

Creative Problem Solving Styles and Personality Types in Macau College Students: A Canonical Correlation Analysis

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Abstract

Within the existing creativity-training programs, the Creative Problem Solving (CPS) model may be the most effective tool for facilitating individual creativity. Among various factors that influence individuals' creative performance, personality is widely considered one of most important factors. By far the most popular measure of personality types is the MBTI; unsurprisingly, the relationship between the MBTI and creativity has been extensively studied. However, relatively little research has touched on the relation between personality types and CPS. The purpose of this study was to use the KTS II as its instrument for measuring personality types, and FourSight as its instrument for measuring CPS styles. In our Macau business undergraduates, canonical correlation analysis shows that a link exists between personality types and CPS styles, and that this link is not gender-dependent. However, the variable *thinking* is the only valid and influential predictor of the canonical function. It is apparent that more empirical investigations are needed to confirm our findings.

Keywords: Creative problem solving styles, Personality, Canonical correlation analysis, Business students, Macau

1. Introduction

Creativity is an important type of capital for individual, organizational, and social development (Tsai, 2012), and students of creativity believe that it can be enhanced through appropriate teaching and training (Tsai, 2013a). Beginning with Torrance (1972), a number of review articles and meta-analytic studies focusing on existing creativity-training programs have suggested that the Creative Problem Solving (CPS) model is the most effective tool for facilitating individual creativity. Rose and Lin (1984) carried out a meta-analytic assessment of creativity-training programs and concluded that CPS-based program had the most substantial positive effect on creative thinking. After reviewing 156 creativity-training programs, Scott, Leritz, and Mumford (2004) found that training programs that featured a cognitive approach, such as CPS, were the most effective. In short, it seems that CPS has earned its reputation as the basis of reliable and effective creativity programs.

Among various factors that influence individuals' creative performance, personality is widely considered one of most important (Barron & Harrington, 1981; Batey, & Furnham, 2006). In particular, personality profiles associated with highly creative people have been a hot topic, within which investigations have mainly focused on the differences between non-creatives and highly creative achievers. After reviewing the relevant personality literature, James and Asmus (2001) suggested that a certain cluster of personality was associated with creativity: independence, introversion, high energy, tolerance for ambiguity, willingness to take risks, and open-mindedness. In addition, Feist's (1998) meta-analysis of personality in the creativity literature found the largest effect sizes with openness, conscientiousness, self-acceptance, hostility, and impulsivity. However, he also found that creative people in art and science did not share the same personality profiles: with artists being distinguished more by their emotional instability, coldness, and rejection of group norms than scientists are (pp. 299-300).

2. Creative Problem Solving

Based on the CPS framework, Puccio (2002) developed a measure called FourSight to assess people's mental orientation toward creative problem solving processes. It divides respondents into four preferences: Clarifiers (who focus on problem clarification), Ideators (who focus on idea generation), Developers (who focus on solution development), and Implementers (who focus on taking action).

Puccio (2002) compared FourSight against the Myers-Briggs Type Indicator (MBTI; Myers & McCaulley, 1985). He found that his Ideator type was positively and significantly correlated with both the MBTI's Sensing-Intuition dimension ($r = .68$) and with its Judging-Perceiving dimension ($r = .33$), while his Clarifier and Developer types were both negatively and significantly correlated with the MBTI's Judging-Perceiving dimension ($r = -.52$ and $r = -.54$, respectively).

Puccio, Wheeler, and Cassandro (2004) then used FourSight to evaluate participants' reactions to specific elements of CPS training with the specific aim of discovering the extent to which people's cognitive-style preferences were related to such training. The results of

regression analysis revealed that individuals with different process preferences usually had opposite reactions to the same aspect of CPS. For example, high Clarifiers enjoyed the gathering-data stage of CPS but did not enjoy its plan-for-action step, which high Ideators did have strong preferences to future for. Such results may indicate that learners with different process preferences could have different attitudes toward interaction with the same CPS-based creativity-training material.

3. Jung's Theory of Personality Types

Jung's theory of personality types has been widely used in psychology (Isaksen, Lauer, & Wilson, 2003; Pittenger, 1993). For Jung (1971) human behaviors were innate and could be classified according to preferences for extroversion vs. introversion; feeling vs. thinking; intuition vs. sensing; and perceiving vs. judging. It was based on his framework that Myers and McCaulley (1985) developed the MBTI, which has gone on to become the English-speaking world's most popular personality measure. The MBTI uses the following six personality types to describe preferences for mental processes: (a) Extroversion or Introversion (EI) refers to a person's preference for focusing on the outer-objective world or the inner-subjective one; (b) Feeling or Thinking (FT), to the preference for personal values and compassion as opposed to logic and reasoning when making decisions; (c) Intuition or Sensing (IS), to whether data is received from the subconscious/insights or from the five senses; and (d) Perceiving or Judging (PJ), to whether one prefers a flexible and spontaneous approach to life, or a planned and organized one.

Another similar measure is the Keirsey Temperament Sorter (KTS II; Keirsey, 1998), which is viewed as an alternative to the MBTI (Cheng, Kim, & Hull, 2010) with the advantages of quicker and easier scoring, shorter administration time (about 15 minutes), and lower cost. Several studies have confirmed the usefulness of the KTS II as a personality indicator (Russo, Mertins, & Ray, 2013; Varlami & Bayne, 2007). There is an online version of the KTS II that is available in many different languages (<http://www.keirsey.com/sorter/register.aspx>).

Several studies have found that the four dimensions of personality as measured by the MBTI are closely related to creativity (Houtz & Krug, 1995; Isaksen et al., 2003; Myers & McCaulley, 1985). However, using path analyses, Houtz et al. (2003) found that only the MBTI's intuitiveness dimension exhibited a clear causal link with creative self-perception on a par with that of the Adaption-Innovation Inventory (KAI; Kirton, 1976). Another study (Dollinger, Palaskonis, & Pearson, 2004) also suggested that intuition was the only valid predictor for the results of three other creativity tests: the Creative Personality Scale (Gough, 1979), the Creative Behavior Inventory (Hocevar, 1980), and the Test of Creative Thinking-Drawing Production (Jellen & Urban, 1986). In addition, Dollinger et al. found that the MBTI's judging-perceiving dimension added nothing to the prediction model, while its thinking-feeling dimension seemed to act as a suppressor variable. In summary, it seems that more research on the casual links between personality and creativity is needed, and that using the KTS II as an alternative personality measure may be a useful direction for such further investigation.

4. Purpose and Research Questions

By far the most popular measure of personality types is the MBTI; unsurprisingly, the relationship between the MBTI and creativity has been extensively studied. However, relatively little research has touched on the relation between personality types and CPS. More specifically, research regarding KTS II and FourSight is very limited. Therefore, the present study uses the KTS II as its instrument for measuring personality types, and FourSight as its instrument for measuring CPS styles. Additionally, despite recent findings that gender seems to play some role in creative performance (Tsai, 2013b), research on KTS II and FourSight performance by gender is sparse. As such, the purposes of the current study are twofold: to examine the relationship between CPS styles and personality types, and to evaluate the possible impact of gender on this relationship, by addressing the following questions:

- 1). Are there gender-related differences between the Clarifier, Ideator, Developer, and Implementer types on FourSight, and/or gender-related differences between the Extroversion, Feeling, Intuition, and Perceiving dimensions on the KTS II?
- 2). Are there relationships between the four above-mentioned types on FourSight and four above-mentioned dimensions on the KTS II?

5. Methods

5.1 Participants

A total of 94 undergraduate business students from one university in Macau participated in this study. Their ages ranged from 18-24 years ($M = 20.66$; $SD = 1.01$), and 59 of them (62.8%) were female.

5.2 Instruments

5.2.1 KTS II

The KTS II (Keirsey, 1998) is a 70-item self-administered forced-choice-format questionnaire that categorizes individuals' personality types according to four dimensions: Extraversion/Introversion (E-I), Sensing/Intuitive (S-I), Thinking/Feeling (T-F), and Judging/Perceiving (J-P). Kelly and Jugovic (2001) reported concurrent validity between MBTI and KTS II as ranging from .60 to .78. Dodd and Bayne (2007) reported adequate reliabilities of the KTS II, .78 for E-I, .79 for S-N, .70 for T-F and .73 for J-P.

5.2.2 FourSight

Puccio (1999) initially developed the FourSight. The present study used the current version of FourSight 6.1 (Puccio, 2002), which is intended to identify four types linked to key elements of the creative process: *clarifier*, referring to problem identification, based on a merging of data-finding and problem-finding responses; *ideator*, referring to idea generation, a combination of mess-finding and idea-finding items; *developer*, referring to solution development, combining responses related to solution-finding and the planning aspect of acceptance-finding; and *implementer*, covering the taking-action aspect of acceptance-finding.

FourSight 6.1 contains 36 items, each of which is a self-descriptive statement designed to reflect one of four mental operations linked to the creative process, with each of the four dimensions of the creative process being represented by nine items. It asks people to evaluate their CPS style on five-point scale, from 1 (“not like me at all”) to 5 (“very much like me”). Puccio (2002) reported Cronbach alpha coefficients for this version of FourSight as follows: clarifier = .78; ideator = .81; developer = .79; and implementer = .81. The evidence of construct validity can be found in Puccio (2002) and Lien Ding’s (2013) study.

5.3 Procedures

We first asked the respondents to provide their demographic information: age, gender, and age. The respondents took about 20 minutes in total to complete the KTS II and FourSight. All respondents participated voluntarily, and their rights of confidentiality and anonymity were made clear at the beginning of the session.

6. Results

6.1 Gender Differences in Creative Problem Solving Styles and Personality Types

Independent T tests were employed to determine possible gender differences across four CPS styles and four personality types. Table 1 shows that there were no significant differences between male and female students in either category.

Table 1. Gender differences between personality types and creative problem solving styles

Measure	Male		Female		<i>df</i>	<i>t</i>	<i>p</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
Clarifier	3.71	.68	3.59	.49	92	1.03	.308
Ideator	3.69	.68	3.65	.48	54	.30	.769
Developer	3.77	.70	3.58	.07	92	1.52	.133
Implementer	3.70	.65	3.60	.49	92	.81	.416
E-I	7.11	1.39	6.91	1.34	92	.69	.494
S-N	13	2.18	12.54	1.79	92	1.10	.273
T-F	12.86	2.28	12.69	1.82	92	.38	.710
J-P	13.09	2.38	12.47	2.07	92	1.31	.194

6.2 Canonical Correlation Analysis

Canonical correlation is used to measure the linear relationship between two sets of variables. For the current study, eight personality types (E, I, S, N, T, F, J, P) were treated as independent variables, and four CPS styles (clarifier, ideator, developer, implementer) as dependent variables. Our first statistical significance test was for the canonical correlations of each of the two canonical functions. This yielded values for Wilks’ lambda of $p = .057$, Pillai’s criterion of $p = .060$, and Hotelling’s trace of $p = .054$, indicating that overall model fit was acceptable. We found that of the four possible roots, only the first was significant at margin, with Wilks’ lambda $F(16, 263) = 1.65$, $p = .057$. In addition, the first canonical correlation coefficient was .413, with an eigenvalue of .205, and explaining 65.67% of the

variance. As a result, only the first canonical variate will be further discussed.

Table 2 presents standard coefficients and correlations between observed variables for the first canonical function. In the first dependent variate, the two strongest influences on the first root were the variables developer (1.11) and clarifier (.60), whereas the weakest influence was from the implementer variable (.01). In the first independent variate, the strongest influence on the first root was variable T (thinking; .92), while variable E (extraversion) had a negative value (-.15). Looking at the dependent variables' correlations, we can see that two dependent variables (clarifier and developer) exhibited high correlations with the independent canonical variate, of .70 and .83, respectively. This reflects the high degree of shared variance between these two variables. By squaring these terms, we find that 49% of the variance in clarifiers and 69% of variance in developers was explained by function 1. Regarding the independent variables, we found that variable T had the highest correlation with the dependent canonical variate (.98). This information suggests that approximately 96% of the variance in T was explained by the dependent variate. Four of the independent variables (E, S, T, J) had a positive, direct relationship with dependent variables, whereas the other four (I, N, F, P) had a negative relationship with them.

Table 2. Correlations and standardized canonical coefficients between personality types and creative problem solving styles

Variable	Correlation	Standardized canonical coefficient
Independent variables		
E	.04	-.15
I	-.04	.00
S	.52	.12
N	-.52	.00
T	.98	.92
F	-.98	.00
J	.57	.07
P	-.57	.00
Dependent variables		
Clarifier	.70	.60
Ideator	.35	-.99
Developer	.83	1.11
Implementer	.55	.01

7. Discussion

The results of independent t testing indicate that there was no significant gender difference in personality types or CPS styles. However, in our sample as a whole, male students had higher means than female ones on personality types. We found the same pattern with CPS styles.

Canonical correlation analysis provides the researcher with insights into the structure of different variable sets as they relate to a dependence relationship. The current research used

this type of analysis because it can identify dimensions among the dependent and independent variable sets and maximize the relationship between these dimensions. Our results indicate that only a single relationship exists, with the second canonical function characterized by a lack of statistical significance and low practical significance. In examining this single relationship, we found that two dependent variables (clarifier and developer) were quite closely related. However, the outcome dimension (i.e., CPS style) was not particularly well predicted by the independent variables acting as a set. When interpreting the independent variate, we can see that only one variable, T (thinking) provided substantive contributions, and was thus the key predictor of the outcome dimension. This finding suggests that thinking is an important factor in individuals' CPS styles, which is reasonable because logical thinking is an important ingredient in the CPS model (Treffinger & Isaksen, 2005). However, the reason that the current study did not find other personality traits (e.g., judging or intuition) to be key factors in CPS is unknown. To our knowledge, no other study has examined personality types and CPS styles using KTS II and FourSight, respectively, and this is certainly the first study to use canonical correlation analysis to investigate this relationship. It is clear that more studies are needed to clarify the relationship between individuals' personality types and their CPS styles.

8. Limitations

Although our study relied on a highly regarded standardized tool for measuring individuals' CPS styles, this paper-and-pencil measure could not reflect the respondents' CPS abilities in the real world. Therefore, a follow-up longitudinal study on CPS ability in real life could reveal a clearer picture of how people's personality traits relate to their CPS abilities. Additional measure should probably also be used in future research to identify and validate the mechanism(s) underlying the link between personality traits and CPS. Finally, our study only focused on one ethnic group from one institution, and it would be beneficial to recruit more diverse groups of research subjects to test the generalizability of this link.

9. Conclusion

In our young Macau adult sample, canonical correlation analysis shows that a link exists between personality types and CPS styles, and that this link is not gender-dependent. However, the variable *thinking* is the only valid and influential predictor of the canonical function. It is apparent that more empirical investigations are needed to confirm our findings.

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