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Myers Briggs Type Indicator Styles and Cognitive Performance

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MYERS BRIGGS TYPE INDICATOR STYLES
AND COGNITIVE PERFORMANCE

by

Gary Mitchell Jaworski

A Dissertation Submitted to the Faculty of the Graduate School
of Loyola University of Chicago in Partial Fulfillment
of the Requirements for the Degree of
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VITA

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CHAPTER I
INTRODUCTION

The intent and focus of this investigation is to address the area of psychological interface between personality style and cognitive performance. Clinical psychological tradition is based on a convention which divides "intellectual" functioning from "personality" functioning. Nowhere is this more evident than in the standard psychological testing report. The underlying position within this investigation is that this distinction, fractionating intellectual functioning from personality functioning, is a rather artificial one- a convention used for convenience and categorization and one that does not exist in nature. The position of this investigation is that personality style and cognitive performance are best viewed as a kind of interwoven tapestry; a synthetic whole conveying a complete picture.

Specifically this investigation will examine cognitive performance of personality styles as defined by the Myers-Briggs Type Indicator. Clinical practice and theory have long suggested a relationship between personality variables and cognitive styles (Rapaport, Gill, & Schafer, 1979;

Shapiro, 1965). More recent advancements in ego psychology have emphasized the complex and interrelated aspects of intelligence and personality. As such, intelligence tests are understood to reflect meaningful configurations of personality structure beyond a means to describe specific, independent abilities. From this perspective intelligence and personality may be regarded as interactive if not inseparable features of a unified phenomena (Allison, 1978).

The theoretical position regarding the clinical relationship between personality and intelligence has received support by those primarily concerned with the research and study of intelligence. Wechsler has stated in his introductory remarks on the WAIS-R: "Intelligence is a function of the personality as a whole and is responsive to other factors besides those included under the concept of cognitive abilities. Intelligence tests inevitably measure these factors as well," (Wechsler, 1981, p. 8). Anastasi (1982) has emphasized the importance of considering appropriate personality variables for understanding both intellectual test performance and academic achievement. Anastasi (1982) views the relationship between personality and intelligence as a reciprocal one. Sternberg (1985), in an extensive review of the intelligence research field, argues for broad based investigation promoting contact with psychological establishments outside cognitive psychology alone. For Sternberg (1982), intelligence is a construct

capable of being understood only through multidisciplinary investigation.

The term "cognitive styles" refers to preferred or habitual patterns of mental functioning including the formation of ideas, judgments, and information processing (Lawrence, 1984). However much of the experimental research on cognitive styles has suffered from a lack in precision because theoretical concepts are expressed in metaphorical language. Baron (1982) has suggested that research on cognitive style is a worthwhile enterprise but a need for clear definition and a framework that specifies related styles is essential. Regarded as the best test of adult intelligence, the Wechsler Adult Intelligence Scale's capacity to yield cognitive style and diagnostic information has been well documented (Allison, 1978; Matarazzo, 1972; Zimmerman & Woo-Sam, 1973). Additionally, Kaufman's (1979) empirical analysis of the WISC-R provides further groundwork for research between Wechsler subtests and cognitive-personality dimensions.

The Myers-Briggs Type Indicator (MBTI) was developed to implement Carl Jung's theory of typology. The MBTI has been widely used as a tool in clinical and counseling populations, in career planning, as a device in family and group work to enhance communication and leadership skills, besides the understanding of type differences in teaching and learning styles. The MBTI has been referred to as a

"new instrument with a long history," (McCaully, 1981). The MBTI classifies individuals according to the rich personality dimensions described by Jung: the two attitudes of introversion-extraversion (I-E), the four functions of thinking-feeling (T-F), sensing-intuiting (S-N), as well as the judging-perceiving (J-P) dimension developed by Myers. McCaulley (1987) has suggested that Jung's theory of psychological type provides a useful model in the understanding of individual differences through the manner in which information is taken in (perception) and decisions made (judgment). Within this framework, problem solving can be understood as an organized means of acquiring information and making decisions. While the majority of validity studies on the MBTI have involved correlations with personality tests, a recent review of over 100 published reports concerning cognitive and learning style research reveals encouraging and consistent results (Lawrence, 1984).

The focus of this study will be to examine the relationship between the MBTI and selected WAIS-R subtests to yield information regarding personality differences in cognitive performance as defined by the MBTI. The MBTI scales will be considered individually and interactionally according to competing models in the literature (Golay, 1982; Kiersey & Bates, 1978; Lawrence, 1979; McCaulley, 1976; Myers, 1985). The goal of this research will be to contribute to the construct validity of this popular

clinical self report instrument by testing specific hypotheses based on the differing MBTI learning style theories.

CHAPTER II

REVIEW OF THE LITERATURE

Intelligence, Learning, and Cognitive Style

The interrelated field of learning style and intelligence research is currently a highly topical area within educational circles (Chicago Tribune, November 1989). Although various descriptions of learning styles are debated, research as well as observation confirm that individuals learn through different styles. The major focus of this section will be to survey both traditional and non-traditional ways in which intelligence and learning styles have been conceptualized. An argument will be made for utilizing the MBTI and the WAIS-R, due to its well established psychometric basis, as a useful means of understanding cognitive performance. Examination of the MBTI is particularly timely given its current wide use as a self report instrument, as evidenced in over two million people take the MBTI yearly (Golden, 1990).

Dunn (1983) has described learning style as the way in which an individual "concentrates or absorbs and retains different materials," (Mein, 1986, p. 44). A related, much broader concept is that of cognitive style as a

comprehensive dimension of an individual's functioning involving the intellectual, perceptual, personality, and social domains (Watkins & Goodenough, 1981). Cognitive style involves processes of behavior -the "how" of behavior, which is stable for given individuals across time. Cognitive styles are "value neutral" and are primarily concerned with "individual differences in the processing of information" (Jeppesen, 1986).

Both theory and research on intelligence and cognitive processes have been characterized by increasing complexity and sophistication. Several researchers on intelligence, Sternberg, Conway, Ketson, and Bernstein (1981) factor analyzed a large number of experts' ratings of behaviors that were deemed either important or characteristic in defining intelligence. Three factors emerged that embodied the experts' conceptions of intelligence: verbal intelligence, problem solving, and practical intelligence. Interestingly, these factors reflect the traditional theories regarding the structure of intelligence.

In short, psychometric theories of intelligence have been based on individual differences in ability that have been arrived at through factor analyses. Differential theories of intelligence differ from one another in the number of factors proposed, as well as in the geometrical arrangement of factors relative to one another. As Sternberg (1985) indicates, the number of factors proposed

has ranged from a general factor of one to 150 specific traits. Historically, the three major proponents of the factor analytic view of intelligence have been Spearman, Thurstone, and Guilford (Sternberg, 1985).

Spearman's work represented the lower end of the "number of factors" continuum. Spearman suggested that intelligence is comprised of two types of factors, a general factor as well as specific factors. The general factor influences performance on all intellectual tasks, while specific factors influence only one task each. For Spearman, the general factor was of major interest. The general factor involves the following principles of cognition: the apprehension of experience, the education of relations, and the education of correlates (Sternberg, 1985). Apprehension of experience refers to the perception, understanding, or encoding of information. Education of relations refers to an inferential understanding of relationships present, while education of correlates refers to the application of the inferred principle to a new domain. As Sternberg (1985) has indicated, ability to understand analogies contains these principles and is consequently regarded by many as most representative measures of the general factor, or "g".

Thurstone represents the "middle ground" position that intelligence is comprised of seven primary abilities: verbal comprehension, verbal fluency, number, spatial

visualization, memory, reasoning, and perceptual speed. Guilford, at the far end of the "number of factors" continuum, maintains that intelligence is comprised of 150 distinct factors. For Guilford, every mental task involves three components: an operation, a content and a product. The five operations include memory, cognition, convergent production, divergent production, and evaluation. The five contents include visual, auditory, symbolic, behavioral, and semantic components. The six types of products include units, relations, classes, systems, transformations, and implications. Guilford arrives at 150 mental abilities in that his categories are both independent and multiplicative (Sternberg, 1985).

Sternberg (1985) contends that each of these theories shares a common assumption that intelligence can be understood in terms of latent factors. In addition, in many cases the theories are mathematically similar. Moreover, differences in theories often reflect differences in emphasis rather than substantive differences (Sternberg, 1985).

Sternberg (1985) has proposed three major kinds of constitutional cognitive abilities involved in information processing: problem solving otherwise known as fluid ability, crystallized or knowledge-based ability, and practical and social ability. Fluid ability includes both an inductive and deductive component. Tests of inductive

fluid ability, which involves series completions, analogies, classifications, and causal inference problems. Deductive fluid ability involves categorical, linear, and conditional syllogisms. Deductive problems, unlike their inductive counterparts, involve a defined a priori correct response. Deductive problems tend not to load highly on the "g" factor and are also factorial complex, including spatial memory as well as reasoning ability. Crystallized intelligence involves the acquisition and application of verbal abilities. Sternberg (1985) discusses a second type of crystallized ability which emphasizes current verbal functioning or performance components, in contrast to verbal knowledge acquisition. Finally, social and practical intelligence is described as involving adaptive behaviors, such as the application of "tacit" knowledge, which is typically overlooked by traditional psychometric theories of intelligence (Sternberg, 1985).

Sternberg (1985) indicates that until recently research in the field of intelligence has been narrowly confined to small "cliques" within psychology, unknown to investigators in related areas. Sternberg advocates that research in intelligence develop full contact with other subdisciplines within psychology, promoting multidisciplinary investigation, as evidenced in his 1982 compendium, Handbook of Human Intelligence. Sternberg states: "Intelligence cannot be understood solely in terms of cognitive

psychology, for example, as soon as one decides that it is just cognitive psychology one wishes to please, the construct will be investigated not in its own right, but in the restricted form tied to the Procrustean bed of any single way of looking at things," (Sternberg, 1985, p. 342).

Baron (1982) in his review of the overlapping domain between intelligence research and personality concludes that "most importantly intelligence itself consists of what must be called intellectual personality traits," (p. 308). While a variety of systems have been used to classify people according to psychological theory and relate these classifications to learning and problem solving style, McCaulley (1987) contends that the Myers-Briggs Type Indicator is especially useful in that it addresses two major components in problem solving: the manner in which individuals take in information (through perception) and the manner in which they make decisions (through judgment). Moreover, the MBTI, as a broad-based personality instrument, meets Sternberg's "cross disciplinary" requirement in research on intelligence and problem solving.

The psychometrically sound Wechsler tests, discussed in detail in the following section, were conceptualized by David Wechsler (1974a) as including not only global intelligence, but also nonintellective traits that function "like enzymes, that serve to direct and enhance (sometimes to demean) the utilization of other capacities," (p. 6). As

Mein (1986) has indicated, the inclusion of nonintellective factors on the WAIS lends itself to ready conceptualizations of learning style paradigms. This viewpoint is consistent with Anastasi's (1976) position that Wechsler tests can be used in providing "useful clues about problem solving approaches, conceptual development, or cognitive styles," (1976, p. 470).

The WAIS: Diagnostic Utility and Personality Correlates

The Wechsler Adult Intelligence Scale-Revised (WAIS-R) is generally regarded as the best individual test of adult intelligence. Its careful construction and standardization has resulted in its being regarded as the standard with which to compare other adult tests (Lyman, 1972). While the primary function of the WAIS-R was conceived to be its capacity for the individual appraisal of adult intelligence, its diagnostic utility in terms of defining personality characteristics has also been used in a variety of settings (Matarazzo, 1972). In fact, Wechsler (1981) himself acknowledged the multifaceted and multidetermined components of intelligence. He regarded intelligence, as measured by the WAIS-R, to be a function of the entire personality and responsive to factors other than solely cognitive abilities.

A comprehensive treatment of the clinical uses of the Wechsler scales has been provided by Zimmerman and Woo-Sam (1973). Essentially their position is based upon the comprehensive approach to assessment discussed by Rapaport,

Gill, and Schafer in R.E. Holt's Diagnostic Psychological Testing (1979). For Zimmerman and Woo-Sam every Wechsler subtest contains useful diagnostic information regarding individual psychopathology. The following highlights such interpretation of scores for each subtest.

Zimmerman and Woo-Sam (1973) suggest that high scores on the Information subtest may be indicative of intellectual ambition and may suggest an obsessive orientation "where knowledge is security," (p. 60). Low scores are frequently found in foreign born individuals and in underachievers. High scores on the Comprehension subtest are frequently obtained by college students and can suggest a practical, conventional individual. Doubt-laden individuals or those with chronic anxiety states tend to do poorly on the Comprehension subtest. The Arithmetic subtest helps gauge memory and orientation which favors obsessives, but can penalize the anxious subject. The Arithmetic subtest also can be affected by the cultural stereotype that females have a more difficult time with mathematics. The Similarities subtest is related to academic success. Again, because meticulousness and sophistication are related to performance on this subtest, obsessives tend to do well here. Poor performance in Similarities is obtained in the records of schizophrenic and brain-damaged individuals. A strong performance on the Digit Span subtest has been related to the "belle indifference" of hysterics. The Vocabulary

subtest, which correlates best with Full Scale IQ, can reflect erudition and intellectual striving. "Obsessive, paranoid subjects, anxious and depressed patients, and certain preschizophrenics are among the pathological groups described as doing well in the subtest," (Zimmerman & Woo-Sam, 1973, p.117).

A strong performance on the Digit Symbol test, where speed is important, suggests of clerical skills. Visual deficits or a dominance problem are reflected in low scores on this subtest. The Picture Completion subtest rewards obsessive attention to detail and can be associated with the vigilance characteristic of a paranoid individual. Schizophrenics and subjects with a low mental age frequently do poorly on this subtest by insisting that "nothing is missing." The Block Design subtest is a nonverbal measure of reasoning. High scores may indicate analytic talent and flexible thinking, low scores may indicate a compulsive, methodical approach or an anxiety state. The Picture Arrangement subtest is related to foresight, planning, and social skills. Low scores on this subtest may suggest impulsivity or a transient attention span. Finally, the Object Assembly subtest is designed to measure mental organization and planning. High scores on this subtest are sometimes obtained from bland schizophrenics who can perform well through trial and error. Low scores on Object Assembly

are related to anxiety or rigidity (Zimmerman & Woo-Sam, 1973).

The theoretical underpinnings for interpreting the Wechsler scales in terms of their diagnostic potential have been articulated by Allison (Allison, Blatt, & Zimet, 1968; Allison, 1978). Allison suggests that the Wechsler scales supply information on an individual's skills and aptitudes, which involve the processes of judging, remembering, conceptualizing, and perceiving. These processes involve the "surface" levels of personality and are thereby construed as involving ego functions. According to Allison (1978), these ego functions are autonomous, free of drive and conflict, and can be expressed and manifested in a cognitive test such as the WAIS.

Allison's position, that the WAIS reflects ego processes, conceptually utilizes the projective hypothesis. That is, all individual acts reflect an individual's unique personality. Styles of thought organization, reflected in Wechsler profiles, are viewed as indicators useful in defining personality configurations. An individual's coping or defensive style is reflected in the emphasis or de-emphasis of particular abilities measured by the WAIS. Intelligence and personality, coping and defensive style, from this perspective, are viewed as interrelated aspects of the same phenomena (Allison, 1978).

Allison (1978) likens this approach to Shapiro's (1965) description of styles of experience. The manner in which an individual experiences himself and others in various situations, as well as how he is an active agent in his life, can be better understood with "surface" tests such as the Wechsler. In his diagnostic approach, Allison (1978) stresses reliance not only on test scores, but also on style and content of response and on interpersonal test behavior.

While much of the clinical lore surrounding WAIS diagnostic utility has involved explanations involving theoretical constructs, increasing sophistication in empirical methods has yielded a growing number of studies on the interface between personality and the abilities measured on the WAIS. Many studies involve the correlation between a particular personality test and WAIS profile, pattern, and scatter. While a majority of earlier studies (Matarazzo, 1972) have indicated modest relationships, more promising results have been found when personality variables are defined with greater specificity (Burnstein, 1972).

Matarazzo's (1972) extensive review of the WAIS cites the Gittinger Personality Assessment System (PAS), as a primary example of research aimed at relating specific WAIS subtest scores to differentiate three personality dimensions. The underlying theory behind the PAS posits that facets of intelligence are thought to be modified by current life style and personality. That is, the core elements of per-

sonality-intelligence are present at birth and unfold and are modified by experience (Matarazzo, 1972).

The three personality dimensions operationalized on the PAS are as follows. The Externalizer-Internalizer dimension is reflected in the person's Digit Span score. Low Digit Span scores are associated with externalizing tendencies, high Digit Span scores are associated with internalizing tendencies. Modification of the Externalizing-Internalizing dimension is based upon the subject's Arithmetic score. A high Arithmetic score indicates compensation, whereas a low score indicates that compensation has not occurred. Finally, the Information subtest is regarded as the quality of the surface adjustment in Externalizers and Internalizers. High Information scores indicate that modification has occurred, low Information subtest scores are indicative of a lack of modification (Matarazzo, 1972).

Recent studies of Gittinger's PAS system in relationship to the WAIS have yielded equivocal results. Henricks and Amolsch (1982), in a comparison of an atheoretical, actuarial approach for obtaining personality descriptions from WAIS profile patterns with the PAS on 500 male psychiatric patients, found that the PAS identified the target group of the actuarial approach well. Personality descriptions between the groups were found to have a distinct resemblance. Kobayashi (1974), in a critique of the PAS argues that the WAIS subtests used to identify

personality dimensions have been selected inconsistently. Kobayashi suggests that it is possible to identify WAIS subtests that can be applied consistently to the three dimensions. Less supportive results have also been found (Turner, Willerman, & Horn, 1976). These authors investigated predictions from the PAS system for 215 adults who had taken the WAIS, MMPI, and 16 PF. The majority predictions of personality generated by the WAIS subtest scores were not confirmed.

A popular instrument for the study of WAIS-personality relationships has been the MMPI. The MMPI represents the most widely used, extensively researched personality inventory available today. Research on the MMPI correlates of WAIS-R performance have followed Wechsler's (1981) position that intelligence must be regarded as part and parcel of the entire personality.

Turner and Horn (1976) investigated MMPI correlates of WAIS subtest performance. On a sample of 200 males and 200 females, personality correlates of subtest performance were determined. For males, the personality scale WAIS subtest correlations were significantly cross validated at the .01 level for Comprehension, Information, and Vocabulary and at the .05 level for Similarities, Digit Symbol and Block Design. Similar results were found for females. The relationship between MMPI validity scale and WAIS subtest was accounted for by general intellectual ability. Such

results are contrary to an earlier study (Bloom & Entin, 1975) in which no significant relationships between WAIS and MMPI were found.

Promising results between WAIS and some lesser used personality tests have more recently been found. Robinson (1985) administered the WAIS and Eysenck Personality Questionnaire to 23 male and 25 female graduate and post-graduate students. For subjects scoring highest and lowest on the Extraversion scale there was a significant difference in subtest profiles obtained. Introverts tended to perform better on the Verbal subtests, with Extroverts performing better on the Performance subtests. Subjects with scores in the middle range of the Extraversion scale had higher scores on subtest associated with the Attention-Concentration factor. Higher scores on Picture Arrangement and Block Design, (previously shown to load on the high Psychoticism and Low Lie factor), were also obtained by this group. The converse of this was found for older female subjects with middle range Extraversion scores. Robinson (1985) argues that these results persuasively demonstrate a systematic relationship between intelligence test performance and personality.

Turner and Horn (1977) investigated the Cattell 16 Personality (16PF) Inventory's relationship to the WAIS. Items and scales from the 16 PF were correlated with WAIS verbal, spatial, and memory/numerical factors in a sample of 489

adults. For both males and females, larger ability-personality correlations resulted in all analyses for verbal ability than for spatial or memory/numerical ability. Three major correlates of verbal ability resulted: communicative competence, equanimity/low anxiety, and a desire for time alone. Item correlates for spatial ability suggested a dispassionate, nontempermental style of interaction as the main correlate. Ability in the memory/numerical area was independent of the 16 PF for women and was associated with fastidiousness for men. Turner and Horn (1975) maintain that these results are generally consistent with Cattell's earlier findings.

Research has also addressed the WAIS-R and projective tests relationship. Hymowitz (1983) assessed the degree to which indicators from the WAIS and from the Rorschach discriminate between inpatients diagnosed as having either borderline personality organization or psychotic personality organization. WAIS scores, especially the Picture Completion subtest score, and Rorschach form levels proved to be group discriminators. Hymowitz (1983) interprets this result as a reflection of reality testing tapped by both the Picture Completion subtests and the Rorschach form level.

In an intriguing investigation of WAIS characteristics of nonpathological obsessive and hysteric styles, McMullen and Rogers (1984) identified eight undergraduates as having high obsessive styles and the same number having high

hysteric styles. Each of 16 subjects was administered the Information, Comprehension, and Vocabulary subtests of WAIS to determine whether a hysteric or obsessive pattern emerged in a nonpathological group. According to the prediction, obsessive subjects had higher Information and Vocabulary scores than Comprehension scores. Hysterics had higher Comprehension than Information and Vocabulary scores. Differences between the groups were significant. McMullen and Rogers (1984) suggest that the results support the probability that nonpathological obsessives and hysterics display patterns of cognitive style similar to more pathological counterparts.

Although empirical investigations of profile, pattern, and scatter analysis of the WAIS has often led to inconclusive results regarding the fruitfulness of continued investigation in the area, Matarazzo (1972) has suggested that the most problematic aspect is the unreliability of the criterion. Further investigation in the area of personality variables and the Wechsler scale would likely benefit from Burstein's (1972) suggestion that the more specified the personality variable, the more encouraging the results. Such research requires the assumption that intellectual activity is not independent of personality, but as Burstein maintains, one aspect of complete psychological functioning. As will be discussed in the next section, the call for

specificity of personality variables was preceded by Jung's original perspective on typology.

The Myers-Briggs Type Indicator (MBTI) in Historical Context

The MBTI was developed specifically to put into practice Carl Jung's personality typology. Consistent with Jungian theory, the underlying assumption in the MBTI is that much of the ostensible chance variation in human behavior is not random but the result of a few fundamental, observable preferences. The original MBTI instrument was created by Isabelle Briggs Myers in 1942 and was further refined through extensive research until its publication in 1975 by Consulting Psychologists Press. The MBTI is primarily concerned with variation in normal behavior and attitudes rather than with psychopathology. As a result, the MBTI has been utilized in counseling populations, in career planning with college students, as a device to enhance communication and leadership skills, as well as for improving educational practice in teaching and learning styles (McCaulley, 1981).

The issue of psychological typology presupposes the fixedness of individual temperament. "Character," wrote Heraclitus, "is destiny." Character or temperament is the sine qua non which predisposes an individual to specific means of thinking, expressing motivation, expressing affect, and behaving. Jung (1971) stated,

"It is not the purpose of a psychological typology to classify human beings into categories - this in itself

would be fully pointless. Its purpose is rather to provide a critical psychology which will make a methodological investigation and presentation of the empirical material possible. First and foremost, it is a critical tool for the research worker who needs definite points of view and guidelines if he is to reduce the chaotic profusion of individual differences to any kind of order," (p. 554-555).

The task of classifying individuals according to observable human differences has been present throughout history. Galen, the second century Greek physician, distinguished four basic temperaments: the sanguine, the phlegmatic, the choleric, and the melancholic. Galen based his idea on the teachings dating back to the fifth century B.C. in which Hippocrates proposed that the human body was composed of four elements: earth, air, fire and water. According to Galen, these four elements corresponded to four substances found in the human body: blood, phlegm, yellow bile and black bile. Individuals having a preponderance of blood were considered to be of the sanguine type, those having primarily phlegm were thought to be of the phlegmatic type, yellow bile was associated with the choleric and black bile with the melancholic. As Jung (1971) has suggested, Galen's psychological classification is especially noteworthy in that it was the first classification to be based on human affectivity and emotionality.

Since Galen, many authors have proposed core differences in temperament. Among the more prominent of the proposed typings (Golay, 1982) have been Schiller's

conceptualization in 1795 of two psychological types - the "realist" and the "idealist", Nietzsche's descriptions of the Apollonian and Dionysian types in 1871, Spitteler's description of the Promethian and Epithemian types. In the early twentieth century, William James described two temperaments, known as the "realist" and the "empiricist". In 1923, Jung published Psychological Types, followed shortly thereafter by Ernest Kretschmer's book Physique and Character, which described the cycloid and schizoid types (Golay, 1982).

Systems of classification following Jung's work were generally characterized by a greater use of scientific methodology. As Myers (1980) indicates, Thurstone's factor analysis of vocational interest scores in 1931 defined four more groupings: individuals interested in science, in language, in people, and in business. In the same year, Gundlich and Gerum examined interest intercorrelations and defined five types of ability: technical, social, creative, intellectual skill and physical skill. Spranger's work during this time period derived six "types of men": economic, religious, social, theoretical, aesthetic, and political (Myers, 1980).

Jung's typology in large part arose as a means of differentiating his work from that of Freud and Adler. Freud's primary account of motivation in terms of Eros, like Adler's primary account of motivation in terms of the power

motive, was criticized by Jung as reductionistic and incomplete. Jung believed that individuals differed in fundamental ways. Jung (1971) stated: "My book, therefore was an effort to deal with the relationship of the individual to the world, to people and things" (p. v).

For Jung, the entire personality or psyche is comprised of several differentiated and interacting systems. The main components of the system include the ego, the persona, the anima and animus, the shadow, the personal unconscious and the complexes, the collective unconscious and its archetypes, and the self or core of personality. Along with these differing components are the attitudes of introversion and extraversion and the functions of feeling, thinking, intuiting, and sensing. The attitudes and functions comprise Jungian typology.

Jung (1971) regarded "attitude" as the readiness of the psyche to act or react in a specific way. This a priori orientation may be either introverted or extraverted in nature. In the extraverted attitude, psychic energy flows outward to objects and people in the environment. In the introverted state, individuals think, feel, and act in relation to the object so that a positive dependence on the object is established. Jung regards extraversion as the transfer of interest from subject to object. The extraverted type occurs when extraversion is habitual.

In the introverted attitude, psychic energy moves from the object back to the subject, who retains the energy by incorporating it to the inner world of thought and concepts. Individuals in the introverted attitude think, feel, and act in a manner that suggests that the subject is the prime motivating factor and the object is of secondary significance. Habitual introversion characterizes the introverted type (Jung, 1971).

Jung (1971) regarded the concept of function as the manifestation of libido that remains constant in principle. Jung likens the concept of function to that of physical force that is considered a specific manifestation of physical energy. As Hillman (1979) indicates, the etymology of function comes from the roots *fungi*, meaning to perform. Its Sanskrit root (*bhunj*) means "to enjoy." Thus the performance of a function is something to enjoy as the operation of one's capacities in any sphere of activity (Von Franz & Hillman, 1979).

Jung's four orienting functions - thinking, feeling, sensing, intuiting, represent the individual's orientation to consciousness. The thinking and feeling functions are considered the rational functions and represent distinct means of judging. Rational functions are concerned with objective values as the form of either external facts or objective values. The thinking function uses conceptualization and logical connection to form the basis

of judgment. The feeling function evaluates subjective material by the ordering of values, That is, feeling is a process that occurs between the ego and a particular content that gives the content a definite value in terms of acceptance or rejection (Jung, 1971).

Within Jung's system, sensation and intuition are regarded as the irrational functions and refer to two distinct stylistic ways of perceiving. By "irrational" Jung does not suggest something contrary to reason, but something beyond reason. The sensation function mediates the perception of a physical stimulus and is regarded as identical with perception. Sensation refers to perceptions that are the direct result of stimulation of the bodily sense organs. Jung regarded normal sensation to be directly proportional to the intensity of the physical stimulus. Jung considered intuition to be perception by way of the unconscious with a focus on the hidden possibilities, meanings, and relationships between what is perceived. Jung regards intuition as an instinctive apprehension regardless of content.

Construction of the MBTI required the determination of items that would reflect preferences described by Jung for extraversion or introversion (E-I), sensing or intuitive perception (S-N), and thinking or feeling judgment (T-F). Myers created the judgment-perception (J-P) scale to measure the effects of judging and perceiving attitudes that

indicates whether an individual relies on judgment (thinking or feeling) or perception (sensing or intuition) in their extraverted presentation and is utilized in ascertaining the dominant function. Test items have been written and weighted to achieve the widest possible separation and least overlap between the two kinds of individuals represented in each scale. Myers (1985) has emphasized precision at the center of the scale so that individuals with indeterminate preferences would be more likely to be classified according to their true preference. Finally an objective division point has been set at for each scale to validate simultaneously the MBTI and the underlying hypothesis.

Utilizing a forced-choice format, individuals are classified according to their higher score on each MBTI dimension, with the empirically derived zero-division point separating types. The score ranges are E58-0-I59, S67-0-N51, T49-0-F51 (male), T61-0-F49 (female), J55-0-P61 (Myers, 1962). For example, the highest possible extraversion score is (E)53, the lowest is 1; the highest possible introversion score is (I)59, the lowest is 1. Myers (1985) regards preferences of 41 or higher (31 for F) "very clear preferences." Individuals with very clear preferences may show questionable ability in using the opposite choice should a situation demand it. "Clear preferences" involve scores between 21-39, or 29 for F. Clear preferences suggest that there is a reasonable probability that an

individual acts on the reported preference. Moderate preferences involve scores between 11-19 and suggest that the respondent may still often agree with the description of the reported preference. Slight preferences involve scores from 1-9 and suggest that the respondent experiences tension between the two poles, rather than implying equal facility between the two.

The MBTI offers 16 possible personality combinations. The TF and SN dimensions reflect basic preferences in perception and judgment. The EI and JP dimensions reflect styles of orientation to the inner and outer worlds. Utilized together, the functions and attitudes provide information about how an individual perceives situations and then chooses a course of action. Myers (1985) likens these choices to a "fork in the road of human development" yielding differing pathways to excellence. Individual type is thus the result of similar interests, values, and mental habits that produce a recognizable individual.

MBTI Validity Studies

Test validity involves the extent to which a test is fulfilling its function and addresses the broader issue regarding what a given test measures (Anastasi, 1982). The role of psychological theory in test construction is the specific concern of construct validity. Cronbach (1970) describes construct validity as the analysis of test score meanings in light of psychological constructs or concepts.

Because theories of ability and personality are incomplete and vague, even the most well established psychological tests yield incomplete interpretations. As a result, construct validity involves a continual attempt at a more thorough description of the influences that effect a given test score (Cronbach, 1970).

Cronbach (1970) describes the investigation of construct validity as a complex process involving the interaction of reasoning, observation, and imagination. As such, the process of construct validation is likened by Cronbach to the same process by which scientific theories are formulated. More specifically, Cronbach describes three distinct processes involved in construct validation. First, the description of the constructs that account for test performance. This involves imagination that is anchored in observation and/or logical investigation of the test. Second, the derivation of testable hypotheses based on the constructs. This step is solely a logical procedure. Third, is the performance of an empirical investigation of each hypothesis (1970). Since procedures for systematically analyzing construct validity data have historically become increasingly sophisticated, the study of construct validation has stimulated novel means of collecting validity data (Anastasi, 1982).

The original MBTI manual (Myers, 1962) contains validity information demonstrating the MBTI's relationship

to various personality variables. MBTI correlations with the Edwards Personal Preference Schedule yielded the following relationships between Indicator continuous scores and EPPS "needs." Dominance was associated with MBTI extraversion ($\underline{r}=.28$), Order was associated with sensing ($\underline{r}=.34$), Endurance was associated with thinking ($\underline{r}=.30$), Order was associated with judgment ($\underline{r}=.49$), Achievement was associated with introversion ($r=.15$), Nurturance was associated with feeling ($\underline{r}=.51$), and Autonomy was associated with perception ($\underline{r}=.31$) (Myers, 1962).

The Allport-Vernon-Lindzey (AVL) study of values contains scales also linked to type preferences. Myers (1962) performed product-moment correlations of the Indicator with AVL scores for freshman classes at Wesleyan, Amherst, and R.P.I. The AVL values most strongly associated with MBTI preferences were as follows: Political value was associated with extraversion ($\underline{r}=.20$), Economic Value was associated with sensing ($\underline{r}=.46$), Theoretical Value was associated with thinking ($\underline{r}=.37$), Economic Value was associated with judgment ($\underline{r}=.12$), Aesthetic Value was associated with introversion ($\underline{r}=.20$), Aesthetic Value with intuition ($\underline{r}=.34$), Social Value was associated with feeling ($\underline{r}=.34$), and Aesthetic Value was associated with perception ($r=.16$). As predicted by MBTI theory, the largest correlation with the AVL was with the SN and TF scales (Myers, 1962).

Comparisons between the MBTI and the Personality Research Inventory (Myers, 1962) for samples of Cornell freshman engineering students as well as Massachusetts high school boys yielded the following significant correlations. The PRI Tolerance for Complexity correlated significantly with the perception scale for the engineers. The PRI Impulsiveness significantly correlated with perception in both samples. Talkativeness correlated significantly ($r=.70$) with extraversion, reflecting a conspicuous characteristic of extroverts. The PRI Gregariousness significantly correlated with sensing in both samples. The PRI Attitude to Work significantly correlated with judgment in both samples. Lastly, MBTI intuition was significantly correlated with the PRI Artistic scale for the Cornell engineer sample and with Liking to Use Mind in both samples (Myers, 1962).

Carlson and Levy (1973) tested type theory in terms of maximum differences on specific variables. They investigated short-term memory utilizing Digit Span on the WAIS and memory for faces on the Lightfoot Facial Expression Series. Results indicated that IT's outscored EF's on Digit Span and EF's outscored IT's on memory for faces. Carlson and Levy (1973) further tested memory task performances utilizing geometric figures, some with numbers on the side, others with fictitious names on the sides, IT's scored

higher than EF's for the difference between numbers minus names.

As Myers (1985) has indicated, the validity of the MBTI is dependent upon its capacity to implement Jung's theory of psychological typology. The MBTI attempts to categorize individuals based on their true types. Basic preferences are reflected in "surface" indicators including motivation, behavior, and values. Myers (1985) argues that if Jung's theory describing type is accurate and if the MBTI accurately measures this typology, then surface behaviors will be in the direction predicted by theory. The MBTI validity studies have included MBTI correlations with other instruments appearing to measure the same constructs, MBTI relationship to career choice, MBTI relationship to various aspects of teaching and learning styles including aptitude, intent, application, and achievement, as well as specific behavior predictions predicted by theory (Myers, 1985).

Myers (1962) reports comparisons between the MBTI and the Strong Vocational Interest Blank scores for a sample of 727 Stanford male freshmen. Strong Vocational Interest Group I (Professional) and Group II (Technical-Scientific) that frequently require graduate degree, typically attract IN types. Group III (Production Manager), Group VII (Certified Public Accountant), Group VIII (Business detail and administration), Group IX (Business contact) and Group XI (President Management Concern), which share a common

concern with business, tend to attract ESTJ types. Group VI (Musician) and Group X (Verbal or Linguistics), which involve artistic use of language or music, attract NP types. Group V (uplift) attracts ENF types; those extroverts uninterested in business.

McCaulley (1981) reviewed several investigations indicating that the psychology field tends to attract primarily intuitive types, as a result of its focus on understanding and explaining the intricacies of behavior and the underlying dynamics. Myers (1985) indicates that while all 16 types enter psychology, intuitive types comprise nearly 82%. Clinical psychology is comprised of 72% NF types, which is consistent with its focus on possibilities for people. Experimental psychology tends to attract NT types with their interest in theory and logical analysis as well as the practical sensing types (33%). McCaulley (1977) reports that for a sample of 415 psychiatrists, 35% were NF and 43% were NT. Child psychiatrists (N=91) were comprised of 42% NF and 40% NT.

Levin (1978) investigated a sample of 91 clinical psychologists and psychiatrists and reported modal types for orientation. The modal type for all psychotherapists across orientations was INFP. The modal MBTI type for those with a psychoanalytic orientation was INFJ, for the rational emotive orientation the modal type was ENTJ. The Gestalt orientation was E/I NFP modal. The Behavioral orientation

had ENTJ as the modal type and ENFP was the modal type for the Experiential orientation.

Medicine has been the most frequently examined occupation for its relationship with MBTI types (Myers, 1980). Since medicine involves scientific and/or humanitarian interests, it follows that INFP's are at least four times more likely to enter medical school than their opposite type(s) ESTJ(s). Moreover, the highest dropout rate for any type in medical school was for the ESTJ's (7.0%). For Myers (1980) sample of 4,000 medical doctor's, IN was the preferred type for psychiatry, research and teaching, neurology, and pathology. The opposite ES types most frequently preferred surgery and obstetrics. Such varied MBTI validity studies specifically address Myers' emphasis on predicting specific surface behaviors from theory.

The MBTI and Learning-Style Research

A review (Lawrence, 1984) of approximately 100 published reports examining the MBTI and teaching, learning, and academic aptitudes yields solid evidence of learning style preferences and refined various learning style constructs. Lawrence (1984) suggests that learning style includes the manner by which individuals process information, form ideas and judgments (i.e., cognitive styles), pattern of attitudes and interests that influence what an individual will attend to, the individual's

disposition to seek out learning environments compatible with his cognitive style, and the inclination to use specific learning tools. Lawrence (1984) maintains that the consistency of the findings regarding MBTI learning styles is encouraging for new research and justifies utilizing the MBTI as an organizing construct in both teaching and learning experiments.

Numerous early investigations broadly related individual MBTI scales in relation to both academic aptitude and achievement. The Educational Testing Service (ETS) studied 15,000 high school and college students in an attempt to find what aptitude and grades can tell about types (Myers, 1962). For 3,503 college preparatory boys, the ETS found the mean advantage of intuitives on IQ is about seven points over sensing types. Introverts and perceptives were found to have a two point advantage over extroverts and judges respectively. By moving away from the zero point, toward the extremes on each scale, the ETS found that regression of IQ and vocabulary on the sensation-intuition dimension showed the greatest differences. That is, as the intuition score became more extreme, the higher the rise in IQ and vocabulary. As the sensing score became more extreme, the greater the drop in IQ and vocabulary (Myers, 1962).

The interaction of the I-E and N-S scales was the focus of one early investigation of aptitude (Myers, 1962). Myers

compared scores on the Concept Mastery Test (CMT), used to measure vocabulary and verbal reasoning, with dimensions on the MBTI. "The almost 20 point difference in CMT scores of mildly intuitive students (N 1-17), depending on whether they were introverts or extroverts, suggests that introverts use their minds, including their intuition, in a way that is different and advantageous for dealing with the intricacies of language and thought," (Myers, 1962, p. 37).

Sunberg (1965), in his review of ETS reports, noted that intuition and, to a lesser extent, introversion has low but significant positive relationships to measures of intelligence and school achievement. Also, within similar aptitude levels, judging types were found to achieve higher grades. Myers (1980), in an analysis of 71 Rhodes Scholars, found that as a group they had even a higher percentage of intuitives than National Merit finalists, which are comprised of 83% intuitives. The majority of Rhodes Scholars were also feeling types, reflecting the humanistic criterion of the award.

Myers (1980) maintains that it is the relative speed with which intuitives translate words into meanings that gives them an advantage in any timed test of verbal ability or timed IQ test in which verbal ability figures: among male freshmen from five colleges, the mean SAT Verbal Ability score was 47 points higher for intuitive students than for sensing types (Myers, 1980). However, Myers (1985)

later clarified her position by suggesting that scholastic aptitude tests measure the intuitive or introversive aspects of intelligence valuable in academic work and are not designed to measure the practical, applied intelligence of extroverts and sensing types. Yet to be investigated is comparative study of the differential aptitudes manifested within individual MBTI scales utilizing Wechsler subtest scales. Rapaport, et al. (1979) suggest that Wechsler subtests have multiple determinants involving both clinical nosological categories as well as specific psychological functions. Moreover, the comprehensive nature of the Wechsler subtests (Wechsler, 1981) would address the "verbal skill vs. practical skill" issue raised by Myers.

A review by McCaulley and Natter (1974), exploring MBTI differences in aptitude and achievement, corroborated the findings that intuitive types average higher on aptitude measures than sensing types. They further compared test scores for sensing and intuitive students at Florida State University Developmental Research School.

McCaulley and Natter (1974) theorized that reading would be more attractive to intuitive types and hence would contribute to greater skill attainment. Intuitive types outperformed sensing types on 10 of the 11 reading, verbal, vocabulary, and English measures, including the P.S.A.T. Intuitive types outperformed sensing types on three aptitude measures, including the California Test of Mental Maturity

(Intuitive Mean = 112, Sensing Mean = 104, $p < .001$). On the Armed Services Vocational Aptitude Battery (ASVAB), intuitives scored significantly higher on those subtests emphasizing verbal, mathematics, and clerical abilities, with no significant differences between the groups on the electronics, mechanics, and motor sections.

McCaulley and Natter (1974) hypothesized that thinking and feeling types would demonstrate less differences on aptitude and achievement measures than sensing and intuitive types. However, they did predict that thinking types would excel in technical knowledge involving mastery of tool knowledge and equipment. Again utilizing scores on the ASVAB, McCaulley and Natter (1974) found that thinking types significantly outperformed feeling types on the technical, electronics, mechanics, and motor sections with the clerical-administrative subtests showing no significant differences.

McCaulley and Natter (1974) further compared scores for introverts and extroverts as well as judging and perceptive types in several areas. For introverts and extroverts, there was no significant difference between school grades across four academic subjects. Moreover, no significant differences were reported for the ASVAB and the California Test of Mental Maturity. However, significant differences were reported for the aptitude, reading and mathematics section of the Florida Twelfth grade test as well as the

mathematics portion of the P.S.A.T., with introverts outperforming extroverts in each section.

McCaulley and Natter's (1974) comparisons of the judging and perceptive groups achievement levels yielded no significant differences for grade point average across four academic subjects. No significant differences were found between the groups on the Florida Ninth Grade Test, the Florida Twelfth Grade Test, the P.S.A.T., the Gates or the ASVAB. In contrast, perceptives achieved higher IQ scores on the California Test of Mental Maturity (Perceptives=109, Judging types=104, $p < .01$).

McCaulley and Natter (1974) further examined how the MBTI scales interact to predict aptitude by examining the following two scale combinations: IN, EN, IS, ES, ST, SF, IF, and IT. Mean IQ scores on the California Test of Mental Maturity were reported: for IN= 114, EN= 111, IS= 103, ES= 104, ST= 105, SF= 103, IF= 112, and IT= 115.

The most current and comprehensive review of MBTI learning styles research has been provided by Myers (1985). In her review and integration of prior research, Myers concluded that the three most salient aspects of learning style applicable to the "end product" academic achievement are aptitude, application, and interest. Myers suggests that aptitude may be best understood in terms of an individual's relationship to concepts and ideas as well as

symbols, theory, and imagination. The E-I scales as well as the S-N scales are most pertinent in the discussion of aptitude. Myers contends that contrary to common perception, thinking types aptitude advantage over feeling types is minimal. Myers states that the J-P dimension is the most relevant in the understanding of application.

Myers (1985) suggests that there is some evidence that consistency of type preference is related to higher aptitude measures. Myers observed a tendency for higher aptitude scores across types as preferences become clearer, i.e., as preference score for each scale increases. The one exception appears to be the sensing dimension. For all levels of preference, sensing types appear to be at the same aptitude level (Myers, 1985).

Myers (1985) further indicates that intuitives' aptitude advantage over sensing types is most pronounced for tests involving abstraction and verbal ability and smaller differences were found for tests of practical skills. This finding is generally consistent with results obtained by this author (Jaworski, 1985) in a preliminary investigation of the aptitudes displayed by the S-N dimension.

For Myers' (1985) application, the ability to fix one's attention to what is required from a task is related to the attributes measured by the J-P dimension. While Myers found there to be a slight aptitude advantage for perceptive types over judging types, judging types were described in faculty

ratings as more thorough, responsible, dependable, and capable of completing undertakings (Ross, 1961), than perceptive types. As such, Myers (1985) contends that J students are likely to receive higher grades than P students given comparable aptitude levels.

Myers (1985) examined the ETS sample of 3,503 college preparatory male students to determine the achievement level of the 16 types. A regression performed between IQ and GPA yielded a correlation of .47. Judging types were regarded as overachieving and P types were regarded as underachieving. The GPA range extended one and one half standard deviations from INTJ's at the high end to ESFP's at the low end. All sensing types were close to or below the mean in IQ and all intuitive types were close to or above the mean. Introverts with intuition, which possess the highest mean intelligence scores, also have the highest grades: INFJ and INTJ have the highest grades for all 16 types and INTP and INFP's have the highest grade point average for all P types (Myers, 1985).

Myers (1985) found that a major source of scholastic achievement in types compared to ES types is not attributable to intelligence, but some other IN quality. Myers hypothesized that there appears to be a "habit of mind" in which IN types have a natural interest in symbols and ideas and a similar "habit of mind" in which ES types have the least interest in symbols and ideas. Myers adds

that scholastic aptitude tests tend to measure I and N components of intelligence and not the practical and applied aspects of intelligence favored by E and S.

Myers' studies underscore the contention that the E-I in addition to the S-N scales are most relevant in the understanding of aptitude while the J-P dimension is most critical in the understanding of application. Moreover, according to Myers, the thinking type aptitude advantage over feeling is minimal.

Competing Paradigms

Three distinct interactional models have been proposed utilizing MBTI scales to define learning/cognitive styles (Golay, 1982; Kiersey & Bates, 1978; Lawrence, 1979; McCaulley, 1976; Myers, 1962; 1985). In general, empirical investigation of these models has been limited. Interactions which have been studied have primarily targeted measures of scholastic ability and achievement (Myers, 1985).

The model initially proposed by Lawrence (1979) and elaborated on by Myers (1985), heretofore described as Myers model, involves the four quadrants of the type table: IN, IS, EN, ES. As Hoffman and Betkowski (1981) suggest, the E-I dimension, when viewed in interaction with the S-N dimension, provides critical information concerning learning styles utilizing relatively simple concepts. Strong evidence exists demonstrating the importance of the S-N

dimension for students of differing levels of academic achievement (Myers, 1962; 1985). Hoffman and Betkowski (1981) propose that one reason the I-E dimension may affect academic success results from the fact that introverted students spend more time reading and thinking about materials, while their extraverted counterparts may be so active in the world that reading and processing information may hold a lower priority for them.

Myers (1985) describes IN's, introverts with intuition that may be either dominant or auxiliary, as "the thoughtful innovators." IN's are regarded as introspective and scholarly. IN's are interested in knowledge for its own sake, and are fond of ideas, knowledge and depth of understanding. Myers (1980) regards individuals in the IN quadrant as the most intellectual of types, with the ability to see into the unknown further than most people. Myers (1980) found that Cal Tech science students are most often IN. Also, while science is a significantly preferred academic subject by INT types, art is a significantly preferred subject of INF types (Myers, 1985). The EN types, extroverts with intuition that may be either dominant or auxiliary, are considered the "action oriented innovators" by Myers. The EN's act as change agents who regard possibilities as challenges. The EN's tend to have rather broadly based interests. Myers (1985) indicates that art, English, and music are the significantly preferred academic

subjects of ENF types while science is the significantly preferred subject of ENT types. The IS types, introverts with sensing either dominant or auxiliary, are labeled "the thoughtful realists" by Myers. The IS types are apt to examine the factual basis of ideas. The IS types tend to deal with real, factual material in a continuous, unhurried manner. Myers (1985) indicates that all IS types significantly preferred academic subjects involving practical skills while IST types also significantly preferred mathematics. The ES types, extroverts with sensing either dominant or auxiliary, are regarded by Myers as "the action oriented realists." The ES's are considered the most practical of types and learn best when useful application is evident. The significantly preferred subject of ESP types was history, while mathematics was significantly preferred by ESTP, ESTJ, and ESFJ types (Myers, 1985). Myers (1980) found that Wharton School of Finance and Commerce students were most often ES.

A second model proposed to define learning styles appeared in the original MBTI manual (Myers, 1962), and has been utilized by not only Myers (1985) but also by Lotas (1978) and McCaulley (1981) and will heretofore be described as McCaulley's model. This model has primarily described career and subject interest for MBTI combinations. The type tables' four columns showing four combinations of perception and judgment comprise this model: SF, ST, NT, and NF.

The SF types have been described as the "sympathetic and friendly types" (Myers, 1985). Their optimal chances for job satisfaction lie in areas where personal warmth can be applied to concrete situations. Hence, SF's are well represented in fields such as elementary school teaching, sales, nursing, and social work. Myers (1985) indicates that course work involving practical skills are the most significantly preferred academic subjects among ISF types, with ESFP types preferring history and ESFJ types preferring mathematics and music. The ST types have been called the "practical and matter-of-fact" types (Myers, 1985). The ST types problem solve by impersonal analysis. They tend to approach problems in a logical manner, reasoning from cause to effect. The ST's tend to gravitate toward occupations such as accounting, business, production, law, and surgery. The NT types are regarded as "logical and ingenious" (Myers, 1985). The NT's focus on possibilities and abstract relationships, judging these through impersonal analysis. The NT's frequently pursue occupations involving scientific research, securities analysis, management, design and engineering (Hoffman & Betkowski, 1981). While science is the most frequently preferred subject among all NT types, INTP's and ENTP's additionally select art as a preferred subject and ENTJ's additionally select English as a preferred subject. The NF types have been referred to as the "enthusiastic and insightful types" (Myers, 1985). The NF's

are interested in the complexities of language and communication. Their intuition provides an interest in symbolic relationships that interacts with feeling to provide insight into interpersonal relationships. The NF's are frequently found in such fields as linguistics, advertising, writing, and counseling and clinical psychology (Hoffman & Betkowski, 1981). Art, English, and music are the most frequently favored subjects among all NF types (Myers, 1985).

A third model, based on temperament and styles, has some overlap with the Myers/McCaulley model. Kiersey and Bates (1978) integrated Jung's work with that of Ernest Kretschmer in the formation of their model. Kiersey and Bates (1978) describe four types: SJ (Epithemian), SP (Dionysian), NF (Appolonian), and NT (Promethian). As with their archetypal, mythological counterparts, the Epithemian types are concerned with duty, the Dionysian types with action, the Appolonian types with self-actualization, and the Promethian types with power.

Kiersey and Bates (1978) describe the SJ types as fitting into the traditional classroom better than any other style. The fact that most elementary school teachers are SJ contributes to the ease with which the SJ student fits into the classroom. The SJ students typically do well with structure and close direction and less well on lengthy, independent projects (Kiersey & Bates, 1978). Kiersey and

Bates (1978) claim that the SP student is the most frequently misunderstood student in the educational system. The SP student comprises 38 percent of elementary school students, but is the least represented in institutions of higher learning. The SP students, who tend toward spontaneity, seek hands on experience, rather than routine paper and pencil work. The SP's gravitate toward "active" curriculums including mechanics, crafts, arts, music, and drama (Kiersey & Bates, 1978). The NF students enjoy communication and often have spoken vocabularies that exceed their ability to express themselves on paper. They prefer subjects involving people to those involving science and business and hence choose liberal arts over fields involving technology (Kiersey & Bates, 1978). The NT students tend to be interested in principles and rules that provide structure for their cognitive worlds. The NT's tend to be intellectually curious and often focus on technology from the early grades. The NT students tend to enjoy independent study, pursuing areas of particular interest and frequently neglecting those subjects that do not capture their attention (Kiersey & Bates, 1978).

Golay (1982) redefined Kiersey and Bates four temperament styles as distinct learning styles. Golay describes the Epithemian (SJ) temperament as the Actual-Routine Learner (ARL). The ARL's focus on concrete activities, acquiring knowledge through identification and

memorization of facts, through drill and repetition, and through sequential presentation of material. The ARL types do not place a high premium on abstraction and theoretical principles. The ARL's generally attend to isolated details and tend to be meticulous and perseverant. Golay states that ARL's are adept at clerical tasks, arithmetic problems, and memorization of spelling words. The ARL's gravitate toward business curriculums and the factual aspects of history and geography. English, literature, the hard sciences and advanced mathematics will hold little interest for the ARL student. Thus the ARL student will perform well when it comes to mastering the facts and mechanics of a given subject but have difficulty when the subject demands analyzing or creating complex ideas. The Dionysian temperament (SP) is an Actual-Spontaneous Learner (ASL). The ASL's work best with physical realities and are described as uninterested in abstraction. The ASL's are described as experiential learners who require variety. Due to ASL's dislike of routine, drill and repetition, Golay suggests that use of the Premack principle, where students are allowed to select activities of their choosing following less desirable activities, may be an effective motivating strategy. While ASL's frequently dislike reading, writing and arithmetic, they may perform quite enthusiastically in musical performances, the fine and industrial arts, drama, and mechanics. The Appolonian temperament (NF) is the

Conceptual-Global Learner (CGL). Golay describes CGL's as excellent communicators with well developed reading skills and spoken vocabularies. The cognitive style of the CGL does not involve well developed judgments or specifically defined facts but rather global impressions of a varied nature. Languages, literature, the arts, and social studies, fields involving the affective as well as the conceptual domain, frequently appeal to the CGL learner. The Promethian temperament (NT) is the Conceptual-Specific Learner (CSL). The CSL's are interested in seeking out and understanding principles. Theories and underlying principles behind concrete facts are what interests the CSL. The CSL's tend to become interested in fields in which models are developed or systems built including architecture, engineering, mathematics, sciences, and philosophy (Golay, 1982).

The area of MBTI learning styles and cognitive aptitude has generated an extensive wealth of hypotheses, but a more limited amount of empirical investigation. Those investigations that have been reviewed (Myers, 1980; 1985) have typically involved traditional academics, scholastic measures such as GPA and SAT scores with "intelligence" measured by less frequently employed tests, (e.g., The California Test of Mental Maturity, Otis-Lennon scores). This author's (Jaworski, 1985) investigation of the relationship between the widely used, well standardized

Wechsler subscales and the MBTI S-N dimension yielded promising results. As Lawrence (1984) has noted, the area of MBTI cognitive styles has yielded limited research, but the consistency of findings in investigations performed bodes well for future research. Moreover, the richness of the constructs developed in the three competing MBTI paradigms merits further investigation of construct validity. From a more pragmatic standpoint, the rapidly burgeoning use of the MBTI in clinical and counseling settings would make such investigation all the more timely.

The MBTI & WAIS-R Summary and Hypotheses

The focus of this study will be to examine the relationship between the MBTI and selected WAIS-R subtests to yield information regarding the personality differences in cognitive performance and learning styles. McCaulley (1981) has indicated that in the study of MBTI learning styles, the three groups of: IN, EN, IS, and ES; ST, SF, NF, and NT; and SJ, SP, NF and NT, are the groupings advocated by investigators and will therefore be the groups used in this investigation. McCaulley states, "The present state of knowledge of types is like that of a jigsaw puzzle with enough pieces in place to identify the main features of the picture, but with a great many gaps to be filled before the details become clear," (1981, p. 342).

The MBTI Form F was chosen for the investigation as it represents the "standard form" of the MBTI since the early

1970's. Its psychometric properties have been well established, (see above). Four WAIS-R subtests (Similarities, Comprehension, Digit Span, and Digit Symbol) were selected for their shared as well as unique properties. The Rapaport et al. model (1979) used in describing the Wechsler tests was utilized in lieu of the models proposed by Spearman, Thurstone, and Guilford due to its greater clinical applicability. Rapaport, et al. (1979) suggest that individual Wechsler subtests fall within four main divisions: 1) Verbal (Vocabulary, Information, Comprehension, and Similarities), 2) Attention and Concentration (Digit Span and Arithmetic), 3) Visual-Motor Coordination (Block Design, Object Assembly, and Digit Symbol), and 4) Visual Organization (Picture Arrangement and Picture Completion). Subtests representing the first three areas (Verbal, Attention/Concentration, and Visual -Motor Coordination) were selected for the study because of their correspondence to the hypothesized cognitive attributes of the various MBTI scales and types found in the literature (Myers, 1985). Two subtests were selected from the verbal domain because of the theoretical emphasis placed on verbal skills in the MBTI types, particularly those grouped as introverted-intuitive (Myers, 1985). These subtests, Similarities and Comprehension, both involve verbal reasoning (Kaufman, 1979) and hence share common properties. However, verbal concept formation in Similarities is not in-

herently meaningful and involves a high level of abstraction as the items progress. This unique source of variance, verbal abstraction, corresponds to the cognitive attributes described in introverted, intuitive, and, to a lesser extent, thinking types. Comprehension, considered a "hold" subtest for its stability in brain injured patients (DeWolfe, 1971; Golden, 1981), requires both social judgment and practical information applied in everyday situations. Rapaport, et al. (1979) have suggested that judgment is a function on the borderline of intellectual and emotional processes. This attribute parallels Jung's description of the evaluative and rational function of feeling. Digit Span involves skills described as attributes of thinking types (numerical recall) and sensing types (attention and freedom from disruptive anxiety). Digit Symbol, a visual-motor coordination task, requires psychomotor speed and accuracy, discussed in the literature as the domain of the extraverted sensing type.

The proposed study represents an amplification of the author's previous research (Jaworski, 1985) in which the cognitive attributes of one scale, the sensing-intuitive scale, were examined. The following synopsis highlights the central findings of this preliminary investigation:

The sample included 93 undergraduate subjects who were classified as either intuitive types ($N= 39$) or sensing types ($N= 54$) according to their scores on the MBTI. Each

subject was administered four WAIS-R subtests in group format: Digit Span, Digit Symbol, Similarities, and Comprehension.

Hypothesis testing in the preliminary study (Jaworski, 1985) centered on the differential aptitudes between the sensation-intuition dimension. Intuitives were predicted to have greater ability on the measures of verbal abstraction and comprehension, (WAIS-R Similarities and Comprehension), while sensing types were predicted to have greater attentiveness and be freer from distractibility, (yielding higher WAIS-R Digit Symbol and Digit Span subtest scores). The strongest individual subtest prediction proposed between groups were intuitives performing better on Similarities than sensing types, and sensing types performing better on Digit Span than intuitive types. Between group differences for individual subtests were also predicted for Digit Symbol, (sensing types higher), and for Comprehension, (intuitive types higher).

With regards to within group differences in the original study, intuitives were predicted to score higher on Similarities and Comprehension than they would on Digit Span and Digit Symbol. The reverse relationship was expected for sensing types. Intuitive types were also expected to perform best on Similarities, followed by Comprehension, Digit Symbol, and Digit Span with opposite order of scoring predicted for sensing types. Lastly, the stronger the

preference for intuition-sensation, the stronger the expected differences predicted.

Overall, the major findings of the preliminary investigation concerned the intuitive group's dominant performance on the WAIS-R subtests compared to the sensing group. The intuitive group scored significantly higher on the sum of the four WAIS-R subtests than did the sensing types. The intuitive group scored significantly higher on the sum of Similarities and Comprehension than did the sensing types as well as on the Comprehension subtest taken alone.

These results were consonant with literature in the field suggesting that the intuitives' high levels of cognition, employing verbally based logic and inference, has its roots in the intuitives' ability to translate quickly words into meanings. These findings more specifically correlate with earlier studies of the MBTI sensation-intuition dimension indicating the intuitive types' tendency to outscore sensing types on overall measures of intelligence (Myers, 1962; Sundberg, 1965) as well as on academic measures (Myers, 1980). Additionally, there was a trend by intuitives to score slightly higher than sensing types on Digit Symbol when "overall ability" and subject variables were partialled out as covariates. This was hypothesized as relating to intuitives' superior test-taking techniques under timed conditions (Myers, 1980).

One of the salient findings in the original study indicated that the Comprehension test taken alone, showed a marked difference in group means with intuitives ($M=12.9$) outscoring sensing types ($M=10.9$) by two points. The significant difference for the Comprehension subtest was maintained even when "overall ability," as well as race, age, and sex, were partialled out as covariates. Paradoxically, for stronger preference intuitive and sensing types, there was only a trend for intuitives to score higher on Comprehension than sensing types, $F(1,35) = 2.04, p < .06$. Also a trend in the opposite direction from the original prediction was found for stronger preference intuitives tending to score higher on Digit Span than the stronger preference sensing types. The findings regarding more extreme types (preference score > 20) for both intuitive and sensing groups are more difficult to interpret. Because the size of each group dwindled by approximately 60% when preference score cutoff was employed, the possibility that a bias between groups, which confounded the findings, could not be ruled out. However, the trend that more extreme intuitives scored higher on Digit Span than more extreme sensing types again appears to be related to the intuitives' ability to perform well under most test-taking conditions (Myers, 1980).

In terms of the individual subtest ordering for each group, sensing types as a group scored in the order

predicted by the investigator, (Digit Span > Digit Symbol > Comprehension > Similarities). Intuitives as a group did not score in the order predicted, Similarities > Comprehension > Digit Symbol > Digit Span. Rather, they scored in the following order, Digit Span > Comprehension > Digit Symbol > Similarities. The predicted individual scoring orders on subtests for both intuitives and sensing types did not attain statistical significance.

Although individuals in both groups did not attain the predicted ordinal position on subtest scoring, taken as a whole, the mean subtest performances for sensing types attained the ordinal position predicted: Digit Span > Digit Symbol > Comprehension > Similarities. While this result must be interpreted cautiously, one extrapolation suggested that sensing types as a group tended to perform better on the Freedom from Distractability or attentional subtests than they performed on subtests requiring a greater degree of verbal mediation. The ordinal position for subtests for the intuitive group, (Digit Span > Comprehension > Digit Symbol > Similarities), also suggested a capacity to perform well on attentional tests in addition to the previously noted strengths in tasks requiring verbal mediation (Jaworski, 1985).

The current study represents an amplification of this preliminary research. The present investigation will include all eight MBTI scales, as well as theoretically

relevant scale interactions defined in the competing models (Golay, 1982; Kiersey & Bates, 1978; Lawrence, 1979; McCaulley, 1976; Myers, 1962; 1985) to assay the validity of the hypothesized constructs. The following hypotheses will be tested:

1. Among the four dimensions of the MBTI; (1) the introversion-extraversion dimension, (2) the sensing-intuition dimension, (3) the thinking-feeling dimension, (4) the judgment-perception dimension, the sensing-intuitive dimension is expected to be the best predictor of "overall ability" as measured by the sum of the four WAIS-R subtests. Additionally, it is predicted that there will be a significant difference between introverts and extroverts in overall ability with introverts achieving the higher cumulative WAIS-R scores.

2. It is predicted that the judgment-perception dimension will be the best predictor of achievement as defined by self-reported high school G.P.A. That is, judging types are predicted to have significantly higher high school G.P.A. than perceptive types.

3. It is predicted that for Myers traditional MBTI learning style breakdown of, introverted intuitive (IN); extraverted intuitive (EN); introverted sensates (IS); and extraverted sensates (ES), will result in significant differences in overall ability as measured by the four subtests, between the IN groups and the ES groups with the

IN's outperforming ES on the sum of the four subtests. This difference is expected to exceed the difference between the intuitive-sensing dimension when taken alone and the introversion-extroversion dimension taken alone.

4. Differences between the traditional MBTI IN and ES groups are expected to be most pronounced on the "verbal" WAIS-R subtests of Comprehension, Similarities, and Digit Span, with the ES group expected to perform better than the IN group on the one psychomotor test, Digit Symbol.

5. It is predicted that McCaulley's proposed interactional model of MBTI learning style involving the combinations sensing-thinkers (ST), sensing-feelers (SF), intuitive-thinkers (NT), and intuitive-feelers (NF) will result in significant differences between the intuitive and sensing groups on overall ability. The thinking and feeling scales are not expected to contribute to the differences found between groups.

6. It is predicted that the Kiersey and Bates/Golay model of learning styles involving the combinations: intuitive-thinkers (NT), intuitive-feelers (NF), sensate-judgers (SJ), and sensate-perceptives (SP) will reflect the differences found between intuitives and sensates on overall ability and that the thinking, feeling, judging, and perceiving scales will be noncontributory to the differences.

7. Based on Myers' theory, the following ordering of group means on WAIS-R subtest total is predicted to be:
intuitives>introverts>perceptives>thinkers>feelers>judgers>
extroverts>sensates.

CHAPTER III

METHOD

Subjects

The archival data base utilized in this investigation had been collected during this investigator's master's thesis research (Jaworski, 1985). The subjects were 93 students from the Loyola University Psychology 101 classes who volunteered for the experiment and received course credit in exchange for participation. There were 27 males (29%) and 66 females (71%), All MBTI types were represented with the modal group comprised of ISTJ's (N=17). The ages ranged from 17 years 10 months to 48 years 11 months. However, the vast majority of subjects (87%) fell in the age range typical of an undergraduate population, (18 to 21 years of age). Subjects' ethnic breakdown was as follows: White (75%), Black (10%), Asian (8%), and Hispanic (7%). A total of six subjects were excluded from the original sample due to incomplete, and thereby unscorable, Myers-Briggs Type Indicators (MBTI) or Wechsler Adult Intelligence Scale-Revised (WAIS-R) subtests.

Measures

The MBTI: Psychometric Properties

Two sets of measures were used in the present investigation. The first set was from Form F of the Myers Briggs Type Indicator (MBTI; Myers, 1962) which is a self report instrument scored on four bipolar dimensions. These dimensions are extraversion-introversion, sensing-intuition, thinking-feeling, and judgment-perception. The second set of measures are contained in the Digit Span, Comprehension, Digit Symbol, and Similarities subtests of the Wechsler Adult Intelligence Scale- Revised (WAIS-R; Wechsler, 1981).

Procedure

Data were collected from individuals participating in Loyola University's Psychology 101 classes in the fall semester 1984 by three trained undergraduate volunteers. The present investigator met with the volunteers prior to the investigation to familiarize them with the study and to ensure uniformity of procedure. During group administration, each subject spent approximately one hour filling out Form F of the MBTI and took paper and pencil version of the WAIS-R Digit Span, Comprehension, Digit Symbol, and Similarities subtests. The subjects were read an introductory statement (see Appendix A) and then were administered the WAIS-R subtests. Because the WAIS-R subtests were administered in group format, some deviations

from individual administration were required, (See Appendix B for uniform instruction given by administrators).

Informed consent was received from each participating subject. Subject confidentiality was safe-guarded by number coding the subjects' questionnaires and subtests before handing them out rather than have subjects place their name on them. Tests were scored according to the guidelines in the respective manuals by the investigator along with the assistants who administered the tests.

CHAPTER IV

RESULTS

In order to describe more fully the sample's characteristics, means and standard deviations for WAIS-R subtests were computed for subjects race, sex, and age. The reader is referred to Table 1, Table 2, and Table 3 respectively for information on sample means and standard deviations.

Hypothesis 1:

It was postulated that of the four dimension of the MBTI; the introversion-extraversion dimension, the sensing-intuiting dimension, the thinking-feeling dimension, and the judgment-perception dimension, the sensing-intuiting dimension was expected to be the best predictor of "overall ability" as measured by the sum of the four WAIS-R subtests. In addition, it was predicted that there would be a significant difference between introverts and extroverts in overall ability with introverts achieving the higher cumulative WAIS-R scores.

Analysis of variance was computed for the following: introversion-extroversion by ability, sensing-intuiting by ability, thinking-feeling by ability, and judgment-perception by ability. A significant difference was found

TABLE 1

Means and Standard Deviations
by
Sex on WAIS-R Subtests

WAIS-R Subtest	Mean	SD
<u>Similarities</u>		
Males (N=27)	9.19	2.20
Females (N=66)	8.92	2.34
<u>Comprehension</u>		
Males	11.48	2.62
Females	11.80	3.03
<u>Digit Span</u>		
Males	14.11	2.59
Females	13.56	2.91
<u>Digit Symbol</u>		
Males	11.88	4.24
Females	12.51	3.09

TABLE 2
Means and Standard Deviations
by
Age on WAIS-R Subtests

WAIS-R Subtest	Mean	SD
<u>Similarities</u>		
17 years (N=9)	9.11	1.45
18 years (N=58)	9.10	2.25
19 years (N=16)	8.38	2.83
20 years (N=7)	8.86	2.12
>20 years (N=3)	10.33	0.00
<u>Comprehension</u>		
17 years	10.67	2.92
18 years	12.07	2.80
19 years	11.38	3.34
20 years	10.71	2.98
>20 years	12.00	0.00
<u>Digit Span</u>		
17 years	14.67	3.04
18 years	13.62	2.68
19 years	12.63	3.20
20 years	14.71	2.56
>20 years	16.67	0.00
<u>Digit Symbol</u>		
17 years	12.78	3.11
18 years	12.48	3.54
19 years	11.13	3.46
20 years	14.42	2.15
>20 years	9.67	0.00

TABLE 3
Means and Standard Deviations
by
Race on WAIS-R Subtests

WAIS-R Subtest	Mean	<u>SD</u>
<u>Similarities</u>		
White (N=67)	9.27	2.03
Black (N=9)	7.89	1.90
Hispanic (N=6)	7.33	1.97
Asian (N=7)	9.00	4.08
Missing (N=4)	9.50	3.11
<u>Comprehension</u>		
White	12.22	2.51
Black	10.78	4.18
Hispanic	9.00	1.89
Asian	11.14	4.02
Missing	10.25	2.99
<u>Digit Span</u>		
White	14.07	2.59
Black	13.89	3.26
Hispanic	10.16	2.71
Asian	11.86	1.86
Missing	16.00	2.45
<u>Digit Symbol</u>		
White	12.61	3.07
Black	10.56	3.00
Hispanic	10.00	5.32
Asian	13.57	4.20
Missing	13.00	4.97

between the sensing and intuition groups, $F(1,91) = 9.302$, $p < .01$, for overall ability with intuitive types ($M = 49.0$) outperforming sensing types ($M = 44.7$). Additionally, a significant difference was found between the thinking and feeling groups, $F(1,91) = 8.677$, $p < .01$ with feeling types ($M = 48.7$) outscoring thinking types ($M = 44.6$) in excess of four scale score points. The hypothesized prediction that introverts would achieve higher cumulative WAIS-R subtest scores than extroverts was not supported, $F(1,91)$, ns. Differences between the judgment-perception dimension also failed to attain statistical significance, $F(1,91)$, ns. The reader is referred to Table 4 for specific information on means, standard deviations, and F values for each group.

Hypothesis 2:

Hypothesis 2 stated that the judgment-perception dimension would be the best predictor of achievement as measured by self reported G.P.A. Specifically, judging types were expected to have significantly higher reported high school G.P.A. than perceptive types. It should be noted that of the 93 subjects, 67 answered this optional question regarding reported high school G.P.A.

Analysis of variance was performed with introversion-extraversion, sensing-intuition, thinking-feeling, and judgment-perception as the grouping factors and G.P.A., the dependent variable. No significant results were obtained in tests of two, three, and four-way interactions. No

TABLE 4
Means and Standard Deviations
for
MBTI groups on WAIS-R Subtests

<u>MBTI Group</u>	<u>N</u>	<u>Mean</u>	<u>SD</u>	<u>F</u>
<u>Introversion</u>	51	45.96	8.0	.700
<u>Extraversion</u>	42	47.19	5.6	
<u>Sensing</u>	54	44.70	7.2	9.302**
<u>Intuition</u>	39	49.03	5.8	
<u>Thinking</u>	50	44.60	7.9	8.677**
<u>Feeling</u>	43	48.74	5.0	
<u>Judgment</u>	50	45.78	7.7	1.84
<u>Perceptive</u>	43	47.37	6.2	

**p<.01

significant differences were obtained for the main effect of judgment-perception in G.P.A., $F(1,51)$, ns. Likewise, there were no main effects for thinking-feeling or sensing-intuiting on G.P.A., $F(1,51)$ ns. However, there was a nonsignificant trend for the main effect of introversion-extraversion on G.P.A., $F(1,51) = 3.363$, $p < .10$, with introverts obtaining higher high school G.P.A. than extroverts (3.43 for introversion and 3.25 for extraversion). The reader is referred to Table 5 for means, standard deviations, and F values for each MBTI group.

Hypothesis 3:

It was postulated that within the Myers learning styles breakdown of the MBTI; introverted-intuitive (IN); extraverted intuitive (EN); introverted sensates (IS); extraverted sensates (ES); there would be significant differences between IN groups and ES groups in overall ability as measured by the four WAIS-R subtests with the IN's outperforming the ES's on the sum of the four subtests. In addition, this difference was expected to exceed the differences between the intuitive-sensing dimension taken alone and the introversion-extraversion dimension taken alone.

An analysis of variance was performed comparing the introverted-intuitives with the extraverted-sensing group on overall ability which yielded a non-significant trend in the expected direction, $F(1,35) = 3.25$, $p < .10$. The mean score

TABLE 5

Means and Standard Deviations for MBTI Groups
on Reported High School G.P.A.

MBTI Group	<u>N</u>	Mean	<u>SD</u>	<u>F</u> value
<u>Introversion</u>	35	3.43	.29	3.363*
<u>Extraversion</u>	32	3.25	.46	
<u>Sensing</u>	34	3.34	.39	.249
<u>Intuition</u>	33	3.35	.40	
<u>Thinking</u>	34	3.35	.43	.162
<u>Feeling</u>	33	3.34	.36	
<u>Judgment</u>	34	3.35	.36	.162
<u>Perceptive</u>	33	3.34	.43	

* $p < .10$

for the 17 subjects categorized as IN was 49.5 and the mean score for the 20 subjects classified as ES was 45.6. However, this difference of 3.9 scaled points was less than the 4.3 scaled score difference between intuition and sensing taken alone. This was the result of a nonsignificant difference between extroverts and introverts in which extroverts, contrary to prediction, scored higher on the four WAIS-R subtests, with 47.19 for extroverts and 45.96 for introverts. Table 6 contains information pertaining to the WAIS-R subtests for Myers traditional breakdown.

Hypothesis 4:

Hypothesis four was an elaboration of the preceding hypothesis that the IN-ES would differ in overall ability. Specifically, hypothesis 4 postulated that differences between the traditional IN and ES groups were expected to be most pronounced on the Verbal subtests of Comprehension, Similarities, and Digit Span. The IN group was expected to excel on these Verbal subtests. In contrast, the ES group was expected to perform better than the IN group on the one psychomotor test, Digit Symbol.

This hypothesis received mixed support. Significant findings were generated with the Comprehension subtest. More specifically, an ANOVA of the IN and ES groups with Comprehension subtest as the dependent variable yielded a significant main effect for type, $F(1,35) = 6.448$, $p < .05$.

TABLE 6

Myers Interactional Model
by
WAIS-R Overall Ability

Myers' Group	<u>N</u>	Mean	<u>SD</u>	<u>F</u> value
<u>Introverted-Intuitive</u>	17	49.47	7.1	3.25*
<u>Extraverted-Sensing</u>	20	45.55	6.1	

*p<.10

The IN group scored higher with a \bar{M} = 13.29, while the mean for the ES group on Comprehension was \bar{M} = 11.2. The remaining verbal subtests failed to achieve significance. An ANOVA with Digit Span as the dependent variable yielded a $F(1,35)$, ns. An analysis of variance of the IN and ES with the Similarities subtest as the dependent variable yielded a $F(1,35)$, ns. Lastly, the prediction that the ES group would outperform the IN group on the one psychomotor test, Digit Symbol, was not supported by an ANOVA of the IN and ES groups with Digit Symbol as the dependent measure: $F(1,35)$, ns. Table 7 contains means and F values for Myers groupings of IN and ES on the four WAIS-R subtests employed in this study.

Hypothesis 5:

Hypothesis 5 examined McCaulley's proposed interactional breakdown of MBTI learning style involving the combinations sensing-thinkers (ST), sensing-feelers (SF), intuitives-thinkers (NT), and intuitive-feelers (NF). It was postulated that there would be a significant difference on overall ability for the intuitive groups (NT, NF) and the sensing groups (SF, ST). The thinking and feeling scales were not expected to be contributory to the differences between groups.

An ANOVA of overall ability by the McCaulley groups yielded positive findings with a main effect for type:

TABLE 7

IN and ES Group Means and F values
on Individual WAIS-R Subtests

WAIS-R Subtest	Mean	F value
<u>Similarities</u>		
Introverted Intuitives N=17	9.59	.562
Extraverted Sensates N=20	9.00	
<u>Comprehension</u>		
Introverted Intuitives	13.29	6.448*
Extraverted Sensates	11.20	
<u>Digit Span</u>		
Introverted Intuitives	13.29	.144
Extraverted Sensates	13.65	
<u>Digit Symbol</u>		
Introverted Intuitives	13.29	1.975
Extraverted Sensates	11.70	

*p<.05

$F(3,89) = 4.756$, $p < .01$. The following means were obtained: for sensing thinkers, $M = 43.6$, for sensing feelers, $M = 46.9$, for intuitive thinkers, $M = 47.2$, and for intuitive feelers, $M = 50.0$. Thus, as a group, the sensing types had lower scores than the intuitives. Table 8 contains information pertaining to McCaulley's proposed learning style model on overall ability.

Hypothesis 6:

Hypothesis 6 addressed the Kiersey and Bates/Golay model of learning styles: intuitive thinkers (NT)- the Conceptual Specific learners, intuitive feelers (NF)- the Conceptual Global learners, sensing judgers (SJ)- the Actual Routine learners, and sensing perceptives (SP)- Actual Spontaneous learners. Specifically, it was postulated that the thinking, feeling, judging, and perceiving scale would be noncontributory to differences found between intuitive and sensates on overall ability.

An ANOVA of overall ability by the Kiersey and Bates/Golay groups yielded a main effect for type: $F(3,89) = 3.684$, $p < .05$. The following mean values were obtained: for intuitive thinkers, $M = 47.2$, for intuitive-feelers, $M = 50.0$, for sensing judgers, $M = 44.4$, and for sensing perceptives, $M = 45.3$. The Kiersey and Bates/Golay paradigm corroborated the strength of intuitives over sensates and moreover, the introduction of the judging-perceiving dimension did not alter this phenomenon. Table 9 contains information

TABLE 8

McCaulley Groupings
on WAIS-R Overall Ability

McCaulley's Group	<u>N</u>	Mean	<u>SD</u>	<u>F</u>
<u>Sensing Thinking</u>	36	43.58	8.14	4.756*
<u>Sensing Feeling</u>	18	46.94	4.65	
<u>Intuitive Thinking</u>	14	47.20	6.94	
<u>Intuitive Feeling</u>	25	50.04	5.08	

* $p < .01$

TABLE 9

Kiersey and Bates/Golay Model
by WAIS-R Overall Ability

Kiersey & Bates Group	<u>N</u>	Mean	<u>SD</u>	<u>F</u> value
<u>Intuitive Thinking</u>	14	47.2	6.94	3.684*
<u>Intuitive Feeling</u>	25	50.0	5.08	
<u>Sensing Judgment</u>	35	44.4	8.18	
<u>Sensing Perception</u>	19	45.3	5.47	

*p < .05

pertaining to Kiersey and Bates/Golay proposed breakdown on overall ability.

Hypothesis 7:

The final hypothesis was based on Myers suggested ordering of individual scales by ability and concerned the mean order rankings of the eight scales. The hypothesized ordering was as follows: intuitives>introverts>perceptives>thinkers>feelers>judgers>extroverts>sensates. The following rank order for individual scale means on overall ability was obtained: intuitives>feelers>perceptives>extroverts>introverts>judgment>sensates>thinkers. The reader is referred to Table 4 for information pertaining to rank ordering of the individual MBTI scales. Table 10 contains ranking ordering information for all 16 types on overall ability.

TABLE 10

MBTI Types Rank Order on
WAIS-R Overall Ability

MBTI type	<u>N</u>	Mean	Rank Order
INFJ	6	51.17	1
ENFP	10	50.70	2
INFP	6	50.00	3
ENTJ	3	49.33	4
INTJ	3	47.67	5
ISFJ	8	47.63	6
ESFP	4	46.75	7
ISFP	3	46.67	8
ENTP	6	46.50	9
ESTJ	6	46.00	10
ESFJ	3	45.67	11
ENFJ	3	45.67	11
INTP	2	45.50	13
ESTP	7	44.43	14
ISTP	5	44.40	15
ISTJ	18	42.22	16
TOTAL:	93	<u>M</u> = 46.52	

CHAPTER V
DISCUSSION

The intent of this investigation has been to explore the interface between personality style and cognitive performance. More specifically, the relationship between MBTI personality styles defined by competing paradigms and specific WAIS-R subtest performance was examined in order to support conceptually MBTI learning style interactions and thereby contribute to MBTI construct validity.

McCaulley (1987) contends that Jung's theory of psychological type provides a useful vehicle to understand individual differences in the manner in which information is taken in (perception) and decisions made (judgment). Though McCaulley (1981) has likened the state of MBTI knowledge to a jigsaw puzzle, containing many gaps despite an identifiable outline, Lawrence (1984) is encouraged by the consistency of findings regarding MBTI learning styles and justifies utilizing the instrument as an organizing construct in both teaching and learning experiments. Three distinct interactional models have been proposed utilizing MBTI scales in defining learning/cognitive styles (Golay,

1982; Kiersey & Bates, 1978; Lawrence, 1979; McCaulley, 1976; Myers, 1962; 1985). The basis of this investigation was that MBTI dimensions reflect differential cognitive styles that would be reflected in WAIS-R subtest performance. Additionally, the three primary interactional models in the literature were examined to determine if one presented more useful MBTI configurations with regard to aptitude and achievement.

Initial hypotheses testing addressed Myers (1985) predictions of MBTI aptitude and achievement styles and specifically examined the model described by Myers (1985) and Lawrence (1979). As previously discussed, (Jaworski, 1985) intuitive types scored significantly higher on the sum of the four WAIS-R subtests than did the sensing types. This finding in the present study supports earlier studies of the MBTI sensing intuition dimension indicating intuitive types tendency to outscore sensing types on overall measures of intelligence (Myers, 1962; Sundberg, 1965) as well as on academic aptitude measures, such as the SAT verbal ability scale (Myers, 1980). This result is in keeping with the literature suggesting that intuitives high level of cognition, utilizing verbally based logic and inference have its origin in intuitives ability to translate rapidly words into meanings. In addition, intuitive types score higher on standard intelligence measures due to superior test taking

techniques (Myers, 1980) that is understood to contribute to their stronger WAIS-R performance.

Contrary to prediction, introverts did not score significantly higher on the four WAIS-R subtests than did extroverts. In fact, the mean extraversion score on the sum of the four WAIS-R subtests exceeded introverts scores by a nonsignificant amount of 1.23 scale points. It is speculated that this rather anomolous finding is related to a unique characteristic of this study that 19 of 51 (37%) of the introverts in the sample belonged to the ISTJ group. The Loyola sample ISTJ group (19% of total sample) collectively scored 4.3 scale points below the overall sample mean. ISTJ's have been discussed (Myers, 1985) as thorough, systematic, and hard working with a primary concern for factual accuracy and clear problem delineation. Thus, it is likely that the introverts who were ISTJs approached the testing in this systematic, thorough manner. Thus it may be that a deemphasis of fluid and integrative ability in ISTJ types may have been contributory to the lower WAIS-R subtest scores.

The unexpected finding concerning feeling types dominance in WAIS-R performance (exceeding four scale points) is understood to result from feeling types more flexible, global styles. This style emphasizes the integration of emotion and cognition as a primary characteristic of these types. This style contrasts with

the circumspect, evaluative cognitive style that characterizes MBTI thinking types. The feeling and intuition scales of the MBTI share an apparent strength in their ability to perceive the synthetic whole of a given problem, before beginning the process of decomposing a given problem into component parts and reintegration of those components. As Sternberg (1986) in his examination of analogical reasoning has indicated, better reasoners in contrast to less able reasoners, spend a greater amount of time in the identification phase of term meaning before moving into word meaning comparisons and subsequent responding. This greater amount of time in the initial identification phase (i.e., global planning) appears to facilitate and expedite subsequent local planning involving the performance automatization of problem solving techniques. Thus, feeling types and intuitive types may well emphasize a global and synthetic cognitive style that assists in proper problem identification and may well contribute to the ability to "chunk" information into meaningful configurations, not unlike the expert chess player in comparison with the novice player.

Myers' (1985) contention that judging types demonstrate higher levels of achievement when compared to perceiving types was not supported in this study. For the purpose of this investigation, academic achievement was operationalized as self reported high school grade point average. There

was, however, a nonsignificant trend in types ($p < .10$) with introverts achieving higher high school GPAs than extroverts ($M = 3.43$ for introverts; $M = 3.25$ for extroverts). Thus, while the introverts did not outscore the extroverts on the overall ability measure (WAIS-R subtests), the introverts achievement level was higher. Given no significant difference between introvert and extravert ability in this sample, it is speculated that introverts higher achievement level results from what Myers (1985) discusses as interest proclivities within types. That is, academic achievement involves the understanding of concepts and the capacity to work with theory and abstraction, which introverts, according to theory, naturally gravitate toward while equally intelligent extraverted counterparts may tend to seek out nonacademic areas in which to use their abilities.

Myers has further purported that introverted intuitives have an advantage over extraverted sensates with regards to ability. This hypothesis was to some extent supported by the data. A nonsignificant trend ($p < .10$) was found in that the IN group scored higher than the ES group on the sum of the four WAIS-R subtests. Myers (1985) maintains that it is a "habit of mind" which produces IN-ES differences with IN types having the greatest inherent interest in symbols and ideas and ES types the least. However, it is noteworthy that in the present study the difference in total score for IN and ES was less than the difference in score between N

and S taken individually. Thus, Myers' putative interaction effect of introversion and intuition was not supported in this investigation. While this may suggest that the fundamental aptitude differentiation is between intuition and sensing, the possibility of a sample artifact presents a plausible alternative explanation that cannot be ruled out.

As an elaboration of the third hypothesis, the fourth hypothesis states that the introverted intuitive group strength would be most pronounced for the verbal subtest of Comprehension, Similarities, and Digit Span and that the extraverted sensing group would perform better on the one psychomotor task, Digit Symbol. Only the Comprehension subtest yielded a significant difference ($p < .05$) in the expected direction with the IN's scoring 13.29 scale points and ES's scoring 11.2 scale points. This finding is consistent with MBTI theory. The IN group, described by Myers as the "thoughtful innovators", excel on a task measuring good judgment, defined as the "efficient utilization of knowledge tuned to the whole situation" (Rapaport, et al., 1979, p. 93). Rapaport et al. (1979) emphasize that the Comprehension subtest measures judgment, a function bordering between emotional and intellectual functioning. The ES group findings are likewise consistent with Myers theory that defines the ES types as the, "action oriented realists". The ES types may be penalized on the Comprehension subtest as a result of impulsivity.

The utility of McCaulley's model was apparent in the significant main effect ($p < .01$) in an ANOVA of type difference for ability as measured by total WAIS-R scores. Specifically, the NF grouping, exceeded its opposite type, ST, by 6.4 scale points for overall WAIS-R score. This suggests the interactive effect of intuition and feeling which corroborates Mein's (1986) position concerning the advantage of a global, fluid, and flexible cognitive style of problem solving. Moreover, it is thought that the impaired performance of the ST group may result from a ST tendency to "lose the forest for the trees." STs move too quickly to the automatization of performance components in problem solving without adequately viewing the whole picture at the beginning in order to identify globally the outline of the problem. Interestingly, when the sensing is combined with the feeling function, a jump of 3.3 points occurs for the overall score, which suggests that feeling (or intuition) alone may contribute to more efficacious problem solving.

The Kiersey and Bates/Golay interactional model also received corroboration with a significant main effect $p < .05$ in an ANOVA of type difference for ability as measured by total WAIS-R scores. As was addressed in the previous model, the traditional viewpoint that the thinking and feeling functions would be noncontributory to fundamental differences between intuitives and sensates was not

supported given the feeling types significant strength on total WAIS-R scores. However, as predicted, the judgment and perception functions were relatively noncontributory to differences between sensing types with SJ and SP's separated by less than one scale point.

The final hypothesis concerned mean rankings for the eight individual MBTI scales and was based on Myers (1985) theoretical predictions. The following rank order for individual type on total WAIS-R scores was predicted: intuition>introversion>perception>thinking>feeling>judgment>extraversion>sensing. The following mean ranking for individual scales on total WAIS-R score was found: intuition>feeling>perception>extraversion>introversion>judgment>sensates>thinkers. Three scales were "hits", intuitive in the first slot, perception in the third, and judgment in the sixth. The probability of predicting a "hit" (correct order for any individual type) is .125. Thus the likelihood of three accurate predictions occurring as a result of mere chance of .125 or .002; roughly one in 500. Additionally, visual inspection of Table 10, which rank orders each of the 16 MBTI types on total WAIS-R scores yielded a rather serendipitous finding. Rank orders 1-3 are held by NF types, ranks 4-5 are held by NTJ types, ranks 6-8 are held by SF types, ranks 9-10 are ET types, ranks 11-12 are held by EJ types, and, finally, ST types in positions 14-16. Interestingly, the Loyola sample most frequently

occurring types ENFP (N=10) and ISTJ (N=17) that are "mirror" opposites, respectively hold virtually opposite positions on the rank order scale, with ENFP in position 2 and ISTJ in position 16. Thus, the eighth hypothesis' findings that support the general structural integrity of Myers model with some variations. Furthermore, the model's integrity would appear to be augmented by the "clustering" of two and three scale combination within the rank order.

In reviewing all the findings, no single theoretical model in this study attained a clear dominance in terms of predicting specific cognitive strengths of MBTI types. That is, each model displayed unique strengths as well as weaknesses. While intuition had been previously documented as outperforming sensing types in overall level of ability (Jaworski, 1985), the most salient cross model finding was the clear edge of feeling types over thinking types in overall ability. This advantage is potentiated when feeling is paired with intuition as described in two of the three models (McCaulley, 1976; Kiersey & Bates, 1978; Golay, 1982). In fact, the NF style, aptly described by Golay (1982) as the Conceptual Global learning style, provides important information to current personality and intelligence researchers who maintain that intelligence is not static but malleable and may be enhanced. As Sternberg (1988) states, "the whole point of testing is not to obtain an immutable score, but rather to suggest strengths upon

which the individual can capitalize and weakness he can remediate" (p. 71). As Baron (1982) similarly reasons: "If the teachable parts of intelligence includes intellectual personality traits, and if personality traits can be changed, then intelligence can be changed" (p. 342).

The results of this investigation are viewed as contributory to MBTI construct validity in the data's support of specific MBTI learning style theories. The growing body of data which suggests inherent differences in cognitive styles provide a possibility of matching individuals, according to type, to a given educational technique with the goal of maximizing their strengths and abilities. This investigation identified strengths within preference types. However, a finding of particular interest was the superiority of the NF types in measures of aptitude. It is the investigator's contention that the unique attribute of the NF types with their emphasis in problem identification prior to reasoning and initiation of action, contribute to their cognitive strengths. Furthermore, it is expected that this more effective style can be taught to individuals by instructing them to emphasize global planning and accurate identification of the problem. As Polya (1971) suggests, problem solving may be improved by first, understanding the problem, followed by devising a plan, carrying out the plan, and finally, looking back. Similarly, Sternberg (1988) maintains that better reasoners

spend the majority of time in problem identification, which is a global integrative process, and that the most effective mental self managers spend most time in the initial planning phase in order to expedite later local performance.

Thus, the MBTI presents as more than a self report personality inventory. Equally important are the implied cognitive substrates within the MBTI scales that offer useful clues in effective amelioration of problem solving skills.

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APPENDIX A

DIRECTIONS FOR ADMINISTRATION

1. Have subjects pick up Wechsler Adult Intelligence Scale-Revised (WAIS-R) answer sheets and Myers-Briggs Type Indicator forms (MBTI)
2. Read instructions for Participating Subjects
3. Have subjects fill out demographic section on the MBTI
4. Administer WAIS-R Comprehension subtest. Have subjects write complete answers.
5. Administer WAIS-R Digit Span subtest. Read the entire digits, backward and forward. Tell the subjects, "The numbers become progressively more difficult, so don't worry if you are not able to recall them all."
6. Administer WAIS-R Digit Symbol subtest. Allow subjects to complete the sample items so that they have the general idea before beginning.
7. Administer WAIS-R Similarities subtest. Have subjects write complete responses using as many words as they require.
8. Administer the MBTI according to manual instructions.

APPENDIX B

INTRODUCTION READ TO PARTICIPATING SUBJECTS

The estimated time to fill out a personality inventory and four short paper and pencil tests should be less than an hour and a half.

You will first take four short aptitude tests. Next, you will be asked to fill out a personality inventory based on the imaginative and comprehensive personality theory of Carl Jung. We are interested in how certain personality types display different abilities and not in your individual performance. Thus, everything you fill out is precoded with a number, to match only materials and will not identify you. You may drop out of the experiment at any time. Thank you for your participation.

APPROVAL SHEET

The dissertation submitted by Gary Mitchell Jaworski has been read and approved by the following committee:

Dr. John Shack, Director
Associate Professor, Director of Applied Psychology
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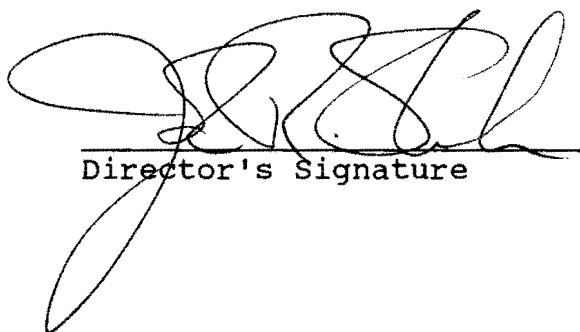
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The final copies have been examined by the director of the dissertation and the signature which appears below verifies the fact that any necessary changes have been incorporated and that the dissertation is now given final approval by the committee with reference to content and form.

The dissertation is therefore accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

10-8-90
Date


Director's Signature