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ABSTRACT

The relevance of cognitive style is not limited to specifically defined learning situations. Information is being processed continually in support of our daily activities and interactions with others. For this reason, an individual's cognitive style determines much of what is called personality. It has been observed that behavior patterns associated with personality typologies often have a great deal in common with patterns identified as learning style, decision-making style, and social style. A review of five measures of cognitive style including the Myers-Briggs Type Indicator, the Learning Style Inventory, the Gregorc Style Delineator, the Decision Style Inventory, and Lifescripts suggested three underlying dimensions despite differences in the terminology and theoretical bases of these instruments. The purpose of this study was to examine the conceptual similarity among five diverse measures of personality and cognitive style using factor analytic methods. The five measures were administered to college student and faculty subjects (N=143). Results of the analysis identified three underlying factors: a thinking/feeling dimension, an information-processing domain, and an attentional focus dimension. (43 references) (ABL)

Common Cognitive Personality Factors in Non-clinical Measures

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Running head: PERSONALITY FACTORS

Abstract

A review of five measures of cognitive style suggested three underlying dimensions despite differences in the terminology and theoretical bases of these instruments. Consequently, factor analytic methods were used on five measures completed by a sample of 143 students and faculty: the Myers-Briggs Type Indicator, Gregorc Style Delineator, Decision Style Indicator, Learning Style Inventory and Lifescripts. Results of this analysis identified three underlying factors consistent with predictions, i.e., a thinking/feeling dimension, an information-processing domain, and an attentional focus dimension. Implications for future psychometric research are discussed.

Common Cognitive Personality Factors in Non-Clinical Measures

The relevance of cognitive style is not limited to specifically defined learning situations. Information is being processed continually in support of our daily activities and interactions with others. For this reason, our cognitive style determines much of what we call personality. It has been the author's observation that behavior patterns associated with personality typologies often have a great deal in common with patterns identified as learning style, decision-making style, and social style (Tables 1 and 2 summarize our view of this overlap). Their similarities may sometimes be obscured by the fact that these typologies have been developed in generally discrete environments, e.g., classroom, counseling, management seminars, for different reasons and typically employ different nomenclatures.

The purpose of the present study was to examine the conceptual similarity among five diverse measures

of personality and cognitive style using factor analytic methods. The next section reviews these measures and presents the logic of our proposed model involving three fundamental dimensions.

The typology of personality developed by Jung (1923, 1971) defined two perceiving functions, by which we initially take in information, and two judging functions which characterize decision making. One approach to perception, termed Sensation, is practical, realistic, and present-oriented.
Sensing types prefer facts, details, and structure. The opposite perceiving approach, Intuition, reflects a greater concern for meanings and implications than with the raw facts, and with patterns, rather than details. Intuitives are imaginative and able to quickly recognize relationships in data.

Judging is accomplished either by Thinking, the term Jung used to denote an objective, logic-oriented mode of evaluation, or by Feeling, which is more personal and value-oriented. Persons with a strong Thinking orientation tend to value control. Those who lean toward Feeling generally prefer collaboration.

Jung also defined two opposite attentional preferences; Extraverted, which concentrates on external stimuli, and Introverted, which gives more attention to the internal mental process.

Jung's framework is the theoretical foundation of the Myers-Briggs Type Indicator (Myers & McCauley, 1985), an instrument widely used in counseling, educational, and industrial environments. Myers and Briggs have extended the model to include a Judging type (preference for a planned, orderly style, emphasizing Thinking/Feeling) and a Perceiving type (more open and spontaneous, emphasizing Sensation/Intuition). Several writers have defined four problem-solving or cognitive styles by crossing a perceiving and a judging function, i.e., Sensation/ Thinking, Sensation/Feeling, Intuition/Thinking, and Intuition/Feeling. McCauley (1987) advocates this approach for the classroom, while others, e.g., Hellriegel and Slocum (1975), have applied it to managerial problem-solving.

Mitroff and Kilman (1975) classified business managers into one of the four cognitive styles, and

then asked them to define their ideal organization. Each group reported consistent themes: Sensation/Thinking (ST) types concentrated on detail and the physical environment; Intuition/Thinkers (NT) were concerned with broad theoretical issues, and valued innovation and planning; Intuition/Feeling (NF) types were concerned with serving humanity, and valued a sense of organization and direction; Sensation/Feelers (SF) showed little interest in generalities and were more concerned with the individual.

Gregorc's (1982a) learning style theory is based upon the sequential or random processing of concrete or abstract data. In his theory "concrete" refers to the immediate experience of new information, no matter how it is dealt with, while "abstract" refers to the mental representation of the experience. Gregorc's four styles are summarized by Butler (1988) as follows:

> The concrete sequential learner is structured, practical, predictable, and thorough. The abstract sequential learner is logical, analytical,

conceptual, and studious. The abstract random learner is sensitive, sociable, imaginative, and expressive. The concrete random learner is intuitive, original, investigative, and able to solve problems (p. 31).

The preceding description of the Concrete Sequential can be applied to Jung's Sensation type while the adjectives describing the Abstract Sequential are appropriate for the Thinking type. The Abstract Random description is quite suitable for Feeling types while Intuitives can easily be associated with the Concrete Random learning style. While no studies have directly documented the similarities between the MBTI types and those measured by the Gregorc Style Delineator (1982b), they have been linked by separate studies involving the Kirton Adaptation/Innovation Inventory.

Kirton (1976) identified two problem-solving styles, which he labeled Adaptive and Innovative. Adaptors work within the existing situation to solve a problem and tend to be practical, methodical, and conforming. Innovators, on the other hand, question all

aspects of a problem, approach it from new angles and challenge rules.

Kirton's descriptions coincide rather well with Myers' (1987, p. 5) description of Sensing types who "...accept and work with what is 'given' in the here-and-now, and thus become realistic and practical" and Intuitives who "... grow expert at seeing new possibilities and new ways of doing things". Indeed, Carne and Kirton (1982) found a significant correlation between Intuitives and Innovators and between Sensates and Adaptors. Joniak and Isaksen (1988) compared the Kirton and Gregorc instruments and found that Adaptors corresponded to Concrete Sequentials and Innovators to Concrete Randoms.

Gender differences in responding to Gregorc's measure parallel gender differences in response patterns to the MBTI. Davenport (1986) found that males scored significantly higher on the Abstract Sequential channel while females scored higher on the Abstract Random channel. Both genders were predominantly Concrete Sequential. Similarly, Myers and McCauley (1985) report that males are most often classified as

Thinking types (parallel to Gregorc's Abstract Sequential) while most females are typed as Feeling (Abstract Random), and there are many more Sensates (corresponding to Concrete Sequential) in the general population than there are Intuitives (Concrete Random).

In Kolb's (1984) learning cycle model, based largely on Piaget, the terms abstract and concrete are employed differently than they are by Gregorc and relate to Jung's Thinking and Feeling. Kolb states that "An orientation toward abstract conceptualization focuses on using logic, ideas, and concepts. It emphasizes thinking as opposed to feeling" and "An orientation toward concrete experience focuses on being involved in experiences and dealing with human situations in a personal way. It emphasizes feeling as opposed to thinking" (pp. 68-69).

The second dimension in Kolb's learning theory is that of active experimentation versus reflective observation. In one of the several perspectives that Kolb offers on his theory of learning, he describes his dimensions as one of grasping information and one of transforming it. Grasping is accomplished by either

apprehension (concrete experience) or comprehension (abstract conceptualization). The two forms of transformation are extension ("active external manipulation", p. 41) and intention ("internal reflection", p. 41). Kolb specifically relates intention to introversion and extension to extraversion.

Regarding comparisons of his Learning Styles Inventory (LSI) and the MBTI, Kolb (1976) stated "The strongest and most consistent relationships appear to be between concrete/abstract and feeling/thinking and between active/reflective and extrovert/introvert" (p. 29). It thus would appear as if Kolb's learning styles relate to the extraverted and introverted aspects of the Thinking/Feeling scale.

Kolb's four styles are defined by the intersection of his two dimensions. Convergers favor abstract conceptualization and active experimentation while Divergers put emphasis upon reflective observation and concrete experience. Accommodators are inclined toward active experimentation and concrete experience, while

Assimilators prefer abstract conceptualization and reflective observation.

Christensen's (1981) Lifescripts is designed for use in management consulting. It defines four styles (Analyzer, Controller, Supporter, and Promoter) that, while relating more to social interaction than cognitive functions, also appear to be derived from the Thinking/Feeling and Extraversion/Introversion dimensions. According to Christensen, "Controllers want results. They are very task oriented and will make sure the job gets done" (p. 3). They "...like to direct and coordinate the work of others" (p. 3). Myers and Myers (1980, p. 85) tell us that "Extraverted Thinkers use their thinking to run as much of the world as may be theirs to run"; and "...they enjoy deciding what ought to be done and giving appropriate orders to ensure that it will be done".

Introverted Thinking types, like Analyzers, are logical and reserved. They "use their thinking to analyze the world, not run it" (p. 89). Extraverted Feeling types are friendly, tactful, sympathetic, and like dealing with people, while Promoters are described

as gregarious, outgoing, and socially skillful. Introverted Feeling types are idealistic, loyal, and "Value, above all, harmony" (p. 97). Supporters are also characterized as idealistic and loyal and "...will try to keep conflict low in order to maintain harmony." (Christensen, 1981, p. 2).

Similar instruments, also created for management consulting purposes and with virtually identical styles, have been developed by others (see Table 2). Atkins' (1981) Life Orientations Survey (LIFO), bases its four styles on Erich Fromm's (1947) unproductive types, although Atkins emphasizes that his styles can also be used productively. The fact that Atkins' styles fit this pattern, while based upon the theories of Erich Fromm may serve as a bridge between Jung and Fromm. It is conceivable that Fromm's types represent introverted and extraverted maladaptive forms of Jung's Thinking/Feeling dimension.

The pattern of correspondence between these measures and the Jungian T/F and E/I dimensions is also supported by Kilmann and Thomas (1975). They used Jungian typology to study factors in interpersonal

conflict-handling by managers and found Thinking/Feeling and Extraversion/Introversion to be the only significant dimensions for determining their style.

Rowe's Decision Style Inventory (DSI) (Rowe & Mason, 1987) is designed to assess tendencies toward four styles: Directive, Analytic, Conceptual, and Behavioral. The Directive Style reflects a practical, present-oriented approach. Directives are autocratic, action-oriented, and prefer structure. Analytics are logical, task-oriented, abstract thinkers. The Conceptual style is associated with creativity, insight, and intuition. Behaviorals are people-oriented, supportive and receptive. Factors used in defining these styles are cognitive complexity, defined in terms of tolerance for ambiguity, and environmental complexity, which refers to the degree to which one is concerned with the interpersonal working environment.

Rowe also utilizes the concept of cerebral hemispheric laterality (Ornstein, 1972; Springer & Deutsch, 1985). Neurological support for specialized forms of processing in the right and left hemispheres

of the brain has provided material for a number of theorists. Taggart and Robey (1981) associated the linear, logical left hemisphere with Sensation and Thinking and the more holistic, relational right hemisphere with Intuition and Feeling. Rowe relates Analytics and Directives to the left hemisphere and Conceptuals and Behaviorals to the right.

The physiological work of Luria (1966, 1970, 1973) is also supportive of hemispheric specialization and of our three basic cognitive dimensions. Based on research into functional deficiencies resulting from localized brain damage, Luria postulated three primary structures he calls "Blocks of the Brain" (1970, p. 66). The first block (brain stem, reticular formation, and hippocampus), relates principally to arousal. (Eysenck (1967, 1969) has proposed that the reticular formation is the source of introversion and extraversion). The second block (temporal, parietal, and occipital lobes), deals with encoding of information. The third block (frontal lobes) deals with planning and decision making. Das, Kirby and Jarman (1979) feel that block three operations have the closest relationship to

cognitive style because of its executive control function over cognitive operations.

We have examined several conceptual models of style relevant to cognition and noted their similarities (see Tables 1 and 2 for a summary of the proposed correspondences). We consider it to be significant that these pronounced similarities exist despite their differences in development and in their domains of application. Jung based his typology upon observations made in the course of his clinical practice; Gregorc and Kolb studied learning in the academic environment; while Rowe and Christensen drew from work done in the industrial environment. In these three varied environments the same patterns of behavior and attitude emerge based, primarily, on our individualized ways of dealing with information.

Traditionally, instruments such as these are intended to help us understand how and why others may view the same situation differently than we do and to identify alternate cognitive orientations which may be more appropriate in certain situations than those to which we are most accustomed. The similarity that

exists between them suggests to us that they are all tapping into a single, consistent conceptual framework consisting of three fundamental factors:
1) Factor 1 - An executive cognitive function charged with controlling cognitive operations and arriving at decisions; 2) Factor 2 - A receiving function ordering and encoding sensory input; and 3) Factor 3 - An activating function determining the general focus of attention and coordinating expression of style in a close relationship with Factor 1. Finally we believe tnat factors 1 and 2 operate along bipolar dimensions analogous to serial and parallel processing.

Our working hypothesis is that a factor analysis of results from the instruments discussed will converge upon these three factors.

Method

The instruments used in this study were the Myers-Briggs Type Indicator (MBTI), the Learning Style Inventory (LSI), the Gregorc Style Delineator (GSD), the Decision Style Inventory (DSI), and Lifescripts (LFS).

More complete documentation on their psychometric properties can be found, respectively, in: Carlson, 1985; Carlyn, 1977; Myers and McCauley, 1985; Thompson and Borello, 1986, **MBTI**; Freedman and Stumpf, 1978; Geller, 1979; Kolb, 1976, 1981, 1984, **LSI**; Gregorc, 1982a, 1982b, **GSD**; Rowe and Mason, 1987, **DSI**; and Christensen, 1981, **LFS**.

The five measures were administered to 180 students and faculty members at Central Connecticut State University. One hundred and sixty-two of the subjects correctly completed all five measures. The data were then screened for outliers, skewness, and multivariate normality following procedures described by Tabatchnik and Fidell (1989). The final sample of 143 individuals had a mean age of 32 years with a range of 17 to 72. A variety of majors was reported, but most of the participants were from psychology, education, and business disciplines.

Several manipulations of the data were performed to prepare it for factor analysis. All the data were put into the form of continuous dimensions. For the MBTI, these were E/I, S/N, T/F, J/P (see Myers &

McCauley, 1985). On the LSI, we reversed the usual order of subtraction, i.e., AC - CE to CE - AC, to align the high and low ends of the scale with the projected MBTI equivalents. We labeled CE - AC as LSI1 and AE - RO as LSI2.

The dimensions of the GSD were defined as GSD1 = Abstract Random - Abstract Sequential, and GSD2 = Concrete Random - Concrete Sequential. DSI dimensions were computed as DSI1 = Behavioral - Analytic, and DSI2 = Conceptual - Directive. In both cases, the alignment is with the T/F and S/N dimensions of the MBTI.

For Lifescripts, the basic dimensions had to be derived from the type scores. The columns defining the four styles are normally split. The upper half relates to normal conditions and the lower half to stressful or adverse conditions. This division was not needed for our study and introduced an unnecessary complication. The first step, therefore, was to combine them into a single score for each type. The SP (Supporter) and PM (Promoter) scores were then combined into a single People-centered score. A Task-centered score was obtained by combining AN (Analyzer) with CT

(Controller). Subtracting Task from People produced the scale, LFS1, that we believe is associated with the MBTI's T/F. The extraversion score (CT + PM) was subtracted from the introversion score (AN + SP) to obtain LFS2.

The continuous scores were subjected to a principal factor analysis using varimax rotation (SAS, 1985). Our hypothesis anticipated the following factor alignment:

Factor1	Factor2	Factor3
T/F	S/N	E/I
GSD1	GSD2	LFS2
LSI1	DSI2	LSI2
DSI1	J/P	
LFS1		

(J/P is included in factor 2 owing to its high correlation with S/N, no other prediction is made with regard to it.)

Results

A complete intercorrelation matrix of all variables is available from the authors. The pattern of correlations was generally consistent with predictions

with the exception of the LSI's AE and RO. Neither showed any meaningful association with Introversion or Extraversion. AE did show a small correlation with Sensation, and RO with Feeling. We also found that the GSD's Sequential scores were significantly correlated with Introversion and the Random scores with Extraversion.

Kaiser's Measure of Sampling Adequacy (Kaiser, 1970) was 0.78, exceeding the 0.6 threshold recommended by Tabatchnik and Fidell (1989) for a good factor analysis. Three factors, which account for 100% of the common variance, were retained. The eigenvalues were: 3.163, 1.670, and 0.854, respectively. The factor loadings after varimax rotation are shown in Table 3.

Loadings exceeding 0.55, Comrey's (1973) criteria for "good" factors, are enclosed in parentheses. As can be seen, the alignment of the dimensions coincides very well with our theoretical predictions.

Discussion

The findings support our hypothesis in nearly every respect. Factor1 represents a decision-making function: convergent and objective at one pole;

divergent and subjective at the other. It appears to play a supervisory role in cognitive functioning. Factor2 represents a basic data processing orientation: at one extreme immediacy, accuracy, and applicability; at the other patterns and possibilities. Factor3 consists of the MBTI Extraversion/Introversion scale and a similar scale derived from Lifescripts. It represents an inclination to attend more to external stimuli or to one's own thoughts and ideas. The Kolb active/reflective dimension failed to load on this factor, or any other. We take this as a reflection on the instrument and not upon Kolb's learning theory. In our opinion one end of this scale relates to pragmatism, rather than to activity, and the other end to a preference for passive learning, which is not necessarily reflective.

All of the instruments, including the LSI, load successfully on Factor1, the decision-making dimension; a result essentially predicted by Das, Kirby, and Jarman's (1979) physiological work. Lifescripts combines this dimension with Factor3 (Introversion/Extraversion). The 'social' styles

defined by this instrument apparently reflect the internal and external application of the executive cognitive function.

The results of this study suggest that several independent lines of research have identified the same cognitive core. This convergence lends validity to these factors as useful dimensions for practice and research.

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Table 1

Related cognitve factors.

1) JUNG	THINKING	FEELING	SENSATION	INTUITION
2) GREGORC	ABSTRACT-SEQUENTIAL	ABSTRACT-RANDOM	CONCRETE-SEQUENTIAL	CONCRETE-RANDOM
3) ROWE	ANALYTIC	BEHAVIORAL	DIRECTIVE	CONCEPTUAL
4) McKENNEY & KEEN	SYSTEMATIC	INTUITIVE	RECEPTIVE	PRECEPTIVE
5) KIRTON	N/A	N/A	ADAPTOR	INNOVA

1-(Jung 1923, 1971), 2-(Gregorc, 1982a), 3-(Rowe & Mason, 1987), 4-(McKenney & Keen, 1974), 5-(Kirton, 1976)

Table 2

Related Social/cognitive factors

Theorist	Key Dimensions			
Jung	Introverted-Thinking	Extraverted-Thinking	Introverted-Feeling	Extraverted-Feeling
Kolb	Assimilator	Converger	Diverger	Accomodator
Christensen	Analyzer	Controller	Supporter	Promoter
Merrill & Reid	Analytical	Driver	Amiable	Expressive
DeVille	Comprehender	Controller	Supporter	Entertainer
Atkins	Conserving/ Holding	Controlling/ Taking	Supporting/ Giving	Adapting/ Dealing
Fromm	Hoarding	Exploitive	Receptive	Marketing

Jung, 1923, 1971; Kolb, 1984; Christensen, 1980; Merrill & Reid, 1981; DeVille, 1984; Atkins, 1981; Fromm, 1947

Table 3

Factor Loadings after Varimax Rotation

Scale	Factor1	Factor2	Factor3
LFS1	(0.794)	0.135	0.026
DSI1	(0.754)	0.012	-0.009
T/F	(0.746)	0.091	-0.002
GSD1	(0.655)	0.206	-0.328
LSI1	(0.635)	-0.039	-0.193
LSI2	-0.249	-0.046	-0.137
S/N	-0.006	(0.723)	-0.149
GSD2	0.174	(0.653)	-0.336
DSI2	-0.023	(0.586)	0.137
J/P	0.229	(0.555)	-0.126
E/I	-0.184	-0.029	(0.655)
LFS2	0.132	-0.218	(0.646)

High loadings enclosed in parentheses