

Development and Validation of a Short-Form Inventory to Identify Personality Types: The Personality Identity Estimator (PIE)

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Abstract

The use of personality inventories has been limited because of their cost and the length. To overcome these limitations, this study created the Personality Identity Estimator (PIE), an easy-to-use inventory to estimate personality types that can be used at no cost. PIE is a categorical inventory containing 12 items with 3 items for each of the 4 personality-type dimensions in Jungian theory. A sample of 1,104 was used to create PIE. Validity was established through multivariate analyses using data from the administration of the Myers-Briggs Type Indicator to 553 of the sample. Reliability was established by test-retest. Consequently, PIE is a new short-form instrument to estimate personality type following Jung's concept of personality types. PIE can be completed quickly, is easy to score and interpret, and can be used for self-assessment of personality types. PIE can be used to address individual differences, to increase self-awareness, and as an interactive instructional tool. Thus, PIE is a new valid and reliable tool that can be used in both instructional and research settings confidently and at no charge. Permission is granted to use the Personality Identity Estimator in practice and research. A printable copy of PIE is appended.

Keywords: personality types, instrument development, Personality Identity Estimator (PIE), Myers Briggs Type Indicator, self-assessment

Impact Statement: This study created the Personality Identity Estimator (PIE), an easy-to-use inventory to estimate personality types that professionals and nonprofessionals can use at no cost. PIE has 12 items, can be completed quickly, and is easy to score and interpret. PIE can be utilized for self-assessment to promote self-reflection and to identify individual differences.

1. Introduction

Personality type is “any of the specific categories into which human beings may be classified on the basis of personality traits, attitudes, behavior patterns, physique, or other outstanding characteristics” (APA Dictionary of Psychology, n.d., para. 1). Personality type is one dimension of individual differences among learners. Addressing individual differences is vital for an effective teaching-learning transaction, ranging from early childhood through college and extending to adult education. Addressing individual differences begins with and is anchored in understanding the individual.

Carl G. Jung (1921/1971) provided the theoretical basis for personality types. His conceptualization of the attitude types provides a means to account for individual differences in dealing with people and events. Jung used the term *psychological type* to refer to when any of these attitudes became habitual to the point of setting a definite stamp on an individual's character (Jung, 1921/1971, p. 482). The degree of preference for particular attitudes and functions is projected to reflect differences in personality (Arnaua, Greena, Rosena, Gleavesa, & Melanconb, 2003, p. 234).

Consequently, psychological or personality types provide one way to address individual differences in learners. Isabel Briggs Myers and her mother, Katherine Briggs, developed the Myers-Briggs Type Indicator (MBTI) “to make the theory of psychological types described by C. G. Jung (1921/1971) understandable and useful in people's lives” (Myers & McCaulley, 1985, p. 1). The MBTI is one of the most widely used instruments in the world for identifying personality differences (Randall, Isaacson, & Ciro, 2017, p. 2). Despite its widespread utilization, its cost and the length of time required to complete it have limited its use among many teachers,

counselors, and other educational professionals.

Nevertheless, there is a need for psychometrically sound instruments for assessing personality traits in educational settings. However, long inventories such as the various versions of the MBTI may be uneconomical and limited in their applicability because of the significant investment of time and money required for their use; hence, there is a need for short-form instruments for assessing personality traits (Franzen et al., 2022, p. 761). Moreover, cheaper alternatives for the MBTI lack known reliability and validity, indicating the need for more empirical studies (Shen, Prior, White, & Karamanoglu, 2007, p. 63). To overcome these challenges, the purpose of this study was to develop an inventory to estimate personality type, which (a) could be easy to administer, (b) could be completed rapidly, and (c) could be used immediately by teachers, other educational professionals, and individual learners. The new inventory was named the Personality Identity Estimator (PIE).

2. Personality Types

Personality types were conceptualized by Carl G. Jung (1921/1971). Jung proposed two types of personalities, which he termed extraverts and introverts. He referred to these as *the attitudes*. The extraversion attitude directs a person toward the external world. In contrast, the introversion attitude orients a person toward the inner, subjective world. Most people are a blend of both of these attitudes. These attitudes are bipolar opposites, with one attitude predisposed to develop more remarkably than the other in each person.

Human behavior is an interactive set of psychological attitudes and functions (Jung, 1921/1971). The psychological attitudes are Extraversion, oriented toward the outer world of people and action, and Introversion, oriented toward the inner world of thought and reflection. The psychological functions are perception (information gathering utilizing Sensing or Intuiting) and judgment (decision making by Thinking or Feeling).

According to the theory of psychological types (Jung, 1921/1971), people can be characterized by their preference for general attitude (Extraversion-Introversion), their preference for one of the two functions of perceiving (Sensing-Intuition), and their preference for one of the two functions of judging (Thinking-Feeling). Extraversion-Introversion indicates the source and direction of a person's energy expression. An extravert's source and direction of energy expression are mainly in the external world, while an introvert's energy source is primarily in their inner world. Thus, extraverts prefer to direct their energy to the outer world of action, people, and objects. At the same time, introverts tend to focus their energy on the inner world of ideas, concepts, and mental images.

The functions of Sensing and Intuition represent how individuals perceive information. Sensing means that a person mainly believes factual, concrete, and tangible information received directly from the external world by the sense organs. Intuition involves information obtained from the internal or imaginative world. The world is seen indirectly as a series of patterns, abstractions, trends, and future possibilities.

The functions of Thinking and Feeling represent how individuals process information for making decisions and judgments. Thinking consists of making a decision mainly through logic. Therefore, it involves forming logical, analytical, sequential, quantitative, and objective assessments. On the other hand, Feeling consists of making decisions based more on a subjectively-held sense of values, on a view toward the probable human consequences of the outcome, and on emotions based on feeling what one should do. Consequently, the basis for decisions for the Feeling preference is mainly feelings and emotions.

Eight (2 x 2 x 2) psychological types result from coupling the dichotomous pairs of attitudes and two dichotomous pairs of functions. For example, one psychological type is Extraversion-Sensing-Thinking while another is Introversion-Sensing-Thinking. Personality type is theorized as an individual's preference for particular attitudes and functions over others.

3. Myers-Briggs Type Indicator

Personality style or type is a widely accepted concept among educators. This concept of personality type is based on Jung's writing on personality. It has been popularized by the Myers-Briggs Type Indicator (MBTI) availability. The theory underpinning the MBTI is that much behavior that seems random is actually very orderly and consistent due to the fundamental differences in the way people prefer to use their perception and judgment (Myers & McCaulley, 1985, p. 1).

The MBTI contains four separate indices concerning what people attend to in a given situation and how they draw conclusions about their perceptions (Myers & McCaulley, 1985, p. 2). The MBTI built on the psychological type model of Jung. It extended Jung's model by adding the Judging-Perception dichotomy that made explicit one aspect of the theory implicit in Jung's work (p. 13). The Judging-Perception dichotomy reflects how a person implements the information that has been processed. Judging refers to organizing all of

one's life events and generally sticking to plans that have been made. Perceiving refers to an inclination to improvise and explore alternative options. With the addition of the Judging and Perceiving preference, the number of individual types increased from 8 to 16. The MBTI identifies a person's preferences among four pairs of personality variables.

Several forms of the MBTI range from 94 items to 166 items. Each test form consists of forced-choice items representing behavioral preferences and preferred self-descriptive adjectives related to the psychological type theory. Raw scores are tabulated to indicate preferences for each indicator's four scales. These results produce both continuous and categorical scores to indicate preferences for the 4 scales of the 16 potential personality types.

Although practitioners and researchers have widely used the MBTI, its measurement characteristics have been questioned (Capraro & Capraro, 2002, p. 595). Several researchers have raised questions regarding its validity and reliability (Randall et al., 2017, p. 5). Nevertheless, several studies have concluded that the MBTI has reasonable construct validity, is reliable over time, and distinguishes the individual personality types in the four dichotomous dimensions (Capraro & Capraro, 2002; Randall et al., 2017).

Despite the evidence of validity and reliability for the MBTI, factor analysis research has indicated that all items do "not meet the criterion for the correct factor in their actual scales" (Saggino, Cooper, & Kline, 2001, p. 247) and, therefore, not all MBTI items are necessary (p. 248). These studies suggest a need for a new, shorter, and easier-to-use inventory. Creating a short scale is a complex task, requiring different and innovative approaches and item selection strategies (Ziegler, Kemper, & Krueger, 2014, p. 187). Multivariate statistical procedures provide an instrument construction alternative to traditional scale construction and meet the practitioners' easy-use criteria (Conti, 2002).

4. Methodology

This study created the Personality Identity Estimator (PIE), an easy-to-use inventory to estimate personality type that can be used at no cost by both professionals and non-professionals. PIE has 12 items, can be completed quickly, and is easy to score and interpret. PIE can be utilized for self-assessment to promote self-reflection and to identify individual differences. This section describes (a) the approach used for developing PIE; (b) the participants in the study; (c) the procedures used for creating the 12 items in PIE; and (d) the procedures used for establishing construct validity, content validity, criterion-related validity, and reliability for PIE.

4.1 Typological Approach

The inventory created for this study, the Personality Identity Estimator (PIE), utilizes a typological approach to identifying personality types. The research and measurement of personality have focused on two approaches: Typological vs. Dimensional. The dimensional approach is variable-centered because it focuses on understanding similarities and differences among variables. However, the typological approach focuses on people rather than variables (Robbins, John, & Caspi, 1997, p. 140). The typological approach is person-centered because it focuses on understanding similarities and differences among people (p. 140). It concentrates on the unique pattern of attributes within each person. More importantly, because the typological approach is helpful for practitioners such as clinical psychologists, counselors, and teachers at all levels and for personal use in self-analysis and reflection, the Personality Identity Estimator was established using the typological approach.

4.2 Participants

The validity and reliability of the Personality Identity Estimator (PIE) were established through numerous steps, and 1,104 participants provided information for this study. All respondents were volunteers. In compliance with APA ethical standards, they were informed of their rights as participants at each study stage. Overall, the sample consisted of 700 females (63.9%) and 391 males (35.7%) with 3 "other" and 2 preferring not to respond and 8 no response. The group's average age was 31.3, ranging from 14 to 90. The ethnic makeup of the group was as follows: White (66.9%), African American (16.6%), Hispanic (7.1%), Native American (6.2%), Asian (1%), and Other (2.2%). The educational level of the respondents varied as follows: Less than a high school diploma (25.8%), high school diploma (24.3%), vocational or educational certificate (6.7%), associate's degree (12.1%), bachelor's degree (13.8%), graduate degree (16.8%), and 6 (0.5%) who preferred not to respond. Participants' responses were used for developing and validating the Personality Identity Estimator (PIE) at each of the steps of (1) creating items for content validity, (2) establishing concurrent criterion-related validity by comparing PIE with the Myers-Briggs Type Indicator and by self-reporting on the accuracy of PIE, and (3) establishing reliability.

4.2.1 Item Construction and Content Validity

The items for PIE were constructed from the results of the analyses of responses to the Myers-Briggs Type Indicator (MBTI); all statistical analyses for this study were conducted with SPSS® 10.0 for Windows. Data were collected from 553 volunteers in Alberta, Montana, Nebraska, New Mexico, Oklahoma, and Texas. This data set was initially combined with other data to measure the relationship between learning strategies and personality types (Conti & McNeil, 2011).

Respondents provided information concerning their age, gender, ethnicity, and educational level and then completed the 94-item version of the MBTI (Form G Self-Scorable). The sample consisted of 321 females (58.2%) and 231 males (41.8%) with 1 no response. The group's average age was 30.8, ranging from 18 to 90. The ethnic makeup of the group was as follows: White (83.9%), Native American (6%), African American (4.9%), Hispanic (4.2%), and Other (1%). The educational level of the respondents varied as follows: Less than a high school diploma (0.7%), high school diploma (37%), vocational or educational certificate (11.5%), associate's degree (24%), bachelor's degree (12.9%), and graduate degree (13.8%).

4.2.2 Concurrent Criterion-Related Validity—Comparison to MBTI

One hundred seventy-four respondents completed both the Personality Identity Estimator and the Myers-Briggs Type Indicator. The 64% female and 36% male group had an average age of 20.9 years. Its racial composition was as follows: African American (42.4%), White (34.7%), Hispanic (12.9%), Asian (2.9%), Native American (2.4%), and Other (4.7%). The educational level of the respondents varied as follows: High school level (87%), bachelor's degree (3%), and graduate degree (10%).

4.2.3 Concurrent Criterion-Related Validity—Self-Report

Data were collected from 288 volunteers anonymously via an internet website. Respondents provided information concerning their age, gender, ethnicity, and educational level. The sample consisted of 219 females (76%), 62 males (21.5%), 3 others (1.1%), and 4 who did not to answer (1.4%). The average age of the group was 44.3 ranging from 15 to 78. The ethnic makeup of the group was as follows: White (65.1%), African American (12.6%), Native American (10.6%), Hispanic (9.2%), Asian (1.1%), and Other (1.4%). The educational level of the respondents varied as follows: High school level (36.6%), associate's/trade school degree (3.5%), bachelor's degree (26.4%), graduate degree (31.3%), and prefer not to say (2.2%). The sample contained all 16 personality types.

4.2.4 Reliability

PIE was administered to a group of 89 at a 1-week interval. The group was 59.8% female and 40.2% male, with an average age of 16.1 years. Its racial makeup was as follows: African American (51.7%), White (25.8%), Hispanic (11.3%), Asian (2.2%), Native American (1.1%), and Other (7.9%). All respondents were at the high school educational level.

5. Construct Validity

Construct validity assesses the underlying theory of the test, which measures hypothetical constructs that explain some aspect of human behavior. For PIE, these are the theoretical constructs of personality type conceptualized by Jung and extended by Myers and Briggs. Evidence for construct validity can be both logical and empirical analyses.

Establishing construct validity for the Personality Identity Estimator used logical evidence. The constructs used for constructing the Personality Identity Estimator were derived from the Myers-Briggs Type Indicator. Consequently, the construct validity of these items had already been established (Myers & McCaulley, 1985), and their validity did not have to be re-established. Therefore, construct validity was inferred to the PIE. Thus, the Personality Identity Estimator has construct validity due to using the Myers-Briggs Type Indicator to identify concepts for its items and for its development in establishing content validity.

6. Content Validity

For the Personality Identity Estimator, content validity concerns how the items represent the Jungian personality types depicted in the Myers-Briggs Type Indicator (MBTI). The MBTI is a summated-rating scale in which the Jungian concept of personality types groups people along four dimensions: Extraversion (E) and Introversion (I), Sensing (S) and iNtuition (N) ["N" is used instead of "I" to avoid confusion with the Introversion scale], Thinking (T) and Feeling (F), and Judging (J) and Perceiving (P). MBTI scoring is conducted by the individual completing the questionnaire and then being categorized into a personality type along each dimension. This classification is a 4-letter personality type such as ENTP with a letter from each dimension. In assigning a letter

to each dimension, the continuous values in each dimension change to a categorical label. The content validity analyses for PIE used both the individual items in the MBTI and the categories created by summing these items into dimensional classifications.

6.1 Discriminant Analysis

The concepts for the items for PIE were identified by the multivariate statistical procedure of discriminant analysis, with the MBTI representing the universe of ideas for Jungian personality types. Discriminant analysis is a multivariate statistical procedure for simultaneously examining the differences between groups using several discriminating variables. This procedure produces a structure matrix that shows the interactions within the analysis; the structure matrix can be used for naming the process which separates the groups. Consequently, the structure matrices from the discriminant analyses indicated the concepts for the items for inclusion in PIE.

A series of discriminant analyses were conducted to simultaneously examine all items in each dimension to determine the differences between the two groups. In these analyses, the discriminating variables were the individual MBTI items that make up the scales for each dimension. The participants were grouped according to their MBTI personality type on each dimension. Each structure matrix showed the correlation between the individual discriminating variables and the overall discriminant function. The variables with the highest coefficients revealed how closely the variable and the overall discriminant function were related. Interpreting the structure matrix distinguished the groups from each other. Consequently, by using the groups for each dimension as the grouping variable and by using the individual MBTI items for that dimension as the set of discriminating variables, each analysis produced a structure matrix that described the *process* that separated the two groups in each dimension (Conti, 1996, p. 71). The nine items with the highest structure matrix correlations for each discriminant analysis were used as the constructs to determine the wording of the items in PIE.

Complete MBTI data were available on 553 participants. The participants were grouped on one of the personality-type dimensions for each separate discriminant analysis. There were 94 discriminating variables from the MBTI. Each analysis used the Wilks' Lambda method to select the inclusion variables in the discriminant function.

The criterion for judging the usefulness of the discriminant function produced by the analysis was that it had to be at least 75% accurate in correctly classifying the participants. The 553 participants were grouped by their MBTI category for the dimension for each of the four discriminant analyses. The constructs from the nine most relevant items in the structure matrix of each discriminant analysis were used to describe the process that made up this dimension in PIE. Each analysis was either 94% or 95% accurate in discriminating between the groups in the dimension.

The discriminant analysis also provided additional information about each concept. An examination of the group means for each item in the selection reveals the *degree* to which each group supported the idea in the item. The mean for each group on the item indicated a range of support from extremely low to extremely high for the concept. Consequently, the PIE items have descriptors. As a result, the items in PIE precisely describe each personality type's general feeling toward the idea in the item. Thus, as well as identifying the constructs for PIE, the discriminant analyses also provided additional information about each concept.

6.2 Replication of Discriminant Analyses

The discriminant analysis results were verified by replication and by factor analysis. Replication was used as a criterion for cross-validating the accuracy of the discriminant analysis results in identifying the best concepts for the new inventory. Using a common method employed for cross-validation (Sheskin, 2007, p. 1541), replicated discriminant analyses were conducted by (a) randomly splitting the large sample of 553 into two subsamples of 267 and 286, (b) extracting structure matrices from each subsample for each of the four personality-type dimensions, and then (c) comparing the results from each subsample to the other subsample and to the previous results from the total sample. There were no significant differences between the subsamples on demographic variables: Gender ($\chi^2=1.35$, $df=1$, $p=.51$), Race ($\chi^2=3.74$, $df=1$, $p=.29$), Education ($\chi^2=5.59$, $df=5$, $p=.35$), and Age ($t=1.31$, $df=537$, $p=.19$).

As with the entire sample, discriminant analyses were conducted for each subsample for the four personality type dimensions. The composition of the structure matrices from each subsample and the total sample was very similar, with the subsample matrices generally replicating the total sample matrix. This replication is especially so for the top three items in each matrix. Thus, this similarity of structure matrices supports the accuracy of the discriminant analyses for the total sample in representing the sampling adequacy of the content for the items for the Personality Identity Estimator.

6.3 Factor Analysis

Factor analysis provided an additional check on the content validity of the items in PIE. To check the validity of the Myers-Briggs Type Indicator items in the sample, the 94 items from the instrument were factor analyzed using a principal components analysis with a varimax rotation. The principal components factor analysis confirmed that the item responses for the sample used for constructing PIE were nearly identical to the generally expected responses to the items.

Additional analyses assessed the similarity between the items identified for PIE by the discriminant analyses and those with high loadings in the factor analyses. Each dimension was examined separately. These separate factor analyses used only the dimensions' items, and the factors were limited to one. The nine highest factor loadings for this one factor were compared to the structure matrix of the discriminant analysis for this dimension. For each dimension, the factor loadings were congruent with the correlations in the structure matrix of the discriminant analyses.

While the factor loadings provide correlational information, the group means for the items in the structure matrix of the discriminant analysis indicate the intensity of support for the item. This support allowed the new item to include descriptors to reflect this magnitude of support, thereby increasing the content validity of PIE by allowing it to more accurately represent the actual universe of possible items for the constructs measured in it.

6.4 Correlation of Items

The analyses of the 94 items in the MBTI produced a set of 36 concepts to serve as the conceptual basis for forming PIE items. There were nine items in each of the four dimensions of personality type. Odd-numbered scales of 9, 7, 5, and 3 items for each of the 4 dimensions were constructed and analyzed to determine the most robust concepts for inclusion in the final PIE inventory. Each scale contained the items with the highest correlations in the structure matrix from the discriminant analyses. For each scale, each item was correlated with the total score for the scale. This procedure was used because each item is part of the overall concept. The item must contribute to the total score for it to be valid.

The standard for judging to retain an item for the final form of PIE was that it should explain at least its own weight in variance to the total score. The correlation coefficients for all items on all four scales were above the minimum required for retention in the scale. All items in the 3-item scale were markedly above the minimum, with nearly two-thirds of the items having a coefficient of .8. Therefore, the format of three items for each of the four dimensions of personality type was judged as the best for the final version of PIE. Thus, the Personality Identity Estimator consists of 12 items with 3 paired items for each of the 4 personality-type dimensions of Extraversion-Introversion, Sensing-Intuition, Thinking-Feeling, and Judging-Perceiving. Table 1 lists the items in each dimension (also see Appendix).

Table 1. Items in the Personality Identity Estimator (PIE)

Extraversion-Introversion Scale	
1a. I am almost always sociable	1b. I am usually restrained
2a. I am inclined to talk a great deal	2b. I am usually quiet
3a. I can generally talk freely with others	3b. I tend to talk mostly in intimate situations
Sensing-Intuition Scale	
4a. I want to be viewed as very down-to-earth	4b. I wish to be considered as very resourceful
5a. The word "actual" often appeals to me	5b. The word "theoretical" usually appeals to me
6a. I prefer to be with practical people	6b. I generally get along best with creative people
Thinking-Feeling Scale	
7a. Reasoning moderately appeals to me	7b. Being responsive to others strongly appeals to me
8a. Analyzing things appeals moderately to me	8b. Being compassionate strongly appeals to me
9a. Sound judgment is more important than enthusiasm	9b. Enthusiasm is much more important than sound judgment
Judging-Perceiving Scale	
10a. Planning is exceptionally appealing to me	10b. I like to improvise
11a. I tend to plan the timing and activities for a trip	11b. When going someplace, I prefer to be flexible
12a. I almost always like to plan things	12b. Following a schedule usually restricts me

6.5 Scoring PIE

6.5.1 How to Score PIE

The Personality Identity Estimator (PIE) is easy to score. The score or result for PIE consists of four letters. Each letter represents one of the four dimensions of the Jungian concept of personality types. Consequently, the four letters in the identified personality type are E (Extraversion) or I (Introversion), S (Sensing) or N (iNtuition), T (Thinking) or F (Feeling), and J (Judging) or P (Perceiving). This combination of four letters indicates the personality type estimated by PIE.

In the Personality Identity Estimator inventory, each dimension has three items with two options for each item (see Table 1). Each option in the item represents one of the dimensions. For example, Item 1 is one of the three items for the Extraversion-Introversion Scale with Item 1a representing Extraversion and Item 1b representing Introversion. The highest number of options selected for each binary choice in the dimension indicates the respondent's primary preference in that dimension. Thus, selecting two or three of the options indicates a preference in that dimension. A respondent's overall personality label is the dominant preference for each of the four dimensions (see Appendix).

6.5.2 Characteristics Associated with Personality Types

Characteristics are frequently associated with each personality type preference (Myers & McCaulley, 1985, pp. 20–21). While the characteristics associated with each personality type provide a general description of a person's preferences, individual differences still exist. These characteristics are firmly based on the theory associated with personality types and are supplemented by years of observations of the types and empirical results from research (Myers & McCaulley, 1985, p. 19). Each of the “four-letter type formulas stand for a complex set of dynamic relationships between the functions (S, N, T, and F), the attitudes (E and I), and the orientation to the outer world (J and P)” (p. 15). The characteristics associated with each personality type are described in tables and can be found in several sources (e.g., Myers & McCaulley, 1985, pp. 20–21; Shetty, 2014, pp. 47–48).

6.5.3 Identifying One's *Superior* Function

PIE estimates a person's superior personality function. With two options for each dimension, there is a 50% chance that a person will be placed in either group simply by random chance when there are two groups. Since there are three items in each dimension in PIE, selecting two of the three preferences indicates a two-thirds or 66.6% preference. Selecting all three options for the dimension indicates a 100% preference.

These percentages of preference alleviate the concern that a mere change of one response can switch a person's personality classification in a dimension. Instead, the potential swing item confirms the correct type. While two of the items may have different responses, the third item ensures which of the two items correctly identifies the person's dominant personality trait. Likewise, suppose two of the three items in a PIE dimension are in opposite directions. In that case, the third item will correctly determine which of these two items is the most fully-developed or *superior* function and which is the less-developed or *inferior* function. Thus, while there are only a small number of items for each dimension, each option selected indicates a considerable improvement over chance placement and the increased probability of correctly identifying the respondent's dominant personality type. As a result, PIE can be scored quickly, and its results are also accurate.

7. Criterion-Related Validity

Criterion-related validity compares an instrument's scores with an external relevant criterion variable. This comparison is a more complicated procedure with an instrument like PIE developed with a multivariate process because the items used to create the new instrument were scored in a univariate format on the original instrument (Conti, 2009, p. 892).

Two separate procedures assessed the criterion-related validity of PIE to overcome this complexity. First, the Personality Identity Estimator responses were compared to those on the Myers-Briggs Type Indicator to establish concurrent criterion-related validity. Second, the participants self-reported the accuracy of the PIE placement for them after reading a description of characteristics associated with the personality type group in which PIE placed them. This self-report provided a check between the response on PIE and the criterion of the real-world of the respondent.

7.1 Comparison of PIE and MBTI

One hundred seventy-four respondents completed both the Personality Identity Estimator and the Myers-Briggs Type Indicator. Responses on PIE were scored and compared to the dimension preferences on the MBTI. The

chi-square test of independence assessed the association between the answers on the Personality Identity Estimator and the Myers-Briggs Type Indicator. Chi-square assesses the statistical independence or association between two or more categorical variables by comparing how the pattern of observed frequencies differs from the pattern of expected frequencies. The personality-type labeling results are categorical both for PIE and for MBTI; therefore, chi-square allowed testing for the relationship between PIE and the external criterion of the MBTI.

A separate chi-square for each of the four dimensions examined the relationship between the responses on PIE and the MBTI. Based upon a significance level of $\alpha=0.05$, significant differences were found for each of the four dimensions: E-I ($\chi^2=86.7$, $df=1$, $p=.001$), S-N ($\chi^2=40.4$, $df=1$, $p=.001$), T-F ($\chi^2=29.2$, $df=1$, $p=.001$), and J-P ($\chi^2=63.1$, $df=1$, $p=.001$). These values strongly support (a) rejecting the null hypothesis that the responses on PIE and the MBTI are independent (not related) and (b) accepting the alternative hypothesis that there is a relationship between the responses on each instrument. This confirmation that PIE and the MBTI are associated with (i.e., dependent upon) each other indicates the criterion validity of PIE. In addition, the residuals from the analyses further verified the strength of the association between PIE and the MBTI: E-I (9.3), S-N (6.4), T-F (5.4), and J-P (7.9). Standardized residuals as high as three or four indicate that extreme associations exist. The exceedingly high standardized residuals indicate a robust association between PIE and its criterion-related MBTI. Consequently, the significant chi-square values supported by extremely high standardized residuals demonstrate the concurrent criterion-related validity of PIE.

7.2 Self-Report

The second criterion-related validity check involved comparing the results from PIE with the criterion of the perception of the real-world of the respondent (cf. Conti, 2009, p. 892). One of the chief purposes of instruments such as PIE is to stimulate the user's thinking about how they perceive the learning situation and their awareness of the learning process (Shetty, 2014, p. 8). Therefore, to foster this process and to check on the validity of PIE, the participants were asked to provide feedback on how accurately they felt that the general characteristics of the personality-type group estimated for them by PIE were in describing them.

After completing PIE and reading the description of the characteristics associated with the personality type based on their PIE responses, the participants reported how accurately they felt this description described them. The participants overwhelmingly felt that the personality characteristics estimated for them by the Personality Identity Estimator accurately described them; 95.5% thought that the description was accurate, while only 4.5% felt it was not. Consequently, this high degree of acceptance of the accuracy of PIE in describing a person suggests that PIE can be helpful in counseling, instructional, and self-analysis situations.

Thus, because of the multivariate procedure used for creating PIE, criterion-related validity was assessed in two different ways. The strong association between personality-type group placement by PIE and the MBTI and the powerful testimony by respondents of the accuracy of the personality-type characteristics estimated by PIE demonstrated the concurrent criterion-related validity of PIE.

8. Reliability

The reliability of PIE was established by the test-retest method that addresses the degree to which scores on the same test are consistent over time. Reliability information is often reported as a correlation coefficient. Past MBTI reliability studies have used the instrument's continuous scores to calculate reliability coefficients. However, correlation coefficients could not be used for PIE because its scores are categorical for each of the four dimensions. Therefore, chi-square was used to establish the reliability of the PIE.

The chi-square test of independence was used to assess the association between the first responses on the Personality Identity Estimator and the retest responses one week later. Separate chi-squares were calculated for each of the four dimensions to compare the responses for each testing: Extraversion-Introversion (E-I), Sensing-iNtuition (S-N), Thinking-Feeling (T-F), and Judging-Perceiving (J-P). Based upon a significance level of $\alpha=0.05$, significant differences were found for each of the four dimensions: E-I ($\chi^2=28.7$, $df=1$, $p=.001$), S-N ($\chi^2=16$, $df=1$, $p=.001$), T-F ($\chi^2=23.4$, $df=1$, $p=.001$), and J-P ($\chi^2=8.4$, $df=1$, $p=.004$). These findings confirm that both the test and retest are associated (i.e., dependent) with each other. Thereby, they support rejecting the null hypothesis that the responses on the first test and the responses on the retest are independent (not related) and support accepting the alternative hypothesis that there is a relationship between the first test and the retest. All of the standardized residuals for the chi-square analyses indicated a robust significant association: E-I (5.4), S-N (4), T-F (4.8), and J-P (2.9). Thus, the chi-square values and supporting standardized residuals confirm the reliability of the Personality Identity Estimator.

9. Implications for Practice

Educational practitioners are constantly looking for good and practical tools that they can use to improve their efficiency and effectiveness with students. To do this, they need inexpensive and easy-to-use tools and ones that are valid and reliable. The Personality Identity Estimator meets these criteria. Consequently, like other instruments based on Jung's theory, PIE can be an inventory for immediate use by professionals and individuals in educational roles.

9.1 Addressing Individual Differences

PIE can be used as a tool to facilitate students' interpersonal understanding and communication. Personality-type inventories address why we think and act the way we do (Thompson, 2016). Consequently, interpersonal understanding for the student can include Gardner's (1983) Multiple Intelligences of Interpersonal Intelligence, which deals with perceiving the moods and emotions of others (pp. 237–276), and of Intrapersonal Intelligence, which involves having a positive self-concept and having competency in knowing oneself (pp. 237–276). Educators can facilitate enhanced interpersonal and intrapersonal awareness for the student by using PIE. Like other inventories that build self-awareness into their conceptual base (e.g., Conti, 2009), PIE can be a valuable tool for objectively making students aware of their interpersonal and intrapersonal preferences. This awareness can help direct them in modifying their learning patterns.

Students can use PIE to depersonalize their feelings and self-concept by giving them an external, objective, and standardized measure against which to analyze and evaluate their personal preferences and behaviors rather than considering them personal, individualized, or personally unique. Consequently, students can have standards and criteria for assessing their current behaviors and for planning future behaviors. These things can allow them to objectively reflect upon their beliefs and behaviors rather than harboring potential feelings of guilt and inadequacies.

This depersonalization process exemplifies how PIE can also be an effective device for improving communication. Depersonalization refocuses the discussion from belonging to a particular person or dealing with personal feelings. Instead, the issue under discussion can be linked to the characteristics frequently associated with each personality type. Thus, the discussion can be framed in terms of the personality-type elements instead of the other person's actions. This reframing could stimulate a values-free conversation instead of a personal defense of oneself or an attack on another person. Such an approach supports open communication and honest dialogue, promoting compromise and seeking common ground. Thus, it becomes a means to express thoughts, feelings, or information efficiently or effectively.

Using PIE to depersonalize thoughts, feelings, or emotions can also improve communications by providing a means of sending or receiving information. For example, teachers and students can use the characteristics of each personality type as a way of "communicating" about things. Instead of the student taking thoughts, feelings, or emotions "personally," these can be off-loaded onto the personality-type label. These elements can then be discussed, analyzed, and critiqued objectively. Such a non-threatening atmosphere can significantly facilitate and enhance communication.

PIE can also improve communication by assisting in the sharing or exchanging of information or ideas and by helping to pass on, transmit, or convey emotions, feelings, and thoughts. For example, students could recognize traits associated with another person's personality type and use these as a discussion point. Students and teachers could also do "what-if" situations. That is, "What if I was an ISTJ? How would I react in this situation?" This could then continue into "What will it take for me to move from an ISTJ to an ESTP in situations like this?" Communication could also be practiced by having students recognize traits associated with the other personality types and then discussing various possible behaviors. These activities can help students better and more critically analyze their behaviors and provide them with tools and information for better interacting with others. Sharing the results of a value-neutral inventory such as PIE can encourage "people to open up to each other about a universe of differences in how we think and communicate" (Thompson, 2016, para. 14).

Thus, using personality-type information with PIE can provide an established and objective standard against which students and educators can judge student behavior. Personality-type categories can be the standard against which students and educators define, describe, and explain student behavior. The student's behavior needs to be clearly defined to bring about change in the student. Once objectively defined, adaptation can be directed at either remediating behaviors or developing areas of challenge. The student can use this information to reinforce and further develop areas of strength. The personality-type characteristics can provide the template for describing and evaluating behavior with all of these. It thus can function as the tool to facilitate communication between students and educators and among various students and as the practical and consistent standard for

exploring individual differences among students.

9.2 Increasing Self-Awareness

Because personality-type inventories address why we think and act the way we do, they can facilitate self-awareness. This awareness of one's own thinking patterns can help a learner become self-directed and self-regulated (Shetty, 2014, p. 1). In this process, PIE can be used to quickly and objectively make students aware of their preferences. This knowledge can then assist students in developing, regulating, and monitoring their learning patterns related to their potential success and satisfaction with various settings and environments.

This emphasis on personality type by using PIE can also send potent indirect messages to students. One of the most powerful is that they are respected as individuals. This is analogous to "when students say they love school, they also say that people in their schools care" (Rogers, 1994, p. 266). This respect has the positive benefit of dramatically increasing the individual's sense of self-worth. This can then stimulate increased motivation for learning because the students have moved to a "more self-reliant and self-directed participation" (Rogers, 1969, p. 341). Accordingly, learning is not purely a behavioral change; instead, it is an internal process that is a pervasive state of being that is not always visible to the eye (Kittredge, 1998, pp. 21–22).

This approach develops metacognitive skills that support awareness, high-level thinking or critical thinking, and it encourages meaningful learning (Ozturk, 2021, p. 55). With tools such as PIE and the insights gained from them, teachers will be better able to help students make thoughtful personal choices. Together with the student's increased self-awareness gained through the reflecting on their personality characteristics indicated by PIE, teachers can efficiently use PIE's information to help individuals make day-to-day choices and to develop more personalized learning plans for their students.

9.3 PIE as an Interactive Instructional Tool

A significant feature of PIE is that it can be used as an instructional tool. In most test situations, a student is an object. The student is acted upon with the test administration and then receives and must react to the results. However, the student is an active partner in a potentially dynamic and interactive instructional episode with PIE.

PIE is a single page with non-threatening items (see Appendix). It is simple to administer, and the student can complete it quickly. Significantly, the student can easily take part in scoring PIE. Instead of being an object receiving test results, the student can be an active and mutual partner by adding up the number of responses in each column for each of PIE's four sections and then transferring those totals to the scoring portion of the test page. In this way, students can actively see their unique personality type revealed before their very eyes and due to their own tallying. This active participation can further personalize and give ownership to their results.

Throughout this entire scoring process, the educator and the student can engage in a dynamic discussion concerning the items and scoring. The educator can probe the student for reasons for choosing one option over the other for an item. Indeed, the items and the choices could serve as a proxy interview schedule related to the student's preferences. Once the scores are totaled, the educator could quiz the student about the choices for items that did not agree with the other selections in the section. These discussions could indicate the depth of the student's feelings in each inventory dimension and the strength of the student's *superior* personality type for each dimension.

Used in this interactive way, PIE could be utilized as an instructional tool to identify the student's individual differences and to explore these differences. PIE is an objective inventory to estimate personality type. Still, it can also be the catalyst for a profound discussion about the identified type's meaning and impact.

Thus, instead of being employed only for identifying personality types, PIE can be the organizer for instructional sessions to explore and develop trust and stimulate the student's self-awareness. This process can convey a feeling to the students that they are prized for their feelings and opinions and as a person (Rogers, 1969, p. 109); "it is an acceptance of this other individual as a separate person, having worth in his [or her] own right" (p. 109). Moreover, this fundamental trust that is developed through this interactive process can create a climate that fosters "how deeply appreciative students feel when they are simply *understood*—not evaluated, nor judged, simply understood from their *own* point of view, not the teacher's" (p. 112).

Students can benefit in many ways from knowing and understanding their own personality characteristics. This understanding can support the student's personal development by furthering awareness of their own motivations and of how to best interact with others. This knowledge can point out the student's strengths and challenges and clarify how to use and adjust to them. Collectively, this knowledge and understanding can assist students in better accepting and appreciating themselves. Significantly, all of this can be done with PIE at no financial cost.

9.4 Constraint on Generality

One crucial caveat relates to PIE: The Personality Identity Estimator (PIE) is not a replacement for the Myers-Briggs Type Indicator (MBTI). The MBTI is a complex instrument containing continuous scores and categorical placement to indicate personality type. It has an expansive array of analysis options. It is supported by a large corporate structure and a significant body of literature related to its validity, reliability, and use. Suppose a detailed and extensive analysis of personality type is desired. In that case, the MBTI has a long track record of being an effective instrument for this purpose.

10. Conclusion

This study aimed to develop a short inventory to identify personality types based on the 4 personality-type dimensions in Jungian theory and to provide evidence of its validity and reliability. This was achieved by employing several multivariate and univariate statistical procedures using data from administering the Myers-Briggs Type Indicator to a large, diverse sample of adults in real-life settings to develop the items and then employing criterion-related testing and test-retest reliability testing that included both statistical analyses and self-reports with other adults. The new inventory was named the Personality Identity Estimator (PIE).

These analyses provide evidence for the psychometric soundness of the Personality Identity Estimator. Consequently, it can be concluded that the Personality Identity Estimator (PIE) is a valid and reliable inventory for estimating a person's personality type. The Personality Identity Estimator is an easy-to-use, categorical inventory that practitioners can use in various settings to estimate personality types following Jung's concept of personality types. PIE can be completed quickly and scored and interpreted easily. PIE is valid in identifying Jung's conceptualization of personality types and is consistent over repeated administrations.

Because PIE is valid and reliable, teachers and other educational professionals and practitioners, ranging from early childhood through college and extending to adult education, and individuals can use it confidently and at no charge. **Permission is granted to use the Personality Identity Estimator (PIE) in practice and research.** Thus, the Personality Identity Estimator provides a valuable inventory that can be another handy tool for identifying personality types and for initiating and facilitating self-awareness activities with learners.

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Appendix

Printable Copy of the Personality Identity Estimator (PIE)

The following page contains a copy of the Personality Identity Estimator (PIE). **Permission is granted to use the Personality Identity Estimator (PIE) in practice and research.** Therefore, you may print PIE and use PIE with no charge. Additional research tools for use with PIE and a self-scoring online version of PIE are available at <http://Conti-creations.com/PIE.htm>



“As we enjoy the advantages from the inventions of others, we should be glad of an opportunity to serve others by any invention* of ours; and this we should do freely and generously” (p. 130). —Benjamin Franklin (2015), *The Autobiography of Benjamin Franklin*, Chartwell Books, New York, NY.

*Instead of “invention”, educators can substitute “scholarship/research”



Personality Identity Estimator (PIE)

Directions: Select one phrase that you feel most applies to you from each pair of phrases that are connected by dots (...or...). Put a check mark in the box for the phrase you select. Then go on to the next pair of phrases. Count the total number of checks in each column before going to the next section.

E-I Scale

I am almost always sociable ...or... I am usually restrained

I am inclined to talk a great deal ...or... I am usually quiet

I can generally talk freely with others ...or... I tend to talk mostly in intimate situations

Total No. of checks in this column (E Scale) **Total No. of checks in this column (I Scale)**

S-N Scale

I want to be viewed as very down-to-earth ...or... I wish to be considered as very resourceful

The word "actual" often appeals to me ...or... The word "theoretical" usually appeals to me

I prefer to be with practical people ...or... I generally get along best with creative people

Total No. of checks in this column (S Scale) **Total No. of checks in this column (N Scale)**

T-F Scale

Reasoning moderately appeals to me ...or... Being responsive to others strongly appeals to me

Analyzing things appeals moderately to me ...or... Being compassionate strongly appeals to me

Sound judgment is more important than enthusiasm ...or... Enthusiasm is much more important than sound judgment

Total No. of checks in this column (T Scale) **Total No. of checks in this column (F Scale)**

J-P Scale

Planning is exceptionally appealing to me ...or... I like to improvise

I tend to plan the timing and activities for a trip ...or... When going someplace, I prefer to be flexible

I almost always like to plan things ...or... Following a schedule usually restricts me

Total No. of checks in this column (J Scale) **Total No. of checks in this column (P Scale)**

Determine Your Personality Type Group

1. Circle the letter of your **highest** total number of checks for each scale.

<i>E-I Scale:</i> E or I	<i>S-N Scale:</i> S or N	<i>T-F Scale:</i> T or F	<i>J-P Scale:</i> J or P
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2. Copy the four letters that you circled above to the four blank lines below.

Your personality type group is:

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