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Computer Anxiety and the Big Five

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Abstract

This paper explores the relationship between personality traits, as described by the Big Five Factors model, and the likelihood of someone suffering from computer anxiety. The research sample was a cohort of Business School Undergraduates. It was found that for this sample there was a small but significant correlation between two of the traits, agreeableness and emotional stability, and computer anxiety.

1. Introduction

In this era, of pervasive technology, people are increasingly being asked to interact regularly with computers. For some people this interaction causes anxiety and decreases their ability to work to their highest standards (M. J. Brosnan, 1998). It would be useful to be able to identify those people likely to suffer from computer anxiety so that they could be supported effectively in order to become more efficient workers. The personality of the individual might be a contributing factor to this. (Anthony, Clarke, & Anderson, 2000; Ceyhan, 2006; Korukonda, 2005, 2007; Wilt, Oehlberg, & Revelle, 2011)

Within a cohort of first year business undergraduates, the combination of emotional stability (inverse) and agreeableness accounted for 37.9% of the variance of computer anxiety. This suggests that some factors of personality do have an impact on the likelihood of computer anxiety for this particular cohort.

This paper explores the current research in this field and reviews the questionnaires available and explains why CARS and the 5 Factor model were chosen. It goes on to discuss the findings in more detail, and the limitations and implications that these have concluding with suggestions for further work.

2. Background

Personality has been described as “the combination of characteristics or qualities that form an individual’s distinctive character:” (Oxford, 2012) although it cannot be measured, only the behaviours that are influenced by it can be measured. So personality, as far as Psychologists are concerned is not a tangible, measurable thing at all, but a construct.

While there are several different models to describe personality, most researchers are agreed that personality does not change very much over time (Maltby, Day, & Macaskill, 2007; Nettle, 2007). The different aspects of a personality are often referred to as factors and there are a range of self-reporting questionnaires which measure these factors each questionnaire relating to a particular model of personality.

MBTI (Briggs Myers, 2000) based on the Myers Briggs model of personality has to be administered by trained psychologists and is expensive to buy and time-consuming to deliver. The results also need to be delivered personally by a professional, specifically trained, psychologist creating a large time investment for the candidate and researcher. The 16PF developed by Cattell (Cattell & Schuerger, 2003) suggests that there are sixteen factors that combine to make one’s personality. These were

synthesised into themes by (McCrae & Costa, 1999) to find five themes which are referred to as the Big Five Factors (Nettle, 2007). They are more accessible and there are many open-source, well researched questionnaires based on this model that are available for general use.

The Big Five or the Five-Factor model of personality (Maltby, Day, & Macaskill, 2007:177; Nettle, 2007:9) examines behaviours which are indicative of particular types of personality and groups them together into five trait clusters. These trait clusters or factors contain six traits (McCrae & Costa, 1999) and it is the extent to which each trait, within a cluster, is manifested that defines a person's whole personality. The five factors are:

Extroversion: Someone who scores highly for extroversion is more likely to take risks and be extrinsically motivated than someone who has a low score. The traits that make up this cluster are warmth, gregariousness, assertiveness, activity, excitement-seeking and positive emotions. The low end is referred to as introversion.

Agreeableness: The very agreeable person will demonstrate a high level of trust, compliance, modesty, straightforwardness, tendermindedness and altruism. They may be too quick to concur with others. A low score is tending towards antagonism. Sometimes the scale is referred to as 'Adapter' (High in agreeableness) to 'Challenger' (low in agreeableness).

Conscientiousness: A high score here indicates a person who is competent and well-organised and although they take time to make decisions they are self-disciplined and motivated by achievement, often referred to as 'Focussed'. A low score may indicate a lack of direction or, in a more positive view, an ability to be 'Flexible'.

Neuroticism: Someone who is a highly neurotic person is likely to react more strongly to negative stimuli than a less neurotic person and is often referred to as 'Reactive'. They will tend to worry more and be more adversely affected by bad news stories. A person with low levels of Neuroticism may not be careful about avoiding danger but will tend to be 'emotionally stable' or 'Resilient'.

Openness: An open person has lots of ideas often straying into fantasy but always with an awareness of aesthetics and their own values. They are often excitable and active and can be referred to as 'Explorer'. A low score here suggests a person who is closed to experience, sometimes referred to as resistant to change or as a 'Preserver'.

(Adapted from Huczynski & Buchanan, 2007; Srivastava, 2011).

For this research the factors of agreeableness/challenger and neuroticism/emotional stability seemed to be the most important.

But what exactly is computer anxiety? For the purposes of this research it is not the extreme phobic reaction that some people have to technology (M J Brosnan, 1998; M J Brosnan & Thorpe, 2006) which is a reaction similar to that displayed by people suffering from arachnophobia when faced with a spider. Instead the focus will be on those cases where people feel uncomfortable and anxious when dealing with a computer (Howard, 1986).

A person who has computing anxiety will evidence "one or more of the following:

- (a) anxiety about present or future interactions with computers or computer-related technology;
- (b) negative global attitudes about computers, their operation, or their societal impact;
- (c) specific negative cognitions or self-critical internal dialogues during present computer interaction or when contemplating future computer interaction." (Weil, Rosen, & Wugalter, 1990)

In spite of the views of some that the current generation should be quite comfortable around computers and technology (Friedl & Verčič, 2011; Judd & Kennedy, 2011; M. Prensky, 2001) computer anxiety is still prevalent across cultures, age groups and countries (Korukonda, 2007; Shah, Hassan, Embi, & Anxiety, 2011; Tekinarслан, 2008; Weil & Rosen, 1995). It seems to be something that can be passed on from teacher to pupil (Ceyhan, 2006; Elkins, 1985; Epstein & Klinkenberg, 2001) suggesting that at least some element of computer anxiety is a state of anxiety in a particular moment. There is some evidence to suggest that state anxiety manifests only if trait anxiety already

exists (Beckers, Wicherts, & Schmidt, 2007) but as some mitigation strategies are successful for some people, (Bostrom & Huber, 2010; Rosen, Sears, & Weil, 1993; Torkzadeh & Van Dyke, 2002; Woszczynski, Lazar, & Walker, n.d.) this may not be the case for all computer anxiety sufferers

Rosen and Weil have developed a questionnaire for use in identifying people with computer anxiety known as the Computer Anxiety Rating Scale (CARS) (Rosen & Weil, 1992) which has been used in many studies around the globe (incl Anthony et al., 2000; Chu & Spire, 1991; Durndell & Haag, 2002; Karal, 2009; Korobili, Togia, & Malliari, 2010; Korukonda, 2005; Korukonda & Finn, 2003; D Mcilroy, Bunting, Tierney, & Gordon, 2001; David Mcilroy, Sadler, & Boojawon, 2007; Rosen et al., 1993; Rosen & Weil, 1995a, 1995b; Shermis & Lombard, 1998; Tekinarslan, 2008)

The results of this are numeric and therefore open to statistical analysis

3. Data analysis and results

We hypothesise that there is a link between the level of computer anxiety and an individual's personality profile. To test this deduction we found out what people's personalities are and whether they have computer anxiety or not. Then the results were analysed with non-parametric statistical tests.

In order to do the research we used the CARS questionnaire (Rosen & Weil, 1992) and a questionnaire based around the five-factor model from IPIP (Goldberg, 1992). These both have 5 point Likert scale responses and the numeric data can be statistically analysed.

The group to be studied was taken from first year undergraduates in a Business School. In the past lectures have found that typically students in this group are not always comfortable with technology and some find it challenging to use the Virtual Learning environment and other applications. Because the sample is of undergraduates it is quite easy to gain access to them in whole cohort taught modules. The personality questionnaire was handed out in paper copy and collected in the same session so the rate of return was quite high- although participation was voluntary. The computer anxiety questionnaires were also in hard copy, but the administration of these was done by colleagues to smaller groups and the return rate was not as good.

The sample group consists of over one hundred level one students on an undergraduate Business Management course. They were approached at the end of semester 1 and the beginning of semester 2. The students are a mixture of international students and home students with a minority of mature students, the majority of the group being under 20 years old. All students were invited to take part in the research but participation was voluntary in line with ethical procedures within the university. For the computer anxiety questionnaire there were 55 useable returns. For the personality questionnaire there were 103 useable responses.

Computer anxiety

There are three ranges of computer anxiety, high, medium and low. They are bounded by the values high being greater than 60, medium between 40 and 60 and low is less than 40. In this cohort the distribution is shown in Figure 1.

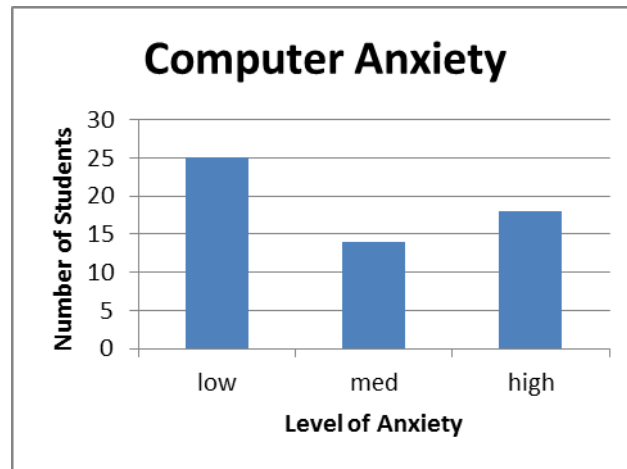


Fig 1: Computer anxiety distribution

A sizeable part of the group had low anxiety but there is still a significant number who are exhibiting high anxiety. The group has a normal distribution (Table A1)

Just under a third of the group who responded are likely to suffer from a high level of anxiety when working with computers. As a lot of the student work must be completed on line or with the use of technology such as word processors this is of concern. However as this was a voluntary exercise and the point of the research was explained it may be that a higher proportion of people who already felt anxious chose to respond.

Personality factors

We used the 5 Factors model of personality and the IPIP questionnaire (Goldberg, 1992). Each factor was scored separately and the results are shown in Table 1.

	<i>Extraversion</i>	<i>Agreeableness</i>	<i>conscientiousness</i>	<i>Emotional Stability</i>	<i>Intellect/Imagination</i>
Mean	55.7	67.2	56.3	50.5	61.9
Standard Deviation	16.0	16.0	15.7	15.7	12.6
Minimum	20.0	22.5	10.0	12.5	35.0
Maximum	97.5	100.0	92.5	90.0	100.0

Table 1: Results of the personality questionnaire

Emotional stability has the largest range with a minimum of 10 and a high score of 92.5. Both intellectual and agreeableness had high scores of 100 while agreeableness had the highest mean score and emotional stability had the lowest.

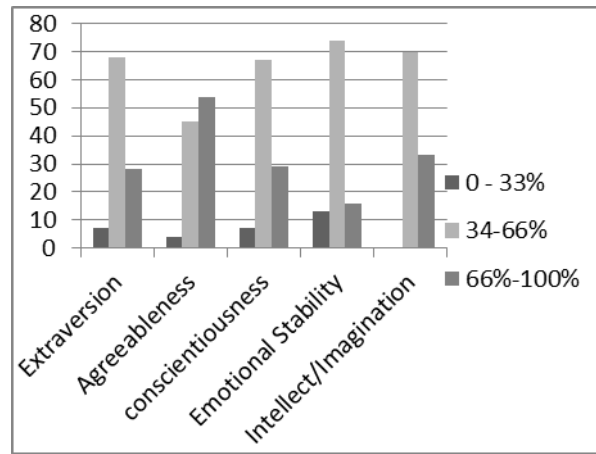


Figure 2: Bar chart of personality profiles

The general overview in Figure 2 shows that the majority of respondents were in the middle range for each trait, other than that for agreeableness which shows a higher level of high scores. It should be noted that there are no low scores for intellect and this may be because the subjects were university students. The overall profiles were normally distributed (Table A2)

Comparing our sample with the reference sample (Goldberg, 1992) using the z-test gives a z value of 14.566, which indicates statistically significant difference between the samples. This suggests that the sample was in some way different from the sample used by the other researchers. Although ethnic data was not collected for the sample other records for the sample suggest that a sizeable minority of the students are from Asia – China in particular. Different cultures can present with profiles that are not the same as Western European/ USA profiles and this can skew the data.

As the data is normally distributed it suggests that we have a representative sample of personality profiles in the group.

Combined findings

There were 28 people who completed both the computer anxiety questionnaire and the personality inventory. The different traits are compared with the computer anxiety scores but only Emotional stability (A) and Agreeableness (B) demonstrated any correlation i.e. had a value of $R^2 > 0.1$ (Figure 3).

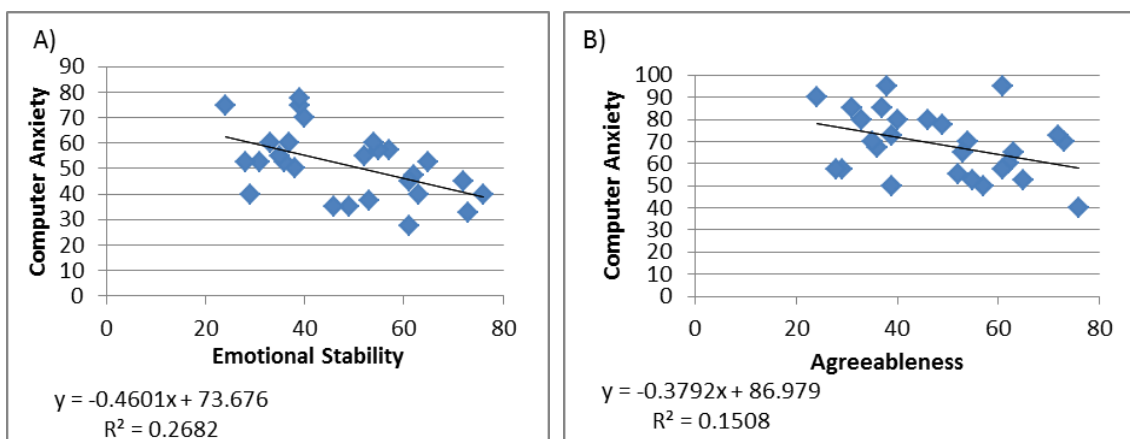


Figure 3: Graphs showing correlation between the traits of Emotional Stability (A) and Agreeableness (B) with computer anxiety

The relationship between ‘technophobia’ (Another name for computer anxiety) and the traits of Neuroticism (the opposite of Emotional Stability) and Openness (which maps to agreeableness) were

established (Anthony et al., 2000) among a South African sample over ten years ago and these relationships have been found to be still true. Work done in New York in 2005 also found high correlation between technophobia and neuroticism (Korukonda, 2005) and a lower negative correlation with openness. However neither of these studies combined the traits to analyse the impact of the combination.

As the data set has less than 50 data points the Shapiro-Wilk test for normality was applied (Table A3) and the data was found to be normally distributed.

Using Spearman's test for correlation we show that Agreeableness and Emotional stability have the highest and significant correlation coefficients. (Table A4)

The testing for linear regression using these two traits shows that the combined model explains the level of computer anxiety better than the traits separately. The analysis also shows that both traits are significant components of the combined linear model (Table 4)

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	78.406	10.213		7.677	.000
	EmotionalStability	-.583	.193	-.518	-3.027	.006
2	(Constant)	106.843	14.380		7.430	.000
	EmotionalStability	-.592	.174	-.526	-3.401	.002
	Agreeableness	-.408	.158	-.398	-2.578	.017

a. Dependent Variable: Anxiety

Table 4 Multiple Regression

The combined linear model, according to Table 4, is:

Computer anxiety score = 106.843 – (0.592 * Emotional Stability score) – (0.408 * Agreeableness score)

Thus the model implies that, the higher the scores of emotional stability and agreeableness for a person, the lower the computer anxiety score of this person.

The summary analysis of the model (Table 5) shows the adjusted R square value is 0.379 i.e. almost 38% of the variance of the anxiety scores is explained by the emotional stability and agreeableness scores of the subjects.

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.518 ^a	.268	.239	13.08639
2	.653 ^b	.427	.379	11.81979
a. Predictors: (Constant), EmotionalStability				
b. Predictors: (Constant), EmotionalStability, Agreeableness				

Table 5 Summary analysis of the linear regression model

Our work shows that some personality traits contribute towards making a person more likely to suffer from some aspect of computer anxiety but that there may be other factors that have a considerable influence on the presence of computer anxiety in an individual. Our results show that this result holds for populations with different normal personality trait distributions, indicating that probably the link between personality traits and computer anxiety is not culture dependent.

4. Discussion

It may seem surprising that there is such a high level of computer anxiety still present in a population that has grown up surrounded by technology. The suggestion is often made that this generation are digital natives (B. M. Prensky, 2001) and should not therefore experience computer anxiety. In practice it can be seen that a sizeable minority of students are anxious about interacting with certain aspects of technology

The findings show that there is a personality profile that is more likely to result in the individual being susceptible to suffering from computer anxiety, but it does not suggest that other profiles are immune from this. Computer anxiety can present both as a transient state and a consistent trait so it is possible that the identified profiles have a trait of anxiety that manifests as computer anxiety and other profiles have moments when they are in a state of computer anxiety.

Even though the sample size was small the presence of a significant result suggests a larger size data sample is likely to confirm more clearly the correlations and the combined linear relationship that we found. The concurrence with the work of others (Anthony et al., 2000; Korukonda, 2007) from earlier years suggests that the level of computer anxiety and the factors that contribute to it are not changing over time. The personality trait distribution difference between our data and the reference data also indicates that cultural factors do not matter very much for the relationship between personality traits and computer anxiety.

This being the case perhaps suggests that the environment does not have such a large impact as suggested by Prensky (2001) and others who embrace the concept of digital native or the 'net generation' (Jones, Ramanau, Cross, & Healing, 2010; Kennedy, Judd, Dalgarno, & Waycott, 2010).

For the front line lecturer, knowing that people presenting with this profile may be more likely to suffer from computer anxiety might help to identify them at the beginning of the teaching year in order to pre-empt anxiety by drawing their attention specifically to a range of intervention strategies. This might support those individuals initially so that they engage with technology and then help to diminish their own anxiety by becoming more competent.

5. Conclusion and further work

Computer anxiety is a complex issue that affects a wide range of people. For the group in this study the personality traits of emotional stability and agreeableness were important in predicting the likelihood of computer anxiety being present in an individual, although it is apparent that there are

other factors as well which are as yet unknown. These other factors will probably not be related to culture as our findings concur with those in other countries.

Personality profile has a role to play but this may be more important in the resolution of the anxiety than in the cause of it. More work could be done in this area.

The CARS questionnaire is a valuable instrument for identifying general computer anxiety, but more specific questions need to be asked if we are going to be able to target the interventions in an appropriate way. The next step is to develop and test an instrument that will do that.

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Appendices

Appendix 1 Computer anxiety distribution

The distribution was normal and the mean fell within the confidence range for the reference study sample (Rosen & Weil, 1992) , shown in Table 1.

	N	Mean	Range	Standard Deviation	Skewness
Our Study	55	48.23	20-100	17.27	0.3
Reference study	2,940	41.46	20-100	14.25	1.15

Table A1: Comparison of study samples

Appendix 2 The normal distribution of the personality data

When the scores for all the traits are taken together this gives a total personality profile value. The distribution of the total personality profile values was normal according to the Kolmogorov-Smirnov test.

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Total personality score	.101	103	.012	.969	103	.017

a. Lilliefors Significance Correction

Table A2 Demonstrating the normal distribution of the personality trait data

Appendix 3 The normality of computer anxiety and personality distributions

Tests of Normality						
	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Anxiety	.158	27	.083	.955	27	.276
Extraversion	.151	27	.117	.963	27	.436
Agreeableness	.109	27	.200*	.972	27	.667
Conscientiousness	.176	27	.032	.949	27	.201
EmotionalStability	.111	27	.200*	.964	27	.450
IntellectImagination	.115	27	.200*	.967	27	.527

a. Lilliefors Significance Correction

*. This is a lower bound of the true significance.

Table A3: Testing the normality of the computer anxiety and personality trait data distributions

As all the significance values are >0.05 it is confirmed that the data is normally distributed in all cases.

Appendix 4 Correlation

		Correlations					
		Anxiety	Extraversion	Agreeableness	Conscientiousness	EmotionalStability	IntellectImagination
Spearman's rho Anxiety	Correlation Coefficient	1.000	-.117	-.372	.108	-.454	-.308
	Sig. (2-tailed)	.	.560	.056	.593	.017	.118
	N	27	27	27	27	27	27
Extraversion	Correlation Coefficient	-.117	1.000	.151	-.453	.050	.496**
	Sig. (2-tailed)	.560	.	.451	.018	.804	.008
	N	27	27	27	27	27	27
Agreeableness	Correlation Coefficient	-.372	.151	1.000	.091	-.028	.201
	Sig. (2-tailed)	.056	.451	.	.653	.890	.315
	N	27	27	27	27	27	27
Conscientiousness	Correlation Coefficient	.108	-.453	.091	1.000	-.120	-.105
	Sig. (2-tailed)	.593	.018	.653	.	.552	.601
	N	27	27	27	27	27	27
EmotionalStability	Correlation Coefficient	-.454	.050	-.028	-.120	1.000	.334
	Sig. (2-tailed)	.017	.804	.890	.552	.	.088
	N	27	27	27	27	27	27
IntellectImagination	Correlation Coefficient	-.308	.496**	.201	-.105	.334	1.000
	Sig. (2-tailed)	.118	.008	.315	.601	.088	.
	N	27	27	27	27	27	27

*. Correlation is significant at the 0.05 level (2-tailed).

** . Correlation is significant at the 0.01 level (2-tailed).

Table A4: The results of Spearman's test for correlation between computer anxiety and personality traits