ($F(4,89) = 3.73$, $p = .008$). Fourteen percent of the variance in FD/FI for males can be accounted for by a combination of the MBTI scales. The SN regression weight of .0444 was significant ($p = .0132$) indicating the SN dimension contributed uniquely to the relationship.

A stepwise multiple regression analysis was used to provide the ordering of the MBTI variables in predicting field-dependence-independence for males. The new equation is identical to the simultaneous equation for males above. The MBTI variables entered the equation in the following order: SN entered first, accounting for approximately 10% of the variance for an R^2 of .0974. It was followed by TF which increased the variance accounted for by 2% resulting in an R^2 of .1201. EI entered next, adding 1% to the variance accounted for resulting in a R^2 of .1342. Finally, JP entered, increasing the variance accounted for by 1% resulting in an R^2 of .1435.

This ordering of the variables for the males in which TF enters as the second variable differs from the overall ordering in which JP is the second variable and TF is the third.

In contrast to the results for the males, when only the females were examined, the simultaneous multiple regression equation containing the four MBTI scales was not significant. A stepwise assessment of the relationships was not conducted because of the absence of significant results for the simultaneous analysis.

H9: The equation for males will predict more variance in field dependence-independence than the equation for females.

Hypothesis 9 has been resolved by the test results for H8 which indicate 14% of the variance in FD/FI can be predicted by the equation for males whereas only a nonsignificant 2% of the variance can be accounted for with the females.

H10: The best predictor variables for field dependence-independence will be different for males and females.

Hypothesis 10 has also been resolved by the test results for H8 which indicate there are no significant predictor variables for females; whereas the variables entered in the following order for males: SN, TF, EI, JP.

Tables II and III are provided to illustrate the nature of the correlations among the GEFT, the MBTI, age, and intelligence for the males (Table II) and for the females (Table III).

TABLE II
PEARSON CORRELATIONS AMONG VARIABLES FOR MALES

	GEFT	EI	SN	TF	JP	INTEL
EI	0.1450					
SN	0.3121*	0.0958				
TF	-0.1310	0.0261	0.0627			
JP	0.2236*	0.0751	0.3820*	-0.0484		
INTEL	0.4970*	0.0042	0.1569	-0.0903	0.1619	
AGE	-0.1100	-0.0754	0.0366	-0.2186**	-0.1198	-0.0453

N = 94 for all variables except intelligence $n = 49$

* $p < .05$

TABLE III
PEARSON CORRELATIONS AMONG VARIABLES FOR FEMALES

	GEFT	EI	SN	TF	JP	INTEL
EI	-0.0623					
SN	0.0383	-0.1140				
TF	0.0739	0.0457	0.1867*			
JP	0.0978	0.0526	0.4222*	0.3868*		
INTEL	0.2403	0.1430	0.1463	0.0306	0.0011	
AGE	-0.0982	-0.0322	0.0907	-0.1280	-0.0783	0.1374

N = 108 for all variables except intelligence $n = 52$

* $p < .05$

DISCUSSION

SUMMARY

This study was predicated on the thesis that the Group Embedded Figures Test (GEFT) and the Myers-Briggs Type Inventory (MBTI) elicit data pertinent to cognitive processing and that the two instruments access a common cognitive process. Five percent of GEFT performance, overall, was significantly predicted by the combination of MBTI variables in the directions hypothesized--INTP. Within the overall equation, however, no single scale contributed uniquely. For the males, 14% of the variance in GEFT performance was predicted by the combination of MBTI variables. SN, the single significant predictor, accounted for 10% of the variance, followed by T, I, and P which, together, accounted for an additional 4% of variance.

According to academic convention, these singular results would be interpreted as though they were a comprehensive representation of the process under consideration. However, for this particular question other direct evidence is available and negates, a priori, any isolated interpretation of the present study's finding. Specifically, the very similar Corman-Platt (1988) study also found a significant GEFT-SN correlation, but only for

females, and the equally similar Lusk-Wright study (1983) found no significant relationship between the GEFT and the MBTI for either gender. As can be seen, when considered separately, the results of each of these three studies contradict the results of the other two.

Because each study tested the relationship between the GEFT and the MBTI using identical materials, prescribed procedures, and adequate sample sizes (N = 202 for the current study; N = 226 for Corman-Platt; N = 103 for Lusk-Wright) drawn from populations of undergraduate students of similar mean ages (24.3 years for the current study; 22.38 years for Corman-Platt; and 21.1 years for Lusk-Wright); no particular set of results can be considered clearly superior to the others. An alternative is to expand the analysis to one in which all three sets of results are regarded as equally valid and partial manifestations of the cognitive process under investigation, and in which all three sets of results become central to its discussion. To put it plainly, these three sets of perplexing data are not mere cosmic disjunctions in the field of cognitive research but do reflect the process under exploration. To understand the process, it must be considered in its entirety.

To accommodate this expanded format, a summary of the results for the current study, the Corman-Platt study, and the Lusk-Wright study is provided in Table IV. A comparison of the SN-TF distributions and ratios by gender for the

current study, the Corman-Plett study, and the MBTI Form F Data Bank is presented in Table V. The Lusk-Wright study did not provide SN-TF information for its subjects.

ANALYSIS

Because these studies utilized identical procedures and materials, yet produced different results, their findings appear to depend on sample artifacts rather than a consistent relationship between the MBTI and the GEFT. The GEFT-SN correlations, $r = .312$ for the current study's males and $r = .241$ for the Corman-Plett females, were obtained for groups sharing four distinct sample characteristics: greater range of GEFT performance, more balanced proportions of gender-related T and F preferences, no significant intercorrelations between SN and TF, and skewed distributions of SN preference.

The intercorrelations between JP and SN and GEFT indicate SN and JP share the same variance with GEFT. Thus the discussion regarding the SN dimension could equally pertain to the JP dimension, and JP will not be referred to specifically.

The relationship between the GEFT and the SN dimension of the MBTI gained significance within samples possessing the more extreme GEFT scores and the more extreme ratios of intuition (N) to sensing (S) preferences. The current study's males and the Corman-Plett females for whom GEFT and SN significantly correlated had higher mean GEFT scores than

TABLE IV

SUMMARY AND COMPARISON OF RESULTS FROM THE CURRENT STUDY,
THE CORMAN-PLATT STUDY, AND THE LUSK-WRIGHT STUDY

	Current Study		Corman-Platt		Lusk-Wright
	Males	Females	Males	Females	All Subjects
Number of Subjects	94	108	107	119	103
Mean GEFT	12.28	11.47	10.80	11.45	12.40
Mean SN	101.68	99.56	90.58	86.04	87.08
Correlations: (*p < .05)					
GEFT:SN	.312*	.038	.159	.241*	.057
GEFT:JP	.224*	.098	.164	.116	.147
SN:JP	.382*	.422*	.440*	.504*	.301*
SN:TF	.063	.187*	.218*	.097	.337*
JP:TF	-.048	.387*	.315*	.190*	.114
SN:EI	.096	-.114	-.240*	-.051	-.061
JP:EI	.075	.053	-.243*	-.044	-.211
AGE:GEFT	-.110	.098	-.235*	.026	N/A
AGE:TF	-.219	-.128	-.016	-.102	N/A
Mean Age	24.3		22.38		21.1

Universities Represented in the Samples:

Current study: Portland State University
 Corman-Platt study: Two major southwestern Universities
 Lusk-Wright study: University of Denver and the Wharton School of the University of Pennsylvania

TABLE V

PERCENTAGES OF TF-SN SCORES FOR THE CURRENT STUDY,
THE CORMAN-PLATT STUDY, AND THE MBTI DATA BANK

Males

Current Study		Corman-Platt Study		MBTI Data Bank	
n = 94		n = 107		n = 5,632	
S/F	N/F	S/F	N/F	S/F	N/F
12.76	22.35	9.34	14.96	23.36	19.94
S/T	N/T	S/T	N/T	S/T	N/T
34.05	30.84	50.46	25.23	35.05	21.66
Thinking = 64.89%		Thinking = 75.69%		Thinking = 56.71%	
Feeling = 35.11%		Feeling = 24.30%		Feeling = 43.30%	
Sensing = 46.81%		Sensing = 59.80%		Sensing = 58.41%	
Intuitive = 53.17%		Intuitive = 40.19%		Intuitive = 41.60%	
N:S = 1.14		N:S = .67		N:S = .71	
T:F = 1.85		T:F = 3.11		T:F = 1.31	

Females

Current Study		Corman-Platt Study		MBTI Data Bank	
n = 108		n = 119		n = 9,616	
S/F	N/F	S/F	N/F	S/F	N/F
29.43	29.66	36.13	17.64	43.14	28.79
S/T	N/T	S/T	N/T	S/T	N/T
23.74	17.60	36.13	10.08	18.32	9.75
Thinking = 41.34%		Thinking = 46.21%		Thinking = 28.07%	
Feeling = 59.19%		Feeling = 53.77%		Feeling = 71.93%	
Sensing = 53.17%		Sensing = 72.26%		Sensing = 61.46%	
Intuitive = 47.26%		Intuitive = 27.72%		Intuitive = 38.54%	
S:N = .89		S:N = .38		S:N = .62	
T:F = .70		T:F = .86		T:F = .39	

did their within-study counterparts for whom GEFT and SN were not significantly correlated. The current study's males and the Corman-Platt females also had the most extreme ratios of N to S preferences among the two studies and the MBTI normative samples. The present study's group of males contained an uncharacteristic majority of subjects scoring as intuitives for the highest N:S ratio of 1.14; the Corman-Platt females indicated a 72% preference for sensing for the lowest N to S ratio of .38. These configurations suggest the strength of the GEFT-SN correlations occur in the upper tail of the GEFT distributions and thus depend upon levels of GEFT performance rather than GEFT performance overall.

A second pattern reveals an inverse relationship between the presence of significant GEFT-SN correlations and the presence of significant TF-SN correlations. For the groups with significant SN-GEFT correlations--the current study's males and the Corman-Platt females--SN and TF were not significantly correlated; for the groups in which SN and GEFT were not significantly correlated--the current study's females, the Corman-Platt males, and the Lusk-Wright group--SN and TF were significantly correlated.

The TF factor appears to be most closely associated with traditional environmental influence, especially as pertains to gender. Males and females have consistently scored differently on the TF scale of the MBTI. According to the MBTI samples of 5,632 male and 9,616 female traditional-age

college students completing the Form F inventory, 56% of the males, compared to 28% of the females, indicated a thinking preference (Myers & McCaulley, 1985). Considering this historical tendency for males to indicate thinking preferences and females to indicate feeling preferences as representing traditional social influence, the current study's males and the Corman-Platt females had the least traditional, within-study, thinking (T) to feeling (F) ratios; i.e., more males in the current study than in the Corman-Platt study expressed feeling preferences, and more females in the Corman-Platt study than in the current study expressed thinking preferences.

Supporting the interpretation of the TF preference as representing gender-related environmental influence is the significant negative correlation ($r = -.219$) between age and TF preference for the current study's males: the older males tended to score thinking preferences and the younger males tended to score feeling preferences. This inverse relationship of age to feeling preference could reflect a changing society in which reinforcement has shifted from the "macho" to the "sensitive" male. The SN/TF data are provided in Table IV.

As presented in Table V, the current study's TF ratio of 1.85 for males is significantly less traditional than the Corman-Platt males' TF ratio of 3.11. The TF ratio of .86 for the Corman-Platt females is also less traditional than

that of the current study's females and significantly less traditional than the .39 TF ratio for the MBTI Data Bank's college females. Thus the groups for whom SN and GEFT significantly correlate--but for whom SN and TF do not significantly correlate--have more balanced proportions of thinking and feeling preferences and therefore appear to contain more individuals expressing TF preferences which are nontraditional for their gender than do the groups for whom no significant GEFT-SN correlations were obtained.

The alliance of this inferred nontraditional factor with the significant GEFT-SN correlations and nonsignificant SN-TF correlations suggests that subjects with atypical SN/TF preferences demonstrated the more extreme levels of spatial reasoning skill. The current study's males had the largest concentration of N/T preferences and the Corman-Platt females had an unusual concentration of S/T preferences for a female population. The equation for predicting GEFT performance for the current study's males indicated a negative TF-GEFT correlation and placed TF as the second MBTI variable in order of importance to the prediction of MBTI-GEFT variance (See H8, p. 22). This ordering for the current study's males differed from the overall ordering in which JP was the second variable and TF was the third.

CONCLUSION

Because of the low strength and reliability of the GEFT-

SN relationship and the absence of relationship between the GEFT and the other MBTI dimensions despite their described similarities, this study's findings do not readily evidence the bipolar, dichotomous cognitive constructs proposed by the Witkin and the Myers-Briggs theorists. A simpler explanation points to arrays of skills acquired through exposure and attention over time to skill-related tasks, arrays which would be, therefore, largely environmentally determined and individualistic.

This conclusion focuses on the time variable because it requires the least definition; can be controlled and measured; and thus is the one element which would be amenable to manipulation in a search for a causal agent among the relationships discussed in these studies.

The GEFT-SN Relationship as a Function of Time Allocated to Cognitive Process

The GEFT-SN relationship may be viewed as a function of the amount of situational time allowed for cognitive process. Compared to groups who register an intuitive (N) preference, sensing (S) groups have been found to demonstrate less tolerance for ambiguity and are more likely to terminate an ambiguous situation by arriving at a quick decision or by premature closure (Chappelle & Roberts, 1986; Myers & McCaulley, 1985).

Individuals expressing strong sensing preferences may not, through unwillingness or inability to allocate the

requisite attention to cognitive process, be as likely to develop certain skills--such as the spatial discrimination measured by the GEFT--as individuals expressing strong intuition preferences. High GEFT scores suggest a higher level of spatial processing than do low GEFT scores; therefore, the high GEFT scorers may possess higher-order spatial discrimination skills. The association of the N preference with the higher scores indicates the amount of time allocated to cognitive process could influence the formation of a higher-order skill. That higher-order cognitive processes may develop over time can be inferred from the rather abrupt increases in learning curves, for the value of overlearning for students preparing for testing situations, for the "Aha!" experience and Professor Higgins' "By George, I think she's got it!" It would be at the juncture of the "Aha," always preceded by a certain period of time allocated to the process, that a skill is in evidence.

Tolerance for ambiguity has also been found to be related to cognitive complexity, defined as an abstract, relativistic cognitive style in contrast to the less capacious, binary style of the less cognitively complex (Rotter & O'Connell, 1982, p. 1218). The interrelation of these three factors--tolerance for ambiguity, the intuitive factor, and cognitive complexity--suggests time allowed for cognitive process could also engender the acquisition of multiple skills. The individual with a wide array of skills

would engage multiple discriminative factors in processing information and therefore evince a more abstract, less categorical mode of cognition. Accordingly, the probability of finding a developed spatial discrimination ability would be higher among the ambiguity-tolerant individuals with the larger arrays of skills than among the ambiguity-intolerant possessing smaller arrays of skills.

Also supporting the notion that larger arrays of skills contribute to more abstract cognitive style is Rotter and O'Connell's finding that the single most important predictor of cognitive complexity among study variables including SAT scores and gender was the number of years of education--a classic combination of time and skill-oriented influence (p. 1215).

Witkin approached the idea of cognitive complexity in his theory of cognitive differentiation. But, using the parameters of his construct, field dependence-independence, he qualified the dimensions of differentiation as follows:

...differentiation is a major formal property of an organismic system. A less differentiated system is in a relatively homogeneous state; a more differentiated system is in a relatively heterogeneous state. A system that is more differentiated shows greater self-nonsel self segregation, signifying definite boundaries between. . .self. . .and the outer world. In a less differentiated system, . . .there is greater connectedness between self and others. (Witkin, et al., 1979, p. 1127)

However, the Rotter and O'Connell study of sex-role and cognitive complexity and the current study's results suggest

that subjects displaying preferences traditionally associated with the opposite sex are more cognitively complex than their traditional peers. Witkin's definition did not recognize the possibility that the acquisition of an empathic skill could involve as much attention or result in as much differentiation as the acquisition of a spatial reasoning skill. From the premise that differentiation or cognitive complexity represents larger rather than smaller arrays of skills, individuals who perceive "greater connectedness between self and others" can be as organismically differentiated as the person who makes a greater distinction between self and nonself. The less differentiated individual would be the person limited to only one mode of perception.

The overrepresentation of sensing and introverted types among groups of patients with diagnoses of depression, schizophrenia, substance abuse, and bipolar-manic disorder (Bisbee, et al., 1982) may be a function of their possessing a smaller than normal range of skills. Complementing this conjecture is the effectiveness of behavioral therapy which essentially requires the client to develop new skills.

The Relationship of Intelligence to the GEFT, Tolerance for Ambiguity, and Cognitive Complexity

Intelligence correlates with both GEFT performance and tolerance for ambiguity. This study's results indicated the GEFT and the SN dimension shared little common variance that was not also related to intelligence as measured by the

Wonderlic Personnel Test. Rotter and O'Connell, in their study of sex role and cognitive complexity, found the single most important predictor of tolerance for ambiguity was the SAT verbal score.

The predictors of cognitive complexity for females included high SAT math scores and low SAT verbal scores; the predictors of cognitive complexity for males included low SAT math scores and high SAT verbal scores (pp. 1214-1215). These inverted relationships of math and verbal scores to cognitive complexity for males and females reflect the nontraditional direction of the gender-related TF preferences found among the groups in the current and Corman-Platt studies for whom SN-GEFT correlated.

The GEFT-SN Relationship as a Function of Nontraditional, Gender-related Preference

Because the groups with significant GEFT-SN correlations demonstrated the least traditional, gender-related TF preferences, it appears as though the amount of time allocated to cognitive process may also influence the development of nontraditional preference.

However, deciding what is traditional and what is not depends upon the reference group. For example, the Corman-Platt sample consisted of business students from two major southwestern universities and thus provided a group of very traditional males--the businessmen, and, from a social perspective, a group of nontraditional females--the

businesswomen. For the Corman-Platt females, however, the factor of least time allowed for situational processing, Sensing, was the dominant influence in career choice. Generically speaking, this group of S/T-dominated females may be quite traditional but have only been able to enter the business world as professionals during the latter half of the twentieth century.

Therefore, the suggested nontraditional factor can be traced to the N preference which indicates the ability or willingness to allocate more time to cognitive process than an S preference. It may be the "mobility-fixity" dimension referred to by Witkin and found to exist for some field independents, but not for others (Witkin, et al., 1971, p. 11). Or, it could be an acquired skill, perhaps essential to creativity, by which an individual can assess data nontraditionally or in a new way. Another possibility is that this nontraditional factor simply reflects the greater range of choice available to individuals who tend to acquire large arrays of skills.

Studies utilizing the Bem Sex Role Inventory (BSRI) also identify a nontraditional sex-role factor among the variables related to cognitive style. Rotter and O'Connell (1982, p. 1209) reported,

Male and female androgynous and cross-sexed subjects were more tolerant of ambiguity than sex-typed subjects and cognitively more complex than undifferentiated subjects. Cross-sexed subjects were more cognitively complex than sex-typed

subjects. The BSRI had differentiated power to predict cognitive complexity depending upon sex of subject.

The GEFT-SN Relationship as a Function of Gender

Most field dependence-independence research reports consistently higher GEFT performance for males than females (Witkin, et. al., 1971); therefore, the Corman-Platt females' obtaining the higher GEFT scores and the significant GEFT-SN correlation was an unexpected result. The notion of a genderless factor being central to cognitive processing is also challenged by neurochemical research indicating hormones influence women's spatial reasoning. From a study of 200 women, ages 25 to 39, Kimura and Sampson (1988) concluded that when levels of estrogen and progesterone were low, the women performed better on tasks requiring spatial reasoning than they did on the more fertile days of their cycle when their estrogen and progesterone levels were higher. However, Kimura and Sampson also noted that these changes in performance varied dramatically from one woman to another.

From the perspective that higher-order skills are acquired through exposure and attention over time to skill related tasks, women, like men, would possess varying degrees of skill in spatial reasoning. Those possessing developed spatial discrimination skills would find their spatial reasoning to be relatively impervious to changes in hormonal concentrations. For those who do not possess such skill, the

process may involve learning, rather than accessing, and may be more sensitive to interference of any nature.

The Validity of the Field Dependence-Independence and Myers-Briggs Measures

The evidence that sensation-seeking correlates significantly with field independence for males, but not for females, (Zuckerman, Kolin, Price, & Zoob, 1964) and the significantly lower correlations between the embedded figures tests and the Rod and Frame Test for females, compared to males, have led several psychometrists to hypothesize that the embedded figures tests are not valid measures of field dependency for females (Thorton & Barrett, 1967; LaVoie, 1984). However, these gender differences may simply indicate the field dependence-independence construct does not adequately define the process which it measures according to its definition. The exercise approximates the dilemma posed by the question, "When did you stop beating your wife?"

The embedded figures tests may not correlate with the Rod and Frame Test (RFT) for females because, due to environmental influence, it is less likely that females, compared to males, would acquire either of these skills, much less both. For the same reason, sensation seeking may not correlate with the field independence-dependence construct for females because many sensation-seeking females may never have acquired the RFT skills out of lack of interest, reinforcement, or opportunity.

Intelligence correlated significantly with GEFT scores for the current study's males, but not for the current study's females. Again, this group of females may not have added GEFT skills to their more traditional array. Similarly, the variance shared by the RFT and the GEFT might also be insignificant for males should ownership of baseball hats be partialled out.

The MBTI is also problematic. As a forced-choice, self-report instrument, its SN dimension may elicit self-report preferences of sensing from subjects who do not yet possess the cognitive skills which would allow them to operate confidently in ambiguous situations. Subjects possessing a larger or bipolar array of interests and skills could experience more approach-approach conflict in answering the forced-choice MBTI. They might choose S or N responses for reasons other than the choices made by subjects with a narrower range of cognitive experience. Subjects who select items from opposing poles of the MBTI dimensions with equal frequency are scored as having low preferences for both poles even though their actual preferences and ability to operate within the two cognitive arenas may be quite strong.

Although precursor skills may enhance the development of other skills, there is little evidence that an elementary cognitive process dictates the development of one set of skills and precludes or inhibits the formation of an artificially-defined opposite set of skills. Field

dependence-independence and the Myers-Briggs constructs may be myths.

RECOMMENDATIONS

A meta-analysis of the studies incorporated in this discussion would be valuable. Because the SN-GEFT relationships appear to be located in the upper tail of the GEFT distributions, an analysis of the scores located in the first and third standard deviations, omitting the middle scores, may provide a stronger indication of the nature of the relationship. The forced-choice format of the MBTI may not accurately reflect the strength of a subject's propensity to rely on both sensing and intuitive preferences; therefore, although a poor second choice, correlations of the raw S and N scores with the GEFT should yield a more direct indication of the GEFT-S and GEFT-N relationships than do the difference scores. However, considering its forced-choice format and the increased probability of extraneous variables influencing responses to a self-report inventory, future research may better profit from posing a more specific question and using a more specific instrument than the MBTI. The administration time for the GEFT could also be shortened to increase the variance among the GEFT scores.

To test the assumed relationship between time allocated to cognitive process and cognitive achievement, recordings of

time spent on various unique tasks, perhaps some unsolvable, could be compared to intelligence scores, Grade Point Averages, or other measures of cognitive achievement. The last task could ask subjects to recall the experimenter's instructions for a bogus task assignment. This exercise, scored for accuracy, would have a secondary function of providing an indication of perceptual skill. To test the relationship between time allocated for cognitive processing and gender-related traditional behavior, the time recordings for the experimental tasks could be compared to scores on the Bem Sex Role Inventory. A task assessing creativity could also be employed.

For another study, subjects demonstrating low attention span could be trained to provide longer periods of time to ambiguous stimuli. Pre-test and post-test measures of problem solving would be compared. A control group could be given equal, unstructured, group time.

Should the intuitive factor or time allowed for cognitive process engender the acquisition of multiple skills, then one could expect to find more skills among subjects demonstrating a high N factor. An adjunct to the studies proposed above would consist of administering a questionnaire devised to enumerate the skill-related activities and interests for each subject and comparing that number to the N measure.

The value of these studies lies in their possible

relevance to education. Although differences in cognitive style, learning strategies, and the effects of day-to-day environmental influence on concentration are widely recognized, our educational system continues to process students within a ladder of time constraints as though the quantity and quality of time were uniform for each student and of little consequence to the process. If the ability to allocate time to cognitive process is essential to learning, further research could determine if this time factor, perhaps a first cousin to intelligence, can be learned and therefore taught.

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APPENDIX A

SAMPLE MEANS AND STANDARD DEVIATIONS FOR
GEFT, MBTI, INTELLIGENCE AND AGE

FOR THE CURRENT STUDY

BY GENDER

	All Subjects		Females		Males	
	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>
	(N = 202)		(n = 108)		(n = 94)	
GEFT	11.85	4.60	11.47	4.50	12.28	4.70
MBTI:						
EI	100.18	27.32	98.15	27.66	102.51	26.87
SN	100.55	27.15	99.56	25.95	101.68	28.57
TF	97.95	21.80	104.96	19.90	89.89	21.20
JP	100.80	27.36	97.68	25.63	104.38	28.95
Age	24.29	7.02	25.39	8.41	23.03	4.70
	(n = 101)		(n = 52)		(n = 48)	
Intelligence						
	23.69	6.18	22.77	5.34	24.67	6.88

APPENDIX B

POLAR DISTRIBUTION OF CURRENT STUDY'S SCORES
FOR THE MBTI SCALES AND THE GEFT
BY GENDER

Classification	Males $n = 94$	Females $n = 108$	Total $N = 202$
E	44	59	103
I	50	49	99
S	44	57	101
N	50	51	101
T	61	44	105
F	33	64	97
J	40	62	102
P	54	46	100

GEFT

$\bar{M} = 11.85$

Above \bar{M}	53	49	102
Below \bar{M}	41	59	100

APPENDIX C

PERCENTAGE DISTRIBUTIONS OF SUBJECTS AMONG MBTI TYPE

CLASSIFICATIONS: CURRENT STUDY AND MBTI DATA BANK

	Males		Females	
	Current Study n = 94	Data Bank* n = 5,632	Current Study n = 108	Data Bank n = 9,616
ESTJ	10.64%	11.24%	11.76%	7.53%
ESTP	8.51%	6.46%	1.85%	2.56%
ESFJ	3.19%	6.59%	8.33%	16.20%
ESFP	3.19%	5.40%	6.48%	8.54%
ENTJ	5.32%	5.38%	5.56%	2.85%
ENFJ	2.13%	3.69%	7.41%	6.88%
ENTP	9.57%	6.16%	5.56%	3.06%
ENFP	4.26%	7.48%	8.33%	12.32%
INFP	11.70%	5.84%	9.26%	5.78%
INFJ	4.26%	2.93%	4.66%	3.81%
INTP	9.57%	5.81%	4.63%	1.94%
INTJ	6.38%	4.31%	1.85%	1.90%
ISFJ	3.19%	6.27%	10.19%	12.26%
ISFP	3.19%	5.10%	4.63%	6.14%
ISTJ	7.45%	10.60%	8.33%	6.01%
ISTP	7.45%	6.75%	1.85%	2.22%

*Myers and McCaulley, 1985, pp. 46-48: College students of traditional age