A Higher Order Analysis of the Factor Structure of the Myers-Briggs Type Indicator

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This study examined the higher order factor structure of Form G of the Myers-Briggs Type Indicator (MBTI; K. C. Briggs & I B. Myers, 1987). A third-order component analysis of a sample (N = 926) found 2 higher order components. This higher order analysis contributes to the research literature pertaining to the generalized structure of the personality measure.

The Myers-Briggs Type Indicator (MBTI; Briggs & Myers, 1987) is a personality inventory designed to identify individuals' basic preferences for perceiving and processing information (Conoley & Kramer, 1989; Schiflett, 1989; Tzeng, Ware, & Bharadwaj, 1991). This popular (Pittenger, 1993) and widely researched (Myers & McCaulley, 1985) self-report instrument produces scores over four dimensions: Extraversion-Introversion (EI), Sensing-Intuition (SN), Thinking-Feeling (TF), and Judging-Perceiving (JP). The MBTI has received extensive attention because it is based on Jungian theory for direction of conscious mental activity (Conoley & Kramer, 1989; Myers & McCaulley, 1985); is designed for nonclinical, normal populations (Carlson, 1989a; McCaulley, 1990; Thompson & Borrello, 1986a, 1986b); is easily administered; and uses terminology that conveniently communicates personality differences, especially for those who are test aware (Murray, 1990). Carlson (1989a) praised the MBTI for its "psychological validity . . . the psychological reality of these dimensions becomes apparent to the taker of the MBTI" (p. 484). For these and other reasons, the MBTI has enjoyed popular application in academic, business, and counseling settings (Murray, 1990; Pittenger, 1993).

Drummond (1992) listed the MBTI among the top 10 instruments generating references in the *Tenth Mental Measurements Yearbook* (Conoley & Kramer, 1989). Pittenger (1993) noted that over 2 million copies of the instrument are sold each year. To demonstrate the dramatic support for the MBTI, Pittenger quoted a *Wall Street Journal* editorial: "Insights provided by the MBTI are so extraordinarily useful that the test should be routinely administered to adults as they enter the workplace, to parents raising children, and to young adults thinking about getting married" (Auerbach, 1992, p. 11).

Much of the popularity of the MBTI may be attributed to its standing as an inventory based on the writings and theory of the Swiss psychologist Carl Jung (Drummond, 1992; Thompson & Borrello, 1986a; Tzeng et al., 1991). Jung (1921/1971) asserted that everyone is either extraverted or introverted in orientation and prefers one way of perceiving (sensing or

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intuition) and one way of judging or deciding on action (thinking or feeling). He proposed that personality, or psychological type, is formed by the ordered combination of preferences concerning the use of perception and judgment. The MBTI purports to measure the three Jungian dichotomies plus a fourth dimension, perceiving versus judging.

Evaluations of the MBTI, as described in Murray's (1990) literature review, have been generally positive. Reliabilities have generally improved (Myers & McCaulley, 1985); however, questions about the stability of the type dimensions have been raised (Pittenger, 1993). Carlson (1985), commenting on the McCarley and Carskadon (1983) study of the reliabilities of the scores from four subscales of the MBTI, stated that a subject typed as an Extraverted Sensing Thinking Judger (ESTJ) on a first testing had only a 50-50 chance of repeating this preference on retesting. Carlson (1989a) concluded that although recent reports have been favorable, very few studies have demonstrated reliability for scores from the MBTI.

With four scales and two preferences for each scale, there are 16 potential personality types. According to MBTI theory, each of these personality types represents a specific cluster of cognitive and affective preferences (Pittenger, 1993). The manual for the MBTI (Myers & McCaulley, 1985) provides descriptions of the cognitive, affective, behavioral, and perceptual propensities for each of the 16 types. However, Healy (1989a) and Murray (1990) described evidence for the 16 types as modest and unsupported.

Pittenger (1993) contended that although many similarities exist between Jung's theory of personality and the MBTI theory of personality, clear differences also exist. For example, Briggs and Myers (1987) embellished on Jung's (1921/1971) theory by adding the Judgment-Perception dichotomy. In other words, they posited that one relates to the outer world through primarily a judging attitude, using thinking or feeling processes, or a perceiving attitude, using sensing or intuition processes. Furthermore, MBTI theory deviates from Jung's theory by making specific predictions about what are known as "attitudes" (measured by the EI scale), "functions" (as measured by the SN and TF scales), and "orientation" (as measured by the JP scale). MBTI theory predicts for each orientation and attitude a specific dominant and auxiliary function. Murray (1990) concluded, "Four dimensions of the Myers-Briggs Indicator, rather than 16, are well supported, although even these four may not reflect Jung's typological theory as accurately as the authors hoped or claimed" (p. 1199). These and other research studies have emphasized the need for greater psychometric support of the instrument's constructs (Carlson, 1985, 1989a, 1989b; Healy, 1989a, 1989b; Pittenger, 1993; Sipps & Alexander, 1987; Sipps & DiCauldo, 1988).

Several important validity studies have been undertaken over the years, and support for the four-factor structure has been mixed. Tzeng, Outcalt, Boyer, Ware, and Landis (1984) reported finding "clear simple structures with the resultant empirical factors being matched almost perfectly with the theoretical scales of the MBTI" (p. 255). Thompson and Borrello (1986b) analyzed data from 359 students. A four-factor exploratory solution found that only a small number of items failed to exhibit strong structure coefficients on their predicted factor. Harvey, Murry, and Stamoulis (1995) performed a confirmatory factor analysis on the 94 MBTI items ($N = 1,091$). Exploratory factor analyses were also performed. Their findings supported a four-factor view of the MBTI.

Sipps, Alexander, and Friedt (1985) conducted an exploratory factor analysis of 1,291 undergraduates that produced a six-factor solution. They concluded that there was "only limited support for the item validity of the MBTI" (Sipps et al., 1985, p. 789). Sipps and DiCauldo (1988) examined the MBTI measures of sociability and impulsivity for convergent and discriminant validity. They found five factors, and as expected the JP scale of the MBTI was supported as a measure of impulsivity and sociability. However, their results and the results previously obtained by Sipps and Alexander (1987) suggested that the constructs differed from those cited in the MBTI manual.

Johnson and Saunders (1990) performed a confirmatory factor analysis using LISREL 7.13 on scores from 500 participants in developmental workshops. Their results sup-

ported four distinct, well-defined constructs. But because of the lack of internal consistency in some of the constructs, Johnson and Saunders recommended that the constructs not be given the status of subscales until improvements were made in the reliabilities.

Some studies have been quite critical of the MBTI. Costa and McCrae (1989) found no support for truly dichotomous scales. Stricker and Ross (1964) found no evidence for the bimodality of the scales and noted that few studies had attempted to validate the JP index. Costa and McCrae asserted that the research indicates that either Jung's theory is incorrect or it has been inadequately operationalized. Furthermore, they asserted that the MBTI indexes measured only four of five major dimensions of personality. Weiss, Mendelsohn, and Feimer (1982) agreed with these comments and suggested abandoning the Jungian framework in favor of a five-factor model.

Researchers have continued to call for more MBTI psychometric assessments (Sipps et al., 1985; Tzeng et al., 1984). Harvey, Murry, and Stamoulis (1995) suggested that the only way to settle the questions about the instrument was by continued confirmatory factor analysis. Pittenger (1993), in particular, noted that evidence to support the factor structure of the MBTI remains only partial and incomplete despite strong claims about the veracity of the MBTI structure in the popular literature. To help clarify the factor structure of the MBTI, we examined the higher order factor structure of the instrument.

Researchers often want to extract higher order solutions because the higher levels provide different structural perspectives. As Gorsuch (1983) explained, if a planet represented a higher order factor solution, a lower solution level would divide the planet into areas of water and land. And a still lower solution would divide the water into oceans and lakes and the land into continents and islands. Higher order factorial solutions organize data structurally similar to this topological example. The first-order solution is a close-up view that focuses on details; higher order solutions look at a greater Euclidian distance to give areas of generalization across the primary factors. These areas of generalization across the primary factors form the higher order factors. Thompson (1990) noted that both perspectives are potentially useful in understanding data.

Another advantage for assessing higher order structures is that they provide useful information if the higher order factors will be used in future research. Such information might show, for example, that the primary factors are quite narrow and that the higher order solution would be of greater importance. In this study, the higher order solution provided an abbreviated pool of MBTI items. The higher order item scores can be reviewed and factor analyzed to assess the dimensionality of the primary factor model.

The present research was a follow-up study, with a larger sized pool of research participants than that of our pioneering 1998 study, to examine the higher order factor structure of the MBTI (Johnson, Johnson, Murphy, Weiss, & Zimmerman, 1998). Despite its wide popularity in applied settings, fundamental questions remain to be answered regarding the construct validity for the MBTI's higher order structure. We anticipated that a similar two-factor higher order structure would emerge to provide evidence of factorial validity for the generalized structure of the MBTI. We also anticipated that similar MBTI items would emerge (Johnson et al., 1998) to provide evidence of item validity for the items in the generalized structure. Because instrument structural invariance is established only through multiple studies, this higher order analysis provides support for the integrity of the higher order solution. Furthermore, we anticipated that the higher order factor solution would subsume lower order solutions in such a way that the number and interpretations of those solutions could be supported empirically. We also provide an interpretative, conceptual framework for evaluating the themes of the higher order factors that emerged in the analysis and address the implications of our research. Consequently, this study lays the groundwork for further research and adds significantly to the previous MBTI literature.

METHOD

Participants

The campus career center staff administered Form G (Briggs & Myers, 1987) of the MBTI to undergraduate students ($N = 926$) attending a private university in the southwestern United States. The participants represented an available student population who came voluntarily to the campus career center requesting administration of the MBTI. There were 370 freshman, 180 sophomores, 145 juniors, and 231 seniors. The mean age was 19.3 years. There were 491 women (53%) and 435 men (47%) in the sample. The research participants' majors were as follows: business administration (25%), English (8%), family studies (12%), liberal studies (35%), management information systems (13%), and psychology (7%). Ethnicities were represented as follows: Black (2.5%), Asian/Pacific Islander (.8%), Hispanic (2%), Caucasian (70%), international (24.5%), and race unknown (.2%). Most of the students tested were of Caucasian ancestry and middle-class backgrounds.

Measure and Procedure

Form G of the MBTI consists of 94 forced-choice items that represent the bipolar scales implied by Jung's (1921/1971) theory. A person is classified into one of the 16 personality types based on the larger score obtained on each of the four bipolar scales.

The campus career center staff administered the self-scoring MBTI test form to the research participants individually and in small groups. Participant debriefing was available immediately after testing. Although debriefing was not mandatory, the majority of the participants participated in the debriefing sessions. The responses to the sessions were overwhelmingly positive.

Research Methodology

The statistical literature suggests that different choices in factor analytic processes can produce substantial differences in results, and the same literature has delineated some of the conditions under which differences in procedures will produce these differences. However, an understanding of these issues among researchers is far from complete (Fabrigar, MacCallum, Wegener, & Strahan, 1999). Selecting a factor analytic procedure, researchers should consider design features such as sample size, variable-to-factor ratios, and communality values. For example, considering principal component analysis (PCA) and exploratory factor analysis (EFA), differences in results are most likely when communalities are low (e.g., .40) and when there are a modest number of measured variables (e.g., three) per factor (Widaman, 1993).

Furthermore, the number of variables in the analysis itself will affect the degree of difference in the two approaches. With large variable sets, the proportion of entries in the diagonal of the correlation matrix is smaller. With 94 variables, only 1.06% (94/8,836) of the entries are in the main diagonal of the correlation matrix. Gorsuch (1983) noted that the difference in the two approaches was negligible when a large number of variables with moderately sized communalities were considered.

If one wishes to conduct a higher order factor analysis, the interfactor correlation matrix can be factored just like the intervariable correlation matrix (Floyd & Widaman, 1995). In higher order research, it is common to see factors extracted from the interfactor correlation matrix, rotated to the desired criterion, and interpreted directly as factors comprising factors. This sort of interpretation is not desirable for higher order factor analysis, because the accuracy of interpretation will decrease with each level of the higher order factor solution. This problem can be avoided if the relationship of the original variables to each level of

the higher order factors is determined (Gorsuch, 1983; Thompson, 1990). Gorsuch suggested that one way to address this issue was to postmultiply the first-order factor pattern matrix by the orthogonally rotated second-order factor pattern matrix. Thompson noted that because rotation is used to facilitate factor interpretation, it would be logical also to rotate the product matrixes to the desired criterion.

Therefore, at each level of analysis, the matrix of correlations among the components was factored and used as the matrix postmultiplier for the previous matrix. The procedure relates the original variables to each level of the higher order factors. The product was then rotated to the desired criterion. Specifically, in the first-order factor analysis of the 94 variables, the 94 × 17 promax rotated matrix was postmultiplied by the 17 × 6 promax rotated matrix that was extracted from the 17 × 17 interfactor correlation matrix obtained from the first-order solution. The 94 × 6 product matrix was rotated to the promax criterion and postmultiplied by the 6 × 2 varimax rotated matrix that was extracted from the 6 × 6 interfactor correlation matrix obtained from the 17 × 6 solution. The 94 × 2 third-order product matrix was then rotated to the varimax criterion to obtain the final third-order solution.

Higher order solutions conclude when only one factor remains or when there are uncorrelated factors (Gorsuch, 1983). Higher order solutions can continue indefinitely as long as a nonidentity correlation matrix is generated in the promax factor rotation. The pivot power for the promax rotations was $k = 3$. The decision at any order to perform an orthogonal rotation terminates the higher sequence (Loehlin, 1992). In this study, the third-level solution was chosen because of the large number of primary factors (Gorsuch, 1983). Had there been a small number of primary factors, only one level of higher order analysis would have been needed.

RESULTS

Raw weighted scores were obtained using the scoring procedures designated by the test's authors (Briggs & Myers, 1987). McCaulley (1981) explained that "answers carry a weight of 2, 1, or 0, depending on the probability that answers will be given by the types for whom it was intended and will not be chosen by those with the opposite preference" (pp. 310–311).

In the analysis, the researchers used the SAS principal components program (SAS Institute, 1986) to examine the construct validity of the MBTI scores. This factoring method was chosen because of the large number of variables with moderate communalities (Gorsuch, 1983; Guadagnoli & Velicer, 1988). The average communality was 0.67. In addition, the previously cited research, reporting a four-, five-, or six-factor structure (e.g., Sipps et al., 1985; Sipps & DiCauldo, 1988; Tzeng et al., 1984), noted a nonmodest number of measured variables per factor.

In this study, the researchers extracted all factors with eigenvalues greater than 1 (Guttman, 1954). This criterion has been shown to yield an accurate estimate for the number of true factors when the number of participants is greater than 250 and the average communality is greater than or equal to 0.60 (Hakstian, Rogers, & Cattell, 1982; Stevens, 1986). Because both conditions were met for this study, the authors used the eigenvalue criterion. Scree plots (Cattell, 1966) also supported the factor structures, finding that the primary factors with eigenvalues greater than unity accounted for approximately 70% of the total variance. For the primary factor analysis, the 17 factors accounted specifically for 67.6% of the total variance. For the second step in the procedure, the 17 × 6 matrix, there were six salient factors accounting for 72.9% of the variance. In the 94 × 6 product matrix, 52% of the variance was explained. For the final matrix operation, 62% of the variance was accounted for by the two salient factors in the 6 × 2 matrix used as the last matrix postmultiplier. Regarding the primary factor analysis, the eigenvalue of the first factor was 38.52, accounting for 40.98% of the variance. The eigenvalue total for Factors 2 through 17 was 24.98, accounting for

26.58% of the variance. The presence of a large generalized factor was one justification for performing a promax factor rotation for the primary factor solution, as was the number of factors in the primary solution.

An approximate check of whether a factor pattern coefficient is statistically significant can be obtained by doubling the standard error (i.e., doubling the critical value required for significance for an ordinary correlation). The statistically significant value for a sample size of 926 is approximately 0.18 (Stevens, 1986). This number is a minimum; the actual number may be higher. Very often in research, the absolute value is set at 0.3. A factor pattern coefficient of 0.18 would only account for approximately 4% of the shared variance between a variable and a factor. We thought the factor pattern coefficients should account for more variance, so we chose a factor pattern coefficient that would be practically significant and would account for approximately 10% of the shared variance of the construct (factor) it would be used to name. Salient items with factor pattern coefficients greater in absolute value than $|0.35|$ are presented in bold. Items are sorted by factor based on the respective factor pattern coefficients being greater in absolute value than $|0.35|$. The items are also presented and arranged numerically from highest to lowest. See Table 1 for the third-order varimax rotated solution.

DISCUSSION

The decision to examine the higher order factor structure of the MBTI was based in part on the fact that there were only two previously published higher order MBTI studies found in the psychological and statistical literature. One study was a second-order analysis (Thompson & Borrello, 1986b), and the other was a third-order analysis (Johnson et al., 1998). We wanted to conduct a third-order follow up study with a larger pool of research participants.

For the 94 × 17 first-order solution in the present study, there were 83 salient items (58 items in F1, and 25 items in F2 through F17) distributed as follows by total number and percentage over the four MBTI dimensions: EI (18, 21.68%), SN (22, 26.50%), TF (23, 27.71%), and JP (20, 24.09%). For the 94 × 6 second-order solution, there were 76 salient items (62 items in F1, and 14 items in F2 through F6) distributed as follows: EI (16, 21.05%), SN (21, 27.63%), TF (19, 25.00%), and JP (20, 26.31%). For the final 94 × 2 solution, there were 56 salient items (46 items in F1, and 10 items in F2) distributed as follows: EI (12, 21.42%), SN (17, 30.35%), TF (14, 25.00%), and JP (13, 23.21%).

As was expected, the number of salient items decreased consistently with each step of the analysis. From the primary solution to the final solution, the number of items decreased by MBTI dimension as follows: EI, –6; SN, –5; TF, –9; and JP, –7. These decreases are remarkably similar. The decrease of 20 items from the second-order solution to the final solution reinforced the need to conduct the third-order analysis. The large number of factors in the primary solution also indicated the need for a solution beyond the second order. Furthermore, even though there were 83 salient items subsumed in the 17 components in the primary factor solution, an analysis of the primary solution could not confirm that there were 16 unique personality types with distinct and unique affective, behavioral, and cognitive properties.

Pertaining to what the two higher order factors measure, the items in Factor 1 pick up the themes of flexibility, adaptability, analytic traits, and factors of interpersonal relationships. The items are more cognitive than affective. They are adaptive and analytical in terms of relationships and dealing with others and situations. The terms *thoughtful, thinking of others,* and *characteristics of interpersonal relationships* seem especially applicable in describing Factor 1. For the higher order Factor 1, the 10 EI items pick up the themes of activity, sociability, and dominance. The 12 SN items can be described conceptually as pertaining to imagination, creativity, curiosity, and originality. There is also a JP flavor in the item pool. For the 14 TF items, the descriptors *enjoying others* and *agreeableness* are appropriate.

TABLE 1

Rotated Factor Pattern Coefficients for Salient Items

Item	Scale	Factor 1	Factor 2
30	Sensing-Intuition	**0.752**	0.012
87	Judging-Perceiving	**0.698**	0.018
94	Sensing-Intuition	**–0.631**	–0.308
58	Sensing-Intuition	**0.630**	0.129
71	Thinking-Feeling	**0.599**	0.006
35	Thinking-Feeling	**0.588**	0.023
38	Sensing-Intuition	**0.563**	–0.098
54	Sensing-Intuition	**–0.554**	0.262
27	Thinking-Feeling	**0.539**	–0.084
12	Judging-Perceiving	**0.538**	–0.166
86	Thinking-Feeling	**0.536**	–0.055
47	Thinking-Feeling	**–0.533**	0.014
26	Sensing-Intuition	**0.500**	0.019
67	Thinking-Feeling	**0.498**	–0.071
33	Extraversion-Introversion	**0.495**	–0.034
75	Thinking-Feeling	**0.491**	–0.067
74	Sensing-Intuition	**0.490**	–0.105
25	Extraversion-Introversion	**0.483**	–0.031
83	Thinking-Feeling	**0.483**	–0.031
11	Thinking-Feeling	**–0.481**	0.029
72	Judging-Perceiving	**–0.481**	0.017
55	Thinking-Feeling	**–0.476**	–0.011
88	Sensing-Intuition	**0.461**	0.026
92	Judging-Perceiving	**0.460**	0.068
81	Extraversion-Introversion	**0.455**	–0.141
2	Sensing-Intuition	**–0.450**	–0.008
1	Extraversion-Introversion	**–0.441**	0.041
29	Extraversion-Introversion	**0.440**	–0.094
93	Sensing-Intuition	**0.435**	–0.057
23	Thinking-Feeling	**0.431**	0.029
40	Judging-Perceiving	**0.422**	0.054
39	Thinking-Feeling	**0.416**	–0.029
77	Extraversion-Introversion	**0.412**	0.097
91	Sensing-Intuition	**0.412**	0.023
73	Extraversion-Introversion	**0.408**	0.128
68	Judging-Perceiving	**–0.402**	0.026
28	Judging-Perceiving	**0.391**	0.205
84	Judging-Perceiving	**–0.386**	–0.341
89	Thinking-Feeling	**0.383**	–0.059
22	Sensing-Intuition	**0.379**	–0.336
21	Extraversion-Introversion	**–0.371**	0.015
9	Extraversion-Introversion	**–0.371**	0.046
16	Judging-Perceiving	**–0.369**	0.021
15	Thinking-Feeling	**–0.366**	–0.115
24	Judging-Perceiving	**0.362**	0.013
45	Extraversion-Introversion	**0.352**	0.211
76	Judging-Perceiving	0.152	**0.638**
57	Extraversion-Introversion	–0.291	**0.468**
62	Sensing-Intuition	0.001	**–0.457**
82	Sensing-Intuition	0.333	**–0.453**
37	Extraversion-Introversion	–0.146	**–0.435**
4	Judging-Perceiving	–0.291	**0.419**
64	Judging-Perceiving	0.325	**–0.410**
50	Sensing-Intuition	–0.098	**–0.372**
70	Sensing-Intuition	0.075	**–0.368**

(table continued on next page)

TABLE 1 (Continued)

Rotated Factor Pattern Coefficients for Salient Items

Item	Scale	Factor 1	Factor 2
6	Sensing-Intuition	−0.095	**0.350**
5[a]	Extraversion-Introversion	**−0.379**	**0.508**
36[a]	Judging-Perceiving	**−0.365**	**−0.393**
46[a]	Sensing-Intuition	**−0.555**	**−0.414**
49[a]	Extraversion-Introversion	**−0.355**	**0.783**
78[a]	Sensing-Intuition	**0.531**	**0.584**
51	Thinking-Feeling	−0.345	0.003
3	Thinking-Feeling	−0.338	−0.011
17	Extraversion-Introversion	−0.321	−0.161
60	Judging-Perceiving	0.309	0.108
63	Thinking-Feeling	0.308	−0.176
14	Sensing-Intuition	−0.298	0.043
19	Thinking-Feeling	−0.284	−0.052
20	Judging-Perceiving	−0.245	0.024
13	Extraversion-Introversion	−0.238	0.042
56	Judging-Perceiving	0.238	0.088
59	Thinking-Feeling	−0.234	−0.065
85	Sensing-Intuition	0.228	−0.051
10	Sensing-Intuition	−0.219	−0.007
90	Judging-Perceiving	−0.219	−0.130
69	Extraversion-Introversion	0.203	0.023
7	Thinking-Feeling	−0.196	−0.130
53	Extraversion-Introversion	−0.185	0.062
65	Extraversion-Introversion	−0.179	−0.096
31	Thinking-Feeling	0.161	−0.064
44	Judging-Perceiving	−0.139	−0.052
48	Judging-Perceiving	−0.134	0.010
79	Thinking-Feeling	0.118	−0.001
41	Extraversion-Introversion	−0.066	−0.019
80	Judging-Perceiving	−0.004	0.295
52	Judging-Perceiving	0.264	−0.272
61	Extraversion-Introversion	−0.003	0.256
42	Sensing-Intuition	−0.079	−0.236
8	Judging-Perceiving	−0.105	−0.230
34	Sensing-Intuition	0.059	0.228
18	Sensing-Intuition	−0.127	−0.226
66	Sensing-Intuition	0.054	−0.226
43	Thinking-Feeling	−0.052	0.212
32	Judging-Perceiving	0.129	0.130

Note. Salient items with factor pattern coefficients greater in absolute value than |0.35| are presented in bold. Nonsalient items are not bolded. Items are sorted by factor based on factor pattern coefficient with the largest absolute value.

[a]Factorially complex items with factor pattern coefficients greater in absolute value than |0.35|. The items are arranged numerically from lowest to highest.

Responsibility is indicated, as is task orientation. For the 10 JP items, the themes of persistence, motivation, and goal direction emerge. There is also a TF flavor in these items. In the sense of emotionality, meaning agreeableness and conscientiousness, these ideas are somewhat noted in the TF and JP dimensions. Overall, the generality and the intercorrelation of items from all four MBTI dimensions in Factor 1 of the primary solution were all picked up in Factor 1 of the third-order solution. Factor 1 of the final solution captures a personality dimension that contains four facets.

The findings presented in Table 1 indicate that two factors represent a third-order generalized solution of the MBTI. The five items displaying factorial complexity are also listed. The 33 nonsalient items are listed at the end of the table. There are 46 items in Factor 1. These items are clustered in a way that is consistent with the MBTI structure. There are 12 SI items, 10 JP items, 14 TF items, and 10 EI items. Following are the ratios of the four MBTI scales to the total number of MBTI items for each scale: (a) SI (12/26, 46%), (b) JP (10/24, 42%), (c) TF (14/23, 61%), and (d) EI (10/21, 48%). The total, 46/94 or 49%, represents the number of MBTI items clustered in the factor. Factor 1 emerged as a generalized factor represented essentially equally in number by the four MBTI scales.

The SN items reflect a person's preference between two opposite ways of perceiving. One may rely on the process of sensing, which reports observable facts or happenings through one or more of the five senses, or one may rely more on intuition, which reports meanings, symbolism, and possibilities that are beyond the reach of the conscious mind. The JP items relate to the process a person uses in dealing with the outer world. A person who prefers judgment uses thinking or feeling in dealing with the outer world. The person is highly structured and organized and has plans laid out carefully. One who prefers perception uses sensing or intuition. The person is curious and flexible, keeps options open, and is ready for change, spontaneous, and adaptable.

The TF items refer to the two styles of making a decision. A person relying primarily on thinking will decide impersonally on the basis of logical, rational, cognitive consequences. These individuals are concerned with criticality, objectivity, justice, fairness, and analytical ability. A person relying on feelings will decide primarily on the basis of personal or social values and focus on the value or merit of an issue. The person is concerned with subjectivity and is generally sympathetic to the values of others. The person has a need for affiliation and has a substantial capacity for warmth.

The EI items reflect whether a person is an extravert or an introvert. Extraverts are oriented primarily to the outer world, and they focus on people, sociability, and activity. Introverts are oriented primarily to the inner world, and they tend to focus on concepts and ideas. They value solitude and privacy.

Within higher order Factor 2, the 10 items from the SN, EI, and JP dimensions pick up the themes of initiating, creating, deliberation, and organizing. The JP and EI items reflect how much control one is comfortable with using. The factor is characterized as "organization." Factor 2 consisted of 10 questions. The proportion of the MBTI scale items to the total number of items per scale follows: (a) SI (5/26, 19%), (b) EI (2/21, 10%), and (c) JP (3/24, 12%). The JP items pertain to the preference for planning and order as opposed to a preference for flexibility and spontaneity. The EI items pertain to the systematic-casual dichotomy of preference for the outer world of people as opposed to the inner world of concepts and ideas. The SI items pertain to a preference for perception of the observable through the senses as opposed to perception of possibilities and relationships through insight. Factor 2 could be named "organization." The term reflects the idea of choice and flexibility. The 10 items in Factor 2 represent about 10% of the total items on the MBTI.

There are two EI items, two SN items, and one JP item in the factorially complex group of items. These items pertain to activity, sociability, and direct versus unconscious perception. These are the same scales that were represented in Factors 1 and 2.

From a global perspective of the theoretical MBTI structure, the third-order solution involved two clusters: (a) a generalized factor and (b) an organization factor. The factorially complex cluster had five items. Factor 1 was the dominant cluster. The items grouped in a way that was consistent with the MBTI theoretical structure. Factor 2 could be perceived as organization because the items pertain to the dichotomies related to routine, structure, and systematization. Although there is the large generalized Factor 1, this does not mean there is only one interpretable factor (Daniel, 1991). The second factor is a valid factor

addressing organizational issue of choice and flexibility. The factorially complex cluster had significant factor pattern coefficients on both Factors 1 and 2.

The 33 nonsalient items in the third-order solution were distributed over the four MBTI dimensions as follows: EI (7, 21.21%), SN (7, 21.21%), TF (9, 27.27%), and JP (10, 30.30%). The items that were retained seemed more transparent than those that were not retained. Anastasi (1988) noted that most items on self-report inventories have one answer that is recognized as socially more desirable or acceptable than the others. Consequently, the nonsalient items were viewed as weaker. Otherwise, no specific differences were observed in the items.

Apparent discrepancy exists between the results of this study and those of the previous study (Johnson et al., 1998). From the previous study, there were 60 items in Factor 1, 9 items in Factor 2, and 6 items in Factor 3. In the current study, there were 46 items in Factor 1 and 10 in Factor 2. Conceptually, the Factor 1 themes for both studies are the same. The factors are generalized factors composed of items from all four of the MBTI dimensions. The factors capture a personality dimension that contains four facets. Three of the items in Factor 3 from the first study (Items 6, 50, and 62) were in Factor 2 of the second study. One of the items in Factor 3 of the first study (Item 78) appeared in the factorially complex items in the second study. The remaining two items from Factor 3 of the earlier study (Items 18 and 42) did not appear in the current study. Essentially, the designation of *attention* for Factor 3 in the study reported in 1998 was picked up in Factor 2 of the study reported here, with the term *organization*. Factor 2 in this study is essentially a combination of Factors 2 and 3 from the previous study. The themes are conceptually the same.

The overlap of items for the two studies provides evidence of item validity for the items in the generalized structure. The overlap of items from the two studies follows. Both studies showed 37 common items in Factor 1: EI Items 1, 9, 21, 25, 33, 45, 73, 81; SI Items 2, 22, 26, 30, 38, 54, 58, 74, 88, 93, 94; TF Items 11, 23, 27, 35, 47, 67, 71, 75, 83, 86, 89; and JP Items 16, 24, 28, 40, 68, 72, 92. Within Factor 2, one item was common to both studies: EI Item 76. The second study also picked up four items not found in the first study (Items 4, 37, 70, and 82).

These items represent a salient pool of MBTI items derived from the higher order analysis. The third-order solution in the first study contained 75 items. The current study showed 56 items in the third-order solution. Of these, there was an overlap of 43 items. The higher order solution retained nontrivial, salient items with significant factor pattern coefficients. Nonsubstantive items that did not have significant factor pattern coefficients were dropped from the pool of items. The higher order solution found five groupings (EI, SI, TF, JP, and an organization cluster). This grouping infers a five-factor primary structure with 43 salient items. A higher order analysis of dichotomous or trichotomous data is a way to recapture a primary solution. However, this statistical methodology does not seem to be well understood. Perhaps this is because of the general lack of understanding of higher order analysis and the fact that researchers must exit the traditional statistical software packages to conduct such analyses. We also note that the analysis of MBTI continuous scores ignores the theory of dichotomous preferences. The statistical methodology used in this study does not have the stated analytical limitation; that is, we analyzed raw weighted scores obtained by following the scoring procedures designated by the test's authors and used higher order analysis to recapture the primary factor structure.

The current solution furthers understanding of the MBTI scores by providing an interpretative framework for the higher order solution. The analysis has established five content areas subsumed in two higher order factors. This seems to be a general taxonomy rather than a theory of personality. A similar pool of items was extracted from both this and the previous study (Johnson et al., 1998). The replication of items from both studies demonstrates the factorial validity of the salient items. The higher order solution captures salient items from the traditional MBTI scale to affirm item content and a generalized structure.

Our research found that the MBTI does measure several common personality traits; however, our first-order analysis did not find any evidence of 16 unique personality types. We cannot attribute this to the MBTI structure, the scoring system, the content, or some other reason. However, the item content of the higher order solution seems to argue correctly that individuals scoring differently on the MBTI would perceive the world differently and reach decisions in different ways. It is then logical that the MBTI can describe preferences in thinking and feeling, and deciding and evaluating, and assist those who work in counseling, placement, management development, building effective teamwork, and appreciating the different perspectives of people in general.

With the item content of the higher order factors, it seems logical that there would be a link with the five areas and personality-relevant behavior. Overall, it is logical to conclude from this study that the MBTI can give an indication of career choice linked to item choice and an understanding of why one relates to some people and not to others.

CONCLUSION

The significance of our study lies in the assessment of the higher order structure of the MBTI scale. This type of research has been largely unexplored in the assessment literature. The present study found a generalized structure comprising two higher order components. The generalized solution also suggested a five-factor primary structure. The findings of this study raise the question of why some divergence with the previously cited study emerged. One cannot rule out the possibility that the factor structure of the MBTI varies as a function of the specific sample of respondents being analyzed and whether the administration was by individual or in a group setting. The only way to answer these questions conclusively will be to conduct confirmatory factor analyses in several populations and evaluate the performance of models that constrain the factor patterns to be invariant across samples. Additional studies can use factor analysis to assess the posited five-factor primary structure by factor analyzing research data for the abbreviated pool of MBTI items. The assumptions regarding the statistical analysis of noncontinuous data and the impact of the assumptions on both the primary and higher order MBTI factor solutions should also be investigated further. Additional studies can seek to replicate the findings of this study and examine the convergence of the generalized solutions.

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