Personality and creativity in realistic, investigative, artistic, social, and enterprising college majors

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Abstract

Despite much research on how interests are related to personality and creativity, comparatively little work has focused on how different college majors as categorized by the RIASEC model compare on these constructs. In this study, 3295 college students (207 Realistic, 1945 Investigative, 447 Artistic, 480 Social, and 216 Enterprising) completed a five-factor personality measure, a brief self-report of creativity, and the Compound Remote Associates Task (CRAT). Investigative and Artistic majors scored higher on openness and self-assessed creativity than Realistic and Social majors, and Investigative majors were much more agreeable than other majors.

1. Introduction

Perhaps one of the most basic psychological questions is, “What are different kinds of people like?” Personality research, traditionally using a Big Five model (agreeableness, conscientiousness, extraversion, emotional stability, and openness; Goldberg, 1992), has addressed thousands of these queries. People who enjoy parties can be called extraverts, whereas people who are friendly can be called agreeable. Moving further, there are basic conclusions that have been consistently reached. Creative people are more likely to be open (King, McKee, & Broyles, 1996). Conscientious people are more likely to succeed at work (Schmidt & Hunter, 1998) and in school (Busato, Prins, Elshout, & Hamaker, 2000).

Similarly, many scholars have articulated different categories of people’s interests. Holland’s (1959, 1997) theory of vocational choice is the most prevalent. The RIASEC (realistic, investigative, artistic, social, enterprising, and conventional) model has inspired both research and interest inventories used for career guidance. Many argue (including Holland, 1999) that the RIASEC model strongly incorporates personality, yet there have also been many studies that have placed Holland’s theory within other personality frameworks.

Costa, McCrae, and Holland (1984) found that people with investigative and artistic interests were higher in openness and those with social and enterprising interests were higher in extraversion. Armstrong and Anthony (2009) looked at the facets of the Big Five model (i.e., smaller subscales). Some facets of openness were very closely tied to artistic interests (adventurousness and imagination), yet others were equally linked with other interests (intellect and liberalism lie between artistic and investigative; emotionality is associated with social). Larson, Rottinghaus, and Borgen (2002) conducted a meta-analysis between the Big Five and the RIASEC model and found both predicted connections (particularly openness being linked with artistic and investigative and extraversion linked with social and enterprising) and less expected relationships (people with enterprising interests were more conscientious and emotionally stable).

The RIASEC model has also been applied to creativity. Holland, Johnston, Hughen, and Asama (1991) hypothesized the interests most related to creativity would be, in order from most to least, artistic, investigative, social, enterprising, realistic, and conventional. Indeed, artistic interests have been found to correlate with self-reported creative behaviors (Kelly & Kneipp, 2009) and creative thinking styles (Zhang & Fan, 2007). Perrine and Brodersen (2005) found that artistic interests predicted artistic creativity and investigative interests predicted scientific creativity.

Strikingly little work has looked at how personality, creativity, and interests are intertwined. Helson (1996), for example, reviewed many studies broadly that generally support the hypotheses of Holland et al. (1991). Yet the personality data discussed did not use a Big Five (or comparable) model. Perrine and Brodersen (2005) also examined personality – but only the openness factor.

Studies that focus on college majors, however, can be a valuable source of information. The RIASEC classification system has been applied to college majors; extensive work links different majors to different interests (Gasser, Larson, & Borgen, 2007; Harrington, Feller, & O’Shea, 1993). Given this connection, a fuller picture can be drawn of personality and creativity differences across different interests.
The most common types of majors studied are artistic and investigative, typically manifested as an arts-sciences dichotomy conceptually rooted in the idea of the two cultures (Snow, 1959). Consistent with a larger if conflicting literature on creativity and mental illness (Carson, 2011; Silvia & Kaufman, 2010), artistic majors tend to be less emotionally stable (Rubinstein, 2005) and more open (Furnham, under review). They are also more likely to believe they are creative (Charyton & Snelbecker, 2007; Furnham, Batey, Booth, Patel, & Lozinskasaya, 2011). Most studies that only examine artistic and investigative majors find no differences in measured creativity (Charyton, Jagacinski, & Merrill, 2008; Furnham et al., 2011). Despite public perceptions that creativity is more related to the arts (Plucker, Beghetto, & Dow, 2004), most creativity researchers argue that both the arts and sciences can be equally creative (e.g., Kaufman, 2009; Sawyer, 2012).

Sánchez-Ruiz, Hernández-Torrano, Pérez-González, Batey, and Petrides (2011) compared investigative (both natural/technical and social sciences) and artistic majors on both personality and creativity and examined how the relationships between personality and creativity differed by major. Openness was significantly correlated with both creative personality and divergent thinking across all majors. Artistic majors had a strong connection between low emotional stability and measured creativity. Artistic majors were higher on creative personality and openness to experience (but not divergent thinking).

Some studies have compared one type of major to a variety of other majors. Artistic majors scored higher than non-artistic majors on measures of divergent thinking (Silvia et al., 2008), openness, extraversion, and arts knowledge and preference (Silvia & Nusbaum, 2012); no differences were found in other personality factors or fluid intelligence. Enterprising majors scored higher on conscientiousness, emotional stability, and extraversion than other majors, but lower on agreeableness and openness (Lounsbury, Smith, Levy, Leong, & Gibson, 2009).

Fewer studies look at other RIASEC dimensions. Rubinstein (2005) found that realistic (law) majors were less open and agreeable than artistic (visual art) and investigative (natural science and social science) majors. Similarly, Eisenman (1969) found that artistic (English) majors scored higher than realistic (business) majors on a creativity measure.

Lievens, Coetzier, De Fryut, and De Masseene (2002) conducted one of the few large-scale studies of personality across many different majors. Although they did not discuss or interpret the data on different majors beyond noting that medical students were higher on extraversion and agreeableness, some basic differences emerge. Artistic majors appeared lower than investigative and realistic majors on emotional stability, extraversion, and conscientiousness, but the highest on openness. Investigative majors varied between STEM-based sciences (science, technology, engineering, or mathematics) and social sciences. Social science majors, like realistic majors, tended to be more open and less conscientious, emotionally stable, extraverted, and agreeable than STEM majors.

There has yet to be a thorough investigation of how majors across the RIASEC spectrum compare on personality and creativity. The goal of this study is to investigate individual differences in these two constructs and see how personality and creativity are related by major. Given that conventional interests (i.e., administrative work) are less represented in university majors, the present study will focus on realistic, investigative, artistic, social, and enterprising majors. Investigative will additionally be split into STEM and social science to determine any possible differences.

Given the preponderance of research on artistic and investigative majors, our two specific hypotheses focus on these groups. However, we are interested in how all five types of majors compare.

**H1.** Artistic majors should be more creative (both self-reported and measured) than other majors. They also should be more open and less emotionally stable.

**H2.** Investigative majors (particularly social science majors) should be more creative (both self-reported and measured) than non- artistic majors. They should also be more open.

### 2. Methods

#### 2.1. Participants and procedure

A total of 3295<sup>1</sup> students from a public California university were recruited by student assistants who visited multiple classrooms across different majors. Some participants took the brief survey during class time, whereas others returned the survey by the next class period. Additional students took part via a data collection website. Participation was voluntary; extra credit was assigned at the instructor’s discretion.

There were 609 males and 2686 females. The mean age for participants was 23.7 (SD = 6.8). There were 1355 Hispanic Americans, 920 Caucasians, 341 African American, 256 Asian Americans, 44 Middle Easterners, 26 Native Americans, 141 with multiple ethnic identities, and 79 who declined to state their ethnicity.

Student majors were classified based on the RIASEC model as outlined by Holland (1997). In case of any ambiguity, we relied on the National Center for Educational Statistics Classification of Instructional Program, as described by Tracey and Robbins (2006). There were 207 realistic majors (criminal justice, political science), 1945 investigative majors (anthropology, biology, chemistry, computer science, health sciences, geography, mathematics, physics, psychology, and sociology), 447 artistic majors (art, communication, English, graphic design, history, liberal studies, music, theatre, and world languages), 480 social majors (human services, nursing, kinesiology, and social work), and 216 enterprising majors (accounting, economics, management, marketing, and public administration). Table 1 provides information on gender breakdowns by each type of major.

In addition, given both the oversampling of psychology majors and the past findings indicating possible differences between STEM-based and social sciences, a second classification was conducted that split investigative majors into two categories: investigative-social sciences (anthropology, health sciences, geography, psychology, and sociology) and investigative-STEM (i.e., science, technology, engineering, and mathematics; biology, chemistry, computer science, mathematics, and physics). The gender breakdowns for these two groups are also listed in Table 1.

#### 2.2. Measures

Participants were given a brief survey containing the following measures: the International Personality Item Pool (IPIP; Goldberg, 1999; Goldberg et al., 2006), the Self Assessment of Creativity Scale (SAC; adapted from Kaufman & Baer, 2004), and the Compound Remote Associates Task (CRAT; Bowden & Jung-Beeman, 2003).

The five-factor model of personality was measured using the 50-item version of the International Personality Item Pool (IPIP; Goldberg, 1999; Goldberg et al., 2006). The IPIP comprises 10 Likert-type items (rated on a 1–5 scale) to measure each of Big Five personality factors. In this study, the reliabilities for each dimension were: extraversion (α = .83), agreeableness (α = .80), conscientiousness (α = .80), emotional stability (α = .80), and openness (α = .80).

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<sup>1</sup> This figure does not include 706 students who did not provide their major and were therefore eliminated from analysis.
tiousness (α = .75), emotional stability (α = .82), and openness (α = .74).

The Self Assessment of Creativity (SAC) is a brief measure adapted from the International Personality Item Pool (IPIP; see Goldberg, 1999). These six items (i.e., “I am good at coming up with new and different ideas”), scored on a 1–6 Likert scale were taken from items designed to measure creativity and imagination. A longer form of the SAC was used in earlier studies and correlates with other self-report measures of creativity (Kaufman & Baer, 2004; Kaufman, Bromley, & Cole, 2006). In this study, the scale had a Cronbach’s Alpha of α = .85.

The Compound Remote Associates Task (CRAT) consisted of twelve triads of words taken from Bowden and Jung-Beeman (2003). The participants were instructed to generate one word that related to each word in the triad. For example, if the triad consisted of “Barrel, Root, and Belly”, then the correct response would be “Beer”. Correct answers were scored as one of the following three words “Barrel, Root, and Belly”, then the corrected responses were summed and averaged as a percentage of correct responses. In this study, the abbreviated CRAT had a Cronbach’s Alpha of α = .77.

3. Results

Table 2 presents means and standard deviations of all personality and creativity variables. Table 3 presents correlations between the personality and creativity variables. Notably, the CRAT and SAC were weakly (but significantly) correlated (r = .10). Openness was significantly correlated with both the CRAT (r = .19) and SAC (r = .57).

Given established (if minor) gender differences in creativity (Baer & Kaufman, 2008) and personality (Costa, Terracciano, & McCrae, 2001) and the inconsistent gender breakdown by major, we controlled for gender. An Analysis of covariance (ANCOVA) was conducted with the five RIASEC-defined majors as the independent variable and the five personality factors and two creativity scores as dependent variables. The ANCOVA analysis revealed a significant main effect of small magnitude for college major (Λ = .93, F(35, 12012) = 5.79, p < .01, etα² = .01). Details are presented in Table 4. The same analysis was conducted with the investigative majors split into social science and STEM majors, and these two additional columns have been integrated into Table 4 as well.

Table 4 presents the Post-Hoc analysis, a pairwise comparison by RIASEC major using the Bonferroni correction. Artistic majors scored higher on openness (than social majors) and self-assessed creativity (than realistic, investigative-STEM, and social majors),
partially supporting H3. They were not significantly higher on measured creativity or significantly lower on emotional stability (although those trends were present).

Investigative majors scored higher on openness (than social majors), agreeableness (than realistic, artistic, and enterprising majors), self-assessed creativity (than realistic and social majors), and measured creativity (than realistic and social majors), partially supporting H2. When investigative was split into STEM and social sciences, the higher scores in openness, agreeableness, and self-assessed creativity grew stronger.

Other significant differences by majors include realistic majors scoring higher on extraversion (than investigative-STEM majors) and conscientiousness (than artistic and enterprising majors) and enterprising majors scoring higher on extraversion (than investigative-STEM and artistic majors) and openness (than social majors). Enterprising majors did significantly better on the CRAT than realistic majors.

Finally, correlations between the personality factors and the two measures of creativity were computed for each major, as can be seen in Table 6. These correlations were then compared for significant differences using the Fisher-to-z transformation. Although several comparisons were initially significant, the application of the Bonferroni correction eliminated any significant relationships.

<table>
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<th>Table 6</th>
<th>Correlations between personality factors and both creativity measures by RIASEC model.</th>
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<td>CRAT</td>
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<td>Compound remote associate task</td>
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** p < .01.
* p < .05.

4. Discussion

All five majors scored significantly higher on a personality factor except for social majors. Realistic majors were more extraverted and conscientious; investigative majors were more open and agreeable; artistic majors were more open; and enterprising majors were more extraverted and open. Investigative (particularly investigative-social science) and artistic majors were higher on self-assessed creativity, whereas investigative and enterprising scored higher on measured creativity. The hypotheses, as highlighted in the results, were partially supported.

Many of the findings were consistent with past research. Artistic and investigative majors were higher on openness and self-assessed creativity. Although artistic majors were not significantly higher on actual creativity, this finding may be an artifact of the creativity measure used. The CRAT is heavily dependent on intelligence, vocabulary, and verbal associative thought (Kaufman, Plucker, & Baer, 2008), and hence may have been skewed toward people with certain patterns of abilities. Perrine and Brodersen (2005), as previously mentioned, found that artistic interests predicted artistic creativity – but not scientific creativity. It is likely that if additional measures of creativity were administered (such as a drawing task) that artistic majors would score higher.

Investigative majors – specifically, social science majors – were notably higher on openness and agreeableness. Particularly given the preponderance of psychology majors in this sample, this finding echoes past research on high levels of empathy in psychology majors (Harton & Lyons, 2003) and people-oriented professions (Beauchamp & Mckelvie, 2006). Psychology is traditionally seen as a helping profession (Gervasio, Wendorf, & Yoder, 2010). More psychology majors are interested in helping people (i.e., by becoming therapists) than in conducting research (Marrs, Barb, & Ruggiero, 2007), and being open and agreeable is consistent with these goals. It is interesting, however, to note that in Wicherts and Vorst’s (2010) in-depth analysis of psychology students’ specialties, the methods and psychonomics students were more open, not the clinical students. The clinical students were, however, more agreeable. This study did not distinguish psychology majors more interested in research from psychology majors more interested in clinical work. Perhaps clinically-oriented majors might be best categorized as social majors. It is important to note, however, that social majors scored lower on openness than investigative majors.

Although no pair of correlations (as in Table 6) was significantly different after the Bonferroni correction was applied, there are some trends that are interesting. Investigative-STEM and artistic majors showed a strong correlation of r = .18 between self-assessed creativity and measured creativity, indicating higher creative metacognition (e.g., Kaufman & Beghetto, in press), whereas realistic, social, and enterprising did not have significant correlations. Self-assessed creativity was notably correlated to agreeableness in artistic majors and extraversion in social majors.

There are a number of limitations to be addressed. Although gender was controlled, a large percentage of participants (82%) were female. A more balanced gender distribution would have been preferable. In addition, this study’s participants may still be discovering their passions, whereas professionals may have better-developed interests.

Creativity researchers often analyze differences at the domain level. Consider the Amusement Park Theoretical Model (Kaufman & Baer, 2005), which starts with general thematic areas (arts, sciences) comparable to the RIASEC categories. The model then gets more detailed, so that a broad artistic interest might then be analyzed according to such domains as visual art, creative writing, music, or performance (i.e., Carson, Peterson, & Higgins, 2005; Kaufman, 2012). Using the RIASEC model compressed these many domains into a single category of major (artistic). Indeed, the model further breaks domains into microdomains (i.e., creative writing might be divided into poetry, fiction, plays, or essays). Given the many personality variations that exist simply within different types of writers (e.g., Kaufman, 2002), a more nuanced analysis may have provided different results. A final notable limitation is that future studies could look at rated creative work and have people write stories, draw pictures, or plan experiments. A longitudinal study could address the question of whether different academic majors attract different kinds of people or if a person is changed by what they study.

5. Conclusion

Some findings help reinforce the utility of the RIASEC model on a large and diverse sample (i.e., artistic majors were higher on openness and self-reported creativity; enterprising majors were more extraverted and open; realistic majors were more extraverted and conscientious). Other findings, such as investigative majors also scoring high on openness and self-reported and measured creativity, emphasize the importance of not limiting conceptions of creativity to artists. Curiously, investigative majors (particularly in the social sciences) were notably higher on agree-
ableness than social majors. This finding reinforces the idea of the social scientist wanting to help people. Broadly, this study indicates both striking similarities and differences in the personality and creativity levels of academic majors.

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