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Statistics anxiety and the Big Five personality factors

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Abstract

The purpose of this study was to investigate the relationship between statistics anxiety and the Big Five personality factors using a multivariate approach. Participants were 83 students (69% female) enrolled in one of three statistics courses. A canonical correlation analysis revealed that Neuroticism was positively correlated whereas Openness to Experience and Agreeableness was negatively correlated with Worth of Statistics, Fear of Asking for Help, and Fear of Statistics Teachers. Extraversion was positively correlated with Interpretation Anxiety, Test and Class Anxiety, and Fear of Asking for Help. Conscientiousness was not correlated with statistics anxiety. Practical implications include advising statistics instructors to adjust teaching in order to cater to students with different personalities. Limitations include the possibility of social desirability bias and non-generalizability of results.

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1. Introduction

The growing need for the application of statistical techniques in a diverse range of jobs and workplaces has prompted universities to include at least one statistics course as a core component in their degree programs (Onwuegbuzie & Wilson, 2003). In undergraduate psychology programs, students enter the program expecting to study psychology-related topics without realizing the relevance of statistics to the science of psychology. Indeed, Ruggeri, Dempster, Hanna, and Cleary (2008) reported that only 57.1 percent of students in USA were aware of the statistics element in a psychology program. The lack of awareness is further compounded by the importance assigned to statistics courses. For example, most undergraduate Psychology programs require students to undertake up to three statistics courses with increasing difficulty, from introductory to advanced levels. These statistics courses largely determine entry into the Honors program which in turn, is often essential for entry into

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postgraduate studies. Given the mandatory and high-stakes nature of statistics courses, it is not surprising that these students regard statistics courses as the most anxiety inducing course in their degree programs.

1.1. Statistics Anxiety

Cruise, Cash and Bolton (1985) defined statistics anxiety “as the feelings of anxiety encountered when taking a statistics course or doing statistical analyses” (p. 92). According to Cruise et al., statistics anxiety is a multidimensional construct consisting of six factors: (a) Worth of Statistics, (b) Interpretation Anxiety, (c) Test and Class Anxiety, (d) Computation Self-Concept, (e) Fear of Asking for Help, and (f) Fear of Statistics Teachers. Worth of Statistics relates to an individual’s perception of the relevance of statistics to the individual. Interpretation Anxiety refers to the feelings of anxiety encountered when interpreting statistical data. Test and Class Anxiety deals with the anxiety involved when attending a statistics class or when taking a statistics test. Computation Self-Concept relates to an individual’s self-perception of his or her ability to understand and calculate statistics. Fear of Asking for Help assesses the anxiety experienced when seeking help. Lastly, Fear of Statistics Teachers refers to an individual’s perception of the statistics teacher.

The negative effects of statistics anxiety have been well documented. A growing body of research suggests a negative relationship between statistics anxiety and statistics achievement (Bell, 2001; Onwuegbuzie & Seaman, 1995; Onwuegbuzie, 1995, 2003; Tremblay, Gardner, & Heipel, 2000; Zanakis & Valenzi, 1997). In other words, students who experience higher levels of statistics anxiety tend to have lower performance on a statistics examination. The negative effects of statistics anxiety have prompted researchers to carry out antecedent research in order to clarify its nature and inform interventions.

The antecedents of statistics anxiety can be classified as situational, environmental, and dispositional (Onwuegbuzie & Wilson, 2003). Situational antecedents refer to factors that surround the stimulus object or event and include variables such as mathematics anxiety (Baloğlu, 2004) and characteristics of statistics courses (DeVaney, 2010). Environmental antecedents refer to events which occurred in the past and include variables such as age (Bui & Alfaro, 2011) and gender (Baloğlu, Deniz, & Kesici, 2011). Dispositional antecedents refer to the personality characteristics of an individual and include variables such as perfectionism (Onwuegbuzie & Daley, 1999) and procrastination (Onwuegbuzie, 2004). Nevertheless, despite well documented research on the dispositional antecedents of statistics anxiety, little is known about the personality traits of students who experience high levels of statistics anxiety.

1.2. The Big Five Personality Factors

The Big Five personality factors refer to a hierarchical organization of personality traits into five basic dimensions: (a) Neuroticism, (b) Extraversion, (c) Openness to Experience, (d) Agreeableness, and (e) Conscientiousness (Costa & McCrae, 1992; Goldberg et al., 2006). Neuroticism is the tendency to be sensitive, emotional, and to be prone to experience negative emotions. Extraversion is characterized by being outgoing and active, along with a tendency to seek and to prefer the company of others. Openness to Experience refers to an inclination for a diverse and broad range of new experiences. Agreeableness is the tendency to be compassionate, good natured, and eager to cooperate and avoid conflict. Lastly, Conscientiousness refers to a tendency to exhibit goal-directed behavior, such as persistence, organization, and motivation.

Since its conceptualization, a number of studies have investigated the role of the Big Five personality factors in predicting academic achievement. In general, Neuroticism and Extraversion tend to be negatively correlated whereas Openness to Experience, Agreeableness, and Conscientiousness tend to be positively correlated with various indicators of academic achievement such as final-year projects and examinations (Chamorro-Premuzic & Furnham, 2003a, 2003b; Komarraju, Karau, & Schmeck, 2009; Lounsbury, Sundstrom, Loveland, & Gibson, 2003). More relevant to the current study, Furnham and Chamorro-Premuzic (2004) found Extraversion and

Openness to Experience to be negatively correlated and Conscientiousness to be positively correlated with statistics examination grades.

Given that both statistics anxiety and the Big Five personality factors are related to academic achievement, it is likely that a direct relationship exist between these two constructs. However, little or no research has investigated the relationship between statistics anxiety and the Big Five personality factors. Knowledge of the personality traits of students who experience high statistics anxiety allows statistics instructors to identify and target high-risk individuals for intervention. Additionally, a relationship between a trait-like construct (Big Five personality factors) and a state-like construct (statistics anxiety) furthers understanding of both constructs. In particular, the relationship could shed light on the nature and antecedents of statistics anxiety, which could assist in the development of interventions.

1.3. The Current Study

The current study aims to explore the multivariate relationship between the Big Five personality factors and statistics anxiety. Given the characteristics of each of the Big Five personality factors (Costa & McCrae, 1992; Goldberg et al., 2006), the various relationships between the Big Five personality factors and academic achievement (e.g. Furnham & Chamorro-Premuzic, 2004), and the negative relationship between statistics anxiety and academic achievement (e.g. Onwuegbuzie & Seaman, 1995), several hypotheses were developed for the current study. Due to the exploratory nature of the study, the hypotheses considered statistics anxiety as a whole instead of its individual factors.

First, individuals high in Neuroticism tend to be irritable and have poor impulse control. This may be detrimental to effective study habits (Chamorro-Premuzic & Furnham, 2003a), resulting in higher statistics anxiety. In addition, one of the six facets of Neuroticism is anxiety, which is defined as the level of free floating anxiety in an individual (Costa & McCrae, 1992). Furthermore, both Neuroticism and statistics anxiety are negatively correlated to academic achievement. Hence, it is expected that Neuroticism will be positively correlated with statistics anxiety (Hypothesis 1).

Second, individuals high in Extraversion tend to draw attention and be the life of a party. They tend to seek stimulation and might be easily bored by studying. Indeed, Chamorro-Premuzic and Furnham (2003b) argued that they are disadvantaged in written assessments but would benefit from oral assessments. Similar to Neuroticism, this may be detrimental to effective study habits (Chamorro-Premuzic & Furnham, 2003a), resulting in higher statistics anxiety. In addition, both Extraversion and statistics anxiety are negatively correlated to academic achievement. Hence, it is expected that Extraversion will be positively correlated with statistics anxiety (Hypothesis 2).

Third, individuals high in Openness to Experience tend to be intellectually curious. However, while Openness to Experience is positively correlated to the final grade in a psychology course (Lounsbury et al., 2003), it is negatively correlated to statistics examination grades (Furnham & Chamorro-Premuzic, 2004). Furnham and Chamorro-Premuzic (2004) suggest that effective statistics learning requires hypothetical-deductive thinking as opposed to the creative-inductive thinking characterized by individuals high in Openness to Experience. Hence it is expected that Openness to Experience will be positively correlated with statistics anxiety (Hypothesis 3).

Fourth, individuals high in Agreeableness tend to have better academic adjustment due to the maintenance of positive relationships with statistics instructors and peers (Hair & Graziano, 2003). The presence of an excellent social support system might alleviate statistics anxiety, in particular for the Fear of Asking for Help and Fear of Statistics Teachers factors (Cruise et al., 1985). Furthermore, Agreeableness tends to be positively correlated with academic achievement while statistics anxiety tends to be negatively correlated with academic achievement. Hence it is expected that Agreeableness will be negatively correlated with statistics anxiety (Hypothesis 4).

Lastly, individuals high in Conscientiousness tend to be hardworking and highly organized. Highly prepared and motivated individuals should be able to effectively cope with the rigours of a statistics course. In addition,

these individuals are less likely to procrastinate and hence, should experience lower levels of statistics anxiety (Onwuegbuzie, 2004). Furthermore, a meta-analysis revealed Conscientiousness to be a consistent positive predictor of academic achievement (Poropat, 2009) while statistics anxiety tends to be negatively correlated with academic achievement. Hence it is expected that Conscientiousness will be negatively correlated with statistics anxiety (Hypothesis 5).

2. Methods

2.1. Participants

The sample consisted of 83 psychology undergraduates (69% female) enrolled in one of three statistics courses at James Cook University, Singapore. The three statistics courses were as follows: introductory statistics ($n = 33$), intermediate statistics ($n = 32$), and advance statistics ($n = 18$). Only 50 participants provided their age and they ranged from 18 to 50 years ($M = 22.18$, $SD = 5.21$).

2.2. Instruments

Participants were invited to complete the Statistical Anxiety Rating Scale (STARS) (Cruise et al., 1985) and the International Personality Item Pool (IPIP) (Goldberg et al., 2006). Each instrument took about 10 minutes to complete.

The STARS is a two-part, 51-item instrument designed to assess six factors of statistics anxiety (Cruise et al., 1985). Part 1 consists of 23 items which assess statistics anxiety associated with situations where students have contact with statistics and it includes the following factors: (a) Interpretation Anxiety (e.g., figuring out whether to reject or retain the null hypothesis), (b) Test and Class Anxiety (e.g., doing the final examination in a statistics course), and (c) Fear of Asking for Help (e.g., asking a fellow student for help in understanding a printout). Participants respond on a 5-point Likert scale that ranges from 1 = *No Anxiety* to 5 = *Strong Anxiety*. Part 2 consists of 28 items that measure the level of agreement with various statements about statistics and statistics teachers and it includes the following factors: (d) Worth of Statistics (e.g., I feel statistics is a waste), (e) Computation Self-Concept (e.g., I don't have enough brains to get through statistics), and (f) Fear of Statistics Teachers (e.g., most statistics teachers are not human). Responses are made on a 5-point Likert scale that ranges from 1 = *Strongly Disagree* to 5 = *Strongly Agree*. Appropriate item scores are summed for each factor, with higher scores indicating higher levels of statistics anxiety.

Cruise et al. (1985) reported internal consistencies that ranged from .80 to .94 ($n = 1150$) and five-week test-retest reliabilities that ranged from .67 to .83 ($n = 161$) for the six factors. More recently, Papousek et al. (2012) reported internal consistencies that ranged from .80 to .96 ($n = 400$) and five-month test-retest reliabilities that ranged from .49 to .78 ($n = 89$) for the six factors and the total scale. The six-factor structure has been supported and confirmed by factor analytic studies done with university students in the USA (Baloğlu, 2002), South Africa (Mji & Onwuegbuzie, 2004), the UK (Hanna, Shevlin, & Dempster, 2008), China (Liu, Onwuegbuzie, & Meng, 2011), and Austria (Papousek et al., 2012).

The current study used a revised version of the STARS. Hanna et al. (2008) revised six items to facilitate understanding by students in the UK. The revised version was chosen due to the relative similarity in language use between the Singapore sample and the UK sample. For example, the word "car" is used in both Singapore and the UK instead of the word "automobile".

The IPIP is a 50-item instrument designed to represent the domain constructs of the Five Factor Model, as expressed in the revised NEO personality inventory (Buchanan, Johnson, & Goldberg, 2005; Costa & McCrae, 1992; Goldberg et al., 2006). The IPIP has five subscales of 10 items which measure the five factors of personality: (a) Neuroticism (e.g., often feel blue), (b) Extraversion (e.g., feel comfortable around people), (c)

Openness to Experience (e.g., believe in the importance of art), (d) Agreeableness (e.g., have a good word for everyone), and (e) Conscientiousness (e.g., am always prepared). Responses are made on a 5-point Likert scale that ranges from 1 = *Very Inaccurate* to 5 = *Very Accurate*. Appropriate item scores are summed for each factor, with higher scores indicating higher levels of the relevant personality factor.

Goldberg et al. (2006) reported internal consistencies that ranged from .77 to .86. Once corrected for unreliability, the five subscales of the IPIP have been shown to correlate highly with the corresponding NEO-PI-R domain scores, with correlations that ranged from .85 to .92. Preliminary evidence of construct validity comes from a factor analysis of data from 2448 participants in which five factors were identified after a varimax rotation (Buchanan et al., 2005). In addition, the five subscales of the IPIP have been shown to correlate substantially with relevant behaviors and demographic variables.

2.3. Procedure

This study was carried out over one fourteen-week study period at the James Cook University Singapore campus. The first author visited the three statistics classes and administered the STARS (Cruise et al., 1985) and the IPIP (Goldberg et al., 2006). Participation was voluntary. An information sheet was provided for the participants to keep and they gave their consent by signing an informed consent form. Participants either received extra course credit or were entered into a lucky draw for a chance to win book vouchers. Subsequently, participants dropped the completed questionnaire in a box which was left in the classroom during class time. The first author collected the box at the end of the class.

3. Results

All results were analyzed using SPSS version 16.0 with the alpha level set at .05. Preliminary analyses suggest that females had higher scores on Agreeableness than males. In addition, students enrolled in the introductory statistics course had higher anxiety related to Worth of Statistics than their counterparts in the advance statistics course. However, the sample size was not large enough to permit separate investigations. Hence, the results are collapsed across gender and statistics courses.

The means and standard deviations of the Big Five personality measures and the statistics anxiety measures are presented in Table 1. The median percentile rank equivalent scores (MPRES) for the statistics anxiety measures are also presented. The MPRES were calculated by comparing median anxiety scores of the current study to the percentile rank norms for undergraduate students in the USA reported by the author of the STARS (i.e. Cruise et al., 1985). A MPRES of 70 for Worth of Statistics indicates that at least 50% of the current sample scored higher than 70% of the norm group on this component. With the exception of the Fear of Statistics Teachers factor, the MPRES ranges from 64 to 77. Hence, the current sample appears to represent a moderate statistics-anxious group.

A canonical correlation analysis was conducted using the Big Five personality factors as predictors of the six factors of statistics anxiety to evaluate the multivariate shared relationship between the two variable sets. The results were presented in a manner adapted from Sherry and Henson (2005). The analysis yielded five functions with squared canonical correlations (R_c^2) of .294, .192, .091, .017, and .0007 for each successive function. Table 2 presents the correlation matrix from which the functions were generated.

Collectively, the full model across all functions was statistically significant using the Wilks's $\lambda = .509$ criterion, $F(30, 290) = 1.78, p < .05$. Since Wilks's λ represents the unexplained variance of the model, $1 - \lambda$ yields the model effect size in an r^2 metric. For the current analysis, the r^2 type effect size was .491, which indicates that the model explained a substantial portion, about 49%, of the variance shared between the variable sets.

Table 1. Means and Standard Deviations of Big Five Personality Measures and Statistics Anxiety Measures

Big Five Personality Factors	<i>M</i>	<i>SD</i>	Cronbach's α		
Neuroticism	26.19	6.60	.85		
Extraversion	32.90	5.70	.81		
Openness to experience	35.89	5.21	.76		
Agreeableness	34.96	5.25	.76		
Conscientiousness	33.49	5.60	.80		
Statistics Anxiety Factors	<i>M</i>	<i>SD</i>	Cronbach's α	Median	MPRES
Worth of statistics	39.39	12.50	.94	40	70
Interpretation anxiety	29.82	8.12	.90	30	77
Test and class anxiety	27.02	6.34	.88	27	68
Computation self-concept	18.05	6.26	.88	17	64
Fear of asking for help	9.53	3.32	.83	9	70
Fear of statistics teachers	11.24	4.45	.86	10	42

Note. MPRES = median percentile rank equivalent scores. The MPRES were obtained by comparing median anxiety scores to the percentile rank norms pertaining to undergraduate students reported by Cruise et al. (1985).

Table 2. Pearson Product-Moment Correlations of Statistics Anxiety Factors and the Big Five Personality Factors

Statistics Anxiety Factors	Big Five Personality Factors				
	Neuroticism	Extraversion	Openness	Agreeableness	Conscientiousness
Worth of statistics	.32**	-.09	-.36**	-.12	-.16
Interpretation anxiety	.27*	.18	-.12	.02	-.19
Test and class anxiety	.20	.13	-.09	-.07	-.21
Computation self-concept	.22*	.01	-.14	.03	-.15
Fear of asking for help	.26*	.14	-.11	-.11	-.24*
Fear of statistics teachers	.21	.02	-.29**	-.20	-.12

* $p < .05$, ** $p < .01$.

A dimension reduction analysis was conducted to test the hierarchal arrangement of functions for statistical significance. As noted, the full model (Functions 1 to 5) was statistically significant. However, Functions 2 to 5, 3 to 5, 4 to 5, and Function 5 were not statistically significant. Together, these results suggest that the first function was statistically significant, but the rest of the functions were not statistically significant. Nevertheless, since calculated probabilities are sensitive to sample sizes, the practical significance of the results was assessed by examining their effect sizes (Thompson, 1980). Given the R_c^2 effects for each function, only the first two functions were considered noteworthy in the context of this study (29.4% and 19.2% of shared variance, respectively). Table 3 presents the standardized canonical function coefficients and structure coefficients for Functions 1 and 2. Structure coefficients greater than $|.45|$ are interpreted (Sherry & Henson, 2005).

3.1. Function 1

The structure coefficients revealed that the relevant predictor variables were Neuroticism, Openness to Experience, and Agreeableness whereas the relevant criterion variables were Worth of Statistics, Fear of Asking for Help, and Fear of Statistics Teachers. Neuroticism was positively related to all criterion variables whereas

Openness to Experience and Agreeableness were negatively related to all criterion variables. The adequacy estimates indicate that 29% of the Big Five set variance was represented in that set's canonical composite and 29% of the statistics anxiety set variance was represented in its composite. The redundancy estimates indicate that, on average, 8.5% of the total variance in the set of the Big Five was accounted for by the linear combination of statistics anxiety components whereas 8.6% of the statistics anxiety set variance was accounted for by a linear combination of the Big Five set.

3.2. Function 2

The structure coefficients revealed that the relevant predictor variable was Extraversion whereas the relevant criterion variables were Interpretation Anxiety, Test and Class Anxiety, and Fear of Asking for Help. Extraversion was positively related to all criterion variables. The adequacy estimates indicate that 14% of the Big Five set variance was represented in that set's canonical composite and 28% of the statistics anxiety set variance was represented in its composite. The redundancy estimates indicate that, on average, 2.7% of the total variance in the set of the Big Five was accounted for by the linear combination of statistics anxiety components whereas 5.3% of the statistics anxiety set variance was accounted for by a linear combination of the Big Five set.

Table 3. Canonical Solution for Big Five Personality Factors Predicting Statistics Anxiety

Factors	Function 1			Function 2		
	Coef	r_s	r_s^2	Coef	r_s	r_s^2
Neuroticism	-.413	<u>-.630</u>	.397	.738	.368	.135
Extraversion	-.230	.112	.013	.706	<u>.490</u>	.240
Openness to experience	.701	<u>.806</u>	.650	.276	.213	.045
Agreeableness	.352	<u>.517</u>	.267	.539	.382	.146
Conscientiousness	.053	.351	.123	-.329	-.356	.127
Adequacy (mean of r_s^2)			.290			.139
Redundancy (adequacy * R_c^2)			.085			.027
R_c^2			.294			.192
Worth of statistics	-1.272	<u>-.767</u>	.588	-.651	.142	.020
Interpretation anxiety	.088	-.439	.193	.873	<u>.845</u>	.714
Test and class anxiety	-.095	-.385	.148	-.097	<u>.565</u>	.320
Computation self-concept	.966	-.342	.117	.828	.444	.197
Fear of asking for help	-.403	<u>-.499</u>	.249	.085	<u>.640</u>	.410
Fear of statistics teachers	-.228	<u>-.680</u>	.462	-.252	.050	.003
Adequacy (mean of r_s^2)			.293			.277
Redundancy (adequacy * R_c^2)			.086			.053

Note. Coef = standardized canonical function coefficient; r_s = structure coefficient; r_s^2 = squared structure coefficient; R_c^2 = squared canonical correlations. Structure coefficients (r_s) greater than $|\cdot45|$ are underlined.

4. Discussion

The purpose of the current study was to explore the multivariate relationship between the Big Five personality factor and statistics anxiety. It was hypothesized that Neuroticism, Extraversion, and Openness to Experience

will be positively correlated to statistics anxiety (Hypothesis 1, 2 and 3, respectively) whereas Agreeableness and Conscientiousness will be negatively correlated with statistics anxiety (Hypothesis 4 and 5, respectively). The results provided support for Hypothesis 1, 2, and 4 but not for 3 and 5.

Neuroticism was positively correlated with Worth of Statistics, Fear of Asking for Help, and Fear of Statistics Teachers, providing support for Hypothesis 1. Students high in Neuroticism might be inhibited in asking questions due to excessive worrying. For example, they might worry about appearing “stupid” in front of the statistics instructor and their peers. Such withdrawal also precludes interactions with the instructor, effectively reinforcing the notion that “most statistics teachers are not human” (Item 32 of the STARS; Cruise et al., 1985, p. 94). Consequently, students might think that statistics to be a waste of their time and effort.

Extraversion was positively correlated with Interpretation Anxiety, Test and Class Anxiety, and Fear of Asking for Help, providing support for Hypothesis 2. The interpretation of statistical data requires long periods of silent reading and thinking. Extraverts’ constant efforts of seeking stimulation might interfere with this process, resulting in Interpretation Anxiety. The positive relationship between Extraversion and Test and Class Anxiety was consistent with Chamorro-Premuzic and Furnhams' (2003b) assertion that extraverts are disadvantaged in written assessments. Hence, the relationship might be attenuated for oral assessments. The positive relationship between Extraversion and Fear of Asking for Help may at first seem counterintuitive. After all, extraverts should enjoy the attention drawn by asking for help. However, it seems likely that extraverts enjoy positive attention only. Hence, extraverts might experience higher anxiety with regards to Fear of Asking for Help due to the potential for negative attention.

Contrary to Hypothesis 3, Openness to Experience was negatively correlated with Worth of Statistics, Fear of Asking for Help, and Fear of Statistics Teachers. Openness to Experience refers to an inclination for a broad range of new experiences and students high in this trait might find statistics courses to be worth their time and effort. Consequently, these students might experience lesser anxiety in seeking help from their peers and instructors. However, the results were inconsistent with studies that found a negative relationship between Openness to Experience and statistics examination grades (Furnham & Chamorro-Premuzic, 2004). Despite having lower statistics anxiety with regards to the aforementioned factors, students high in Openness to Experience might still be disadvantaged at statistics examinations. More research is needed to clarify the complex relationship between statistics anxiety, Openness to Experience, and statistics achievement.

Agreeableness was negatively correlated with Worth of Statistics, Fear of Asking for Help, and Fear of Statistics Teachers, providing support for Hypothesis 4. As expected, the good natured and compassionate nature of agreeable students helps maintain positive interpersonal relations. In turn, the social support from statistics instructors and peers alleviates statistics anxiety associated with Fear of Asking for Help and Fear of Statistics Teachers. Consequently, students might find statistics courses to be worth their time and effort.

Contrary to Hypothesis 5, Conscientiousness was not correlated with statistics anxiety. This was inconsistent with studies that found a positive relationship between Conscientiousness and statistics examination grades (Furnham & Chamorro-Premuzic, 2004). The results suggest that conscientiousness students are able to circumvent, but not alleviate, statistics anxiety to do well in statistics examinations. Future research should examine the predictive ability of Conscientiousness on statistics examination grades while controlling for statistics anxiety to clarify the results of the current study.

4.1. Practical Implications

Some practical implications can be derived from the results of the current study. From the results, it appears that students with different personalities experience statistics anxiety differently. Hence, statistics instructors are advised to adjust their teaching and assessment in order to cater to all students. First, due to a possible disadvantage in written assessments (Chamorro-Premuzic & Furnham, 2003b), students high in Extraversion might experience high Test and Class Anxiety. Hence, the weightage for oral assessments (e.g. presentations)

should be increased to match written assessments. Currently, the weightage for oral assessments, if any, ranged from 20% to 30% of the total course grade for most statistics courses. Second, it appears that some factors of statistics anxiety are relatively universal regardless of personality traits. For example, the Fear of Asking for Help factor was correlated with up to four of the Big Five personality factors. Hence, statistics instructors could set up online forums on the Blackboard Learning System to allow students to post questions anonymously. While the lack of exposure precludes anxiety reduction (Foa & Kozak, 1986), it allows students to circumvent the anxiety to proceed with (relatively) unhindered learning.

4.2. Limitations

Several limitations of the current study should be considered. First, it should be acknowledged that canonical correlation analysis does not afford assessments of causality. Nevertheless, it is more likely for the Big Five personality factors (a trait-like construct) to cause statistics anxiety (a state-like construct) rather than the other way round. Specifically, certain personality traits might predispose individuals to experience statistics anxiety. Hence, future research could explore the causal role of the Big Five personality factors in statistics anxiety. Second, the STARS (Cruise et al., 1985) was administered in class with the statistics instructor present. The low MPRES score for the Fear of Statistics Teachers factor (Table 1) suggests that social desirability might have biased the results. Future research on statistics anxiety should be conducted online to reduce social desirability and encourage disclosure (Duffy, Smith, Terhanian, & Bremer, 2005; Wright, 2005). Lastly, the sample was drawn from a small private university in Singapore and the results might not generalize to all undergraduate students taking a statistics course.

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