Gaziantep Üniversitesi Sosyal Bilimler Dergisi (http://sbe.gantep.edu.tr)
2011 10(4):1271 -1290 ISSN: 1303-0094

Computer Phobia in Higher Education: A Comparative Analysis of United Kingdom and Turkish University Students

Yüksek Öğretimde Bilgisayar Fobisi: Biritanya ve Türkiye'deki Üniversite Öğrencilerinin Karşılaştırılması

Ömer Faruk Ursavaş
Rize University

David McIlroy
Liverpool John Moores University

Sami Şahin
Gazi University

Abstract

The possession or acquisition of a range of computer skills is an implicit assumption related to many undergraduate study programmes, and use of university computer facilities may impact on overall academic performance and employability beyond graduation. This study therefore tested levels of computer anxiety (CARS) and computer thoughts (CTS) in Turkish and United Kingdom undergraduates with reference to culture group difference, regularity of use (or home use) and use of university computer facilities. A substantial minority of students (32-33%) reported computer anxiety in both groups, but more UK (41%) than Turkish students (21%) were deficient in positive self-concept (CTS). Reference to the subscales in the two measures pinpointed cultural differences disguised at scale level, and gender differences were evident across rather than within culture groups. As expected, positive self-concept was associated with use of computer facilities (r's = 0 to 0.25, $p < .001$), and anxiety was associated more weakly with avoidance (r's = 0 to -0.18, $p < .001$). Results suggest that computer confidence (implying motivation and engagement) should not be assumed to exist in the agenda for wider participation. Also within and between group differences indicate that there is no typical or stereotypical student profile in approach to computer activity.

Keywords: Computer phobia; Computer anxiety; Computer thoughts; Self-concept

Özet

Birçok lisans düzeyindeki program bilgisayarla ilgili belirli yeteneklere sahip olma ya da bu yetenekleri kazanmayı şart koşar ve üniversitenin sunduğu bilgisayar imkânlarından faydalanmak genel akademik başarıyı ve mezuniyet sonrası iş bulma

İletişim: Rize University, Faculty of Education, Department of Computer Education and Instructional Technology, Room 305 Phone: (464) 532-8454, Fax: (464) 532-8612, 53200, Çayeli / Rize

durumunu etkileyebilir. Buna dayanarak bu çalışmada Türk ve Britanyalı lisans öğrencilerin bilgisayar kaygısını Bilgisayar Kaygısı Ölçeği (BKÖ) ve bilgisayar öz-yeterlik algısı Bilgisayar Düşünce Ölçeği (BGÖ) ile ölçülmüştür. Ülkeler arası grup farklılığı, düzenli olarak bilgisayar kullanma (ya da evde kullanma) ve üniversitedeki bilgisayar imkânlarından faydalanma değişkenlerine bağlı olarak belirlenmiştir. Her iki grupta da önemli oranda öğrenci (%32-33) bilgisayar kaygısına sahip olduklarını dile getirmişlerdir. Fakat Britanya grubundaki öğrencilerin (%41), Türk öğrencilere (%21) göre daha büyük bir yüzdesi kendine dair olumlu bir algıya sahip değildir. İki ölçekteki alt birimler düzeyinde belirlenen kültürel farklılıklar tüm ölçek düzeyinde ortaya çıkmamıştır ve kültürel grupların kendi içinde de gruplar arasında da cinsiyete bağlı farklılıklar belirlenmiştir. Beklendiği gibi, kendini olumlu algılama ile bilgisayar imkânlarını kullanma arasında anlamlı bir ilişki olduğu (r's = 0 to 0.25, $p < .001$) ve kaygı ile kaçınma arasında da daha zayıf ama anlamlı (r's = 0 to -0.18, $p < .001$)bir ilişkinin olduğu belirlenmiştir. Sonuçlar bilgisayar kullanma güveninin öğrencilerde hâlihazırda var olduğuna dair bir varsayımda bulunmanın doğru olmayacağını göstermiştir. Aynı zamanda grup içi ve gruplar arası farklılıklar bilgisayar etkinlikleri açısından herhangi bir tipik ya da şablon öğrenci profili olmadığını da göstermiştir.

I. INTRODUCTION

Information and Communication Technology has formed the basis for extensive educational reform around the world before and since the outset of the new Millenium (Selwyn, 2000). Numerous studies have observed that self-reported computer phobia is a problem for substantial numbers of undergraduate students (Mcilroy, Sadler & Boojawon, 2007), and the phenomenon has been persistent and universal (Chua, Chen & Wong, 1999). Moreover, computer phobia may impair the quality of student learning as it has been associated with slower learning of simple tasks and one study found this to be independent of prior level of computer experience (Mahar, Henderson & Deane, 1997). It is therefore evident that the extensive use of computers in Higher Education presents a dilemma for modern educators, especially given that leading educationalists have advocated that learning experience and learning activities should take place within an environment that minimises anxiety (Gibbs, 1992; Ramsden, 1992; Biggs, 1999).

The commitment to computer use in Higher Education is now firmly embedded in university curricula, and computer literacy is deemed to be a key skill (Dearing, 1997), or basic graduate skill. Students are required to use email, word processing, statistical and graphics software, electronic journals, e-portfolios, library catalogue, Internet searches etc., and may also be required to present evidence of computing skills attained to prospective employers.

1) Computer phobia

There is no consensus in the literature on the use of the terms such as computer phobia or techno phobia. In the studies performed so far this subject has been handled under some titles, computer phobia, technostress, syberphobia,

computer aversion, technophobia, and computer anxiety (Keating, 1996; Yaghi & Abu-Saba, 1998; Choi et al., 2002; Thorpe & Brosnan, 2007; Wang et al., 2008). Although technophobia is becoming a commonly used term, appearing in newspapers and popular magazines with increasing frequency, computer phobia has been defined by Rosen & Weil (1992): (a) anxiety about present or future interactions with computers or computer related technology, (b) negative global attitudes about computers, and their operation or their societal impact; and/or, (c) specific negative cognitions or self-critical internal dialogues during actual computer interaction or when contemplating future computer interaction.

2) Anxiety and Positive Self-concept

In general terms, anxiety has been associated with avoidance (Rachman, 1998), and educational reviews have shown that anxiety is likely to debilitate test performance (Hembree, 1988; Mcilroy & Bunting, 2002). According to Weil and Rosen (1995), up to 25 percent of students had previously reported computer phobia (embodying anxiety) and more recent studies have shown that the trend is still prevalent in students (Mcilroy et al., 2007; Ursavaş & Karal, 2009). It is therefore a recurrent challenge to monitor and screen for computer phobia in undergraduates, and to use validated measures that have been designed for this purpose, such as the Computer Anxiety Rating Scale (CARS, Rosen & Weil, 1992). Computer attitudes and behaviours are frequently assessed through the medium of psychological constructs and measures, but Szajna (1994) lamented that this was often done by merely a single measure, and Bozionelus (2002) observed that constructs reflecting positive psychological states in relation to engagement with computer-based technology had received scant attention. Therefore, in the present study two measures are used that embody a negative approach (CARS) and a positive approach (Computer Thoughts Survey, or CTS, Rosen & Weil, 1992).

Although these two measures have been explored in many western student populations, they have not been previously used in Turkish student populations. In the present study therefore, an aim was to examine whether results previously found in American and western European populations would generalise to a comparable sample of Turkish students.

3) A gender gap in confidence and competence?

It has been previously concluded that men have higher levels of computer and Internet self-efficacy than women (Torkzadeh & Van Dyke, 2002), although Bunz, Curry and Voon (2007) have argued that this perception or stereotype often differs from the real situation. For example, Dyck and Smither (1994) found that when previous experience is controlled for, group differences have a tendency to disappear. An increase of computer use in the work place may account for a reduction in computer anxiety, according to Rainer, Laosethakul and Astone (2003), but this increase solidifies the need for students to continue to build computer skills for employability, whether they are male or female. However, women frequently think of themselves as less scientific (Tsai, Lin & Tsai, 2001), and some careers such as engineering are less likely to be chosen by women (Küskü, Özbilgin &

Özkale, 2007). Therefore it is important to continue to assess computer confidence and anxiety by self-report, as subjective personal perception may have a large impact on career choice and career pursuit (Brown et al., 2008). In the present study, therefore, gender differences are explored to ascertain whether females report higher anxiety and negative cognition/self-perception in their attitude and approach to computers within higher education.

4) Experience – not consistently equated with expertise

According to Barrier & Margavio (1993), experience in itself does not equate with expertise, as the latter will depend on the quality of the experience. Furthermore, there is the issue of whether the experience is relevant to subsequent tasks and activities, and can the user generalise from one application to the next? Experience has been defined as regular practice with a computer at home, and/or whether a computer course has been successfully completed (Chua et al., 1999). Prior experience may have a primary role in the formulation of attitudes to computing (Comber, Colley, Hargreaves and Dorn, 1997), but at least one study has found that attitudes towards computers deteriorated after completion of a computer course (Barrier & Margavio, 1993). Therefore, because students have attended a previous course in computing, or have access to a PC, it should not be assumed that they will be confident, committed and motivated to engage in computer activity within the university context. Previous experience does not guarantee that all students will possess computer fluency or literacy, as outlined by Barnes (2003). Students may not take their previous experience with computers and translate that into expertise in the academic context. Moreover, computer practice within the university setting may generate the kind of anxiety that debilitates performance (Zeidner, 1998). In this study students were requested to provide information about Regular Home Use of computers and it was expected that those who use computers regularly at home will report less anxiety and more positive self-concept, although individual differences within each group are expected.

Employers' demands have led to universities competing with each other by providing the widest range of ICT facilities for students (Breen, Lindsay, Jenkins & Smith, 2001). Ever increasing use of computers in the workplace (Rainer, Laosethakul & Astone, 2003) means that students are frequently required to master a range of technological skills to prepare and fit themselves for the world of work. Anxiety and negative self-concept are likely to debilitate student motivation in the pursuit of these goals (Brown et al., 2008).

According to National Statistics (2007) and the Turkish Statistical Institute (TSI) (2007) database, there are notable differences between UK and Turkey's demographic statistics. PC penetration rate per 1000 people in UK (650) is higher than the PC penetration rate in Turkey (116), according to the statistics in 2007. Similarly, PC users' rate per 1000 people in UK (700) is higher than the user rates in Turkey (177) in 2007 (National Statistics (2007) and the Turkish Statistical Institute (TSI) (2007)).With reference to this background, part of the rationale for the study

is that measures such as the CARS and CTS that have been previously tested on UK samples should be tested with Turkish students. In previous studies the background factors that impacted on CARS and CTS included home use and gender, with more regular users and males reporting less anxiety and more positive cognition. Therefore in the present study the same variables are assessed to ascertain if the same pattern of results can be generalised to Turkish students. Furthermore, a group comparison between Turkish and UK students is added to ascertain if culture group differences emerge in relation to self-reported computer beliefs, perceptions and behaviours.

II. METHODOLOGY

1) Participants and procedure

a) Sample 1

This sample was comprised of undergraduate students from a university in the North West of England (n =363, females = 261, males = 102). The mean age of the sample was 24.51, SD = 8.05, and the students were studying a range of disciplines: psychology, combined studies, business and economics, consumer studies, home economics, leisure and tourism, environmental studies, nursing, counselling, business and language.

b) Sample 2

The second sample was comprised of undergraduate students from Karadeniz Technical University North East of Turkey (n =457, females = 227, males = 230). The mean age of the sample was 21.35, SD = 2.89, and the students were studying a range of disciplines: pre-school education, business and economics, consumer studies, statistics and computer sciences, finance and international relations' students.

In both studies the participants completed the questionnaire booklet during scheduled learning activity sessions, and the exercises were typically completed in around twenty minutes. All participation was voluntary and no time limit was imposed for task completion. Instructions for accomplishing the task were presented in both written and verbal forms. Students completed three clusters of measures including demographic material (age, gender, home use etc.), computer phobia measures in terms of anxiety and thoughts (CARS and CTS) and estimates of use of computer facilities at the university. In order to test the hypotheses and identify the trends in the findings, data were analysed on SPSS version 13, and this included examining the patterns in the Descriptive statistics with reference to measures of central tendency and dispersion; exploring bivariate patterns with reference to independent groups t-tests and correlation analysis; testing for differences across the various demographic variables by means of One Way Analysis of Variance.

In order to render the questionnaires fully comprehensible to the Turkish students, the original CARS and CTS were translated from English into Turkish by linguists who were competent and experienced in both languages. After this task

was accomplished, the Turkish version of the CARS and CTS were distributed to Turkish students (n = 110). Confirmatory factor analysis (CFA) was used to examine the factor structure of the 20-item scales by using AMOS 18. A three factor model tested in this study was estimated using maximum likelihood estimation (MLE) where all analyses were conducted on variance–covariance matrices. Model fit was assessed by a number of indices. There are several different goodness-of-fit indices in the literature. These types of fit index provide us different information about model fit (Kline, 2005; Harrington, 2009). According to Brown's (2006) recommendations that fit indices are classified into three categories: (1) absolute fit indices, (2) parsimony correction indices, and (3) comparative fit indices. These are the absolute fit indices that measure how well the proposed model reproduces the observed data. The most common fit index is the model chi-square (χ^2). Other absolute fit indices are goodness-of-fit index (GFI) and standardized root mean square residual (SRMR). The next category of fit indices, parsimonious indices, is similar to the absolute fit indices except that it takes into account the model's complexity. These include the root mean square error of approximation (RMSEA) and the adjusted goodness-of-fit (AGFI). Finally, the comparative fit indices are used to evaluate the fit of a model relative to a more restricted, nested baseline model (Harrington, 2009). Examples include the comparative fit index (CFI) and Tucker–Lewis index (TLI). Table 1 shows the level of acceptable fit and the fit indices for the proposed surveys' models in this study. After confirmatory factor analysis, acceptable Cronbach's alpha reliability coefficient values for the CARS (.90) and CTS (.81) were obtained in this pilot study. The UK students had completed the English versions of the CARS and CTS and comparable demographic measures.

Table 1. Fit indices for the survey models

	CARS	CTS		
Model fit indices	Values	Values	Recommended guidelines	References
χ^2	421,804	286,804	Non-significant	Klem (2000), Kline (2005), McDonald and Ho (2002)
	p<.05	p<.05		
χ^2/ df (degrees of freedom)	2,757	1,822	<5	Gefen, Karahanna, and Straub (2003)
SRMR	0.039	0.050	<0.05	Klem (2000), McDonald and Ho (2002)
RMSEA	0.060	0.041	<0.05 (good fit)	McDonald and Ho (2002)
	(0.053, 0.066)	(0.033, 0.048)	<0.08 (fair fit)	
CFI	0.950	0.932	=>0.90	Klem (2000), McDonald and Ho (2002)
TLI	0.938	0.916	=>0.90	Klem (2000), McDonald and Ho (2002)

Code: CTS = Computer Thoughts Survey, CARS = Computer Anxiety Rating Scale, χ^2 = chi-

square, SRMR= Standardized Root Mean Square Residual, RMSEA= Root Mean Square Error of Approximation, CFI= Comparative Fit Index, TLI= Tucker–Lewis Index.

2) Design

In this study survey was used to elicit responses on two validated self-report measures of computer anxiety and positive self-concept (CARS and CTS respectively) in a comparison between UK and Turkish undergraduate students. The independent variables in the study were gender, home use and culture (differences between the two samples), and the two measures of computer phobia served as dependent variables along with the estimates of use of computer facilities.

3) Measures

a) Demographic Questions

Students were presented with a demographic questionnaire assessing gender, age, whether regular home users and estimated average usage of applications packages.

b) Computer Anxiety Rating Scale (CARS)

CARS is a 20-item scale in 5-point Likert format, and respondents are asked to express how they feel ``at this point in time": 1=``not at all'', 2=``a little", 3=``a fair amount", 4=``much" and 5=``very much". Among the issues addressed in this questionnaire are: (1) anxiety related to the machines themselves; (2) their role in society; (3) computer programming; (4) computer use; and (5) problems with computers and technology. Rosen and Weil (1992) reported that all alpha coefficients for this measure were in the range of 0.90 to 0.95. Factor analysis has led to three emergent factors labelled as ``Interactive Computer Learning Anxiety, ICLA" (11 items), ``Consumer Technology Anxiety, CTA" (4 items) and ``Observational Computer Learning Anxiety, OCLA" (5 items). Higher scores represent more anxious attitudes. The Cronbach's Alpha for this measure in the present study was UK (0.90), Turkey (0.91) . Norms established by empirical research and reported by Rosen and Weil for computer phobia are: No Computer phobia: 20–41. Low Computer phobia: 42–49. Moderate to High Computer phobia: 50–100.

c) Computer Thoughts Survey (CTS)

The CTS is also a 20-item scale in 5-point Likert format with 11 items phrased in the negative direction and 9 items in the positive direction. Respondents are asked to express how often their thoughts are in accord with each statement. Responses are scored as follows: 1=``Not at all", 2=``A little", 3=``A fair amount",4=``Often" and 5=``Very often". These are reversed for the negative items and higher scores represent more positive computing cognitions. Factor analysis led to three emergent subscales labelled as, "Negative Computer Cognitions, NCC" (11 items), "Positive Computer Learning Cognitions, PCLC" (5 items) and "Computer Enjoyment, CE" (4 items). Rosen and Weil (1992) report reliabilities above 0.8 for the CTS (ranging from 0.81 to 0.93), for the three factors. The present study found

reliabilities of 0.9, 0.7 and 0.7 for the CTS factors 1, 2 and 3, respectively. Norms established by empirical research and reported by Rosen and Weil for computer phobia scores are as follows: No Computer phobia: 69–100; Low Computer phobia: 61–68; Moderate to High Computer phobia: 20–60. CTS is in contrast to CARS where high scores are indicative of Computer phobia.

c) Computer Facilities

Students were asked to estimate their regularity of use of the computer facilities, Microsoft Word, Microsoft Excel, Email and the Internet based on a 5-point Likert scale rated on a time continuum.

III. FINDINGS

Table 2.Three categories for technophobia (norms) on the CARS and CTS measures, and the percentage of students within each group

	Technophobia Levels	CARS	CTS
Turkey Sample	None	20-41 (68%)	69-100 (79%)
	Low	42-49 (11%)	61-68 (15%)
	Moderate/High	50-100 (21%)	20-60 (6%)
United Kingdom Sample	None	20-41 (67%)	69-100 (59%)
	Low	42-49 (14%)	61-68 (23%)
	Moderate/High	50-100 (19%)	20-60 (18%)

In relation to the CARS reported in Table 2, it is evident that similar percentages of both groups of students report responses across all three categories. From each sample, 68% (Turkish, TR) and 67% (UK) report no computer phobia, and this leaves 32% and 33% respectively reporting Low to Moderate/High computer phobia. In contrast, with the CTS, 79% (TR) and 59% (UK) of respondents report no computer phobia, leaving 21% and 41% respectively reporting Low to Moderate/High computer phobia. Thus it is clear that the CTS has identified a higher percentage of UK students who report self-doubts in their approach to computing activity. This illustrates the efficiency of using both measures as they elicit differences across the two samples or cultures. In both measures and in both samples, however, it emerged that it is a minority who fall into the category of moderate to high computer phobia (6 - 21%).

In the t-tests presented in Table 3, it can be seen that 7 of the 8 tests are statistically significant ($p < 0.001$). On the CTS total scale, the TR students have a higher mean score (76.68) than the UK students (70.00), but in the three subscales,

the UK students score a higher mean on one of the three (i.e. NCC). Moreover, when the scores on the two groups are compared on the CARS total, the mean scores are almost identical (37.90 & 37.55), but this disguises statistically significant differences on all three subscales, with UK students reporting higher anxiety on one of the subscales (ICLA), and lower anxiety than the TR students on CTA and OCL. It is therefore again evident that a subscale approach elicits more useful information than total scale scores when comparing across the two culture groups.

Table 3.T-tests for differences between UK (N = 363) and Turkish (N = 475) sample.

	CTS	NCC	PCLC	CE	CARS	ICLA	CTA	OCL
UK Mean (sd)	70.00 (12.87)	44.21 (8.81)	15.64 (3.98)	10.15 (3.64)	37.90 (13.26)	24.08 (9.27)	6.50 (2.70)	7.32 (3.09)
Turkey Mean (sd)	76.68 (10.44)	40.67 (7.01)	20.47 (3.26)	15.54 (3.01)	37.55 (14.05)	22.02 (8.44)	7.32 (2.99)	9.74 (4.69)
t-test	-8.21	6.42	19.15	23.25	0.37	3.28	-4.15	-8.48

All t-tests presented in Table 2 are significant at $p < 0.001$, with the exception of CARS:
$p > 0.05$.
Code: CTS = Computer Thoughts Survey, NCC = Negative Computer Cognition, PCLC = Positive Computer Learning Cognitions, CE = Computer Enjoyment, CARS = Computer Anxiety Rating Scale, ICLA = Interactive Computer Learning Anxiety, CTA = Consumer Technology Anxiety, OCLA = Observational Computer Learning Anxiety.

The mean scores presented in Table 4 suggest that many students are positively orientated in their computer self-perceptions, whether this is looked at through the positive measures (CTS) or the negative measures (CARS). However, the measures of dispersion show that there are strong individual differences within the samples, and as was previously noted many students appear to lack confidence in their attitudes and approach to computers.

Three clusters of relationships can be identified from the correlation matrix presented in Table 3. First, the associations between the computer phobia measures: CARS, CTS and their subscales. These relationships are statistically significant and

consistently in the expected directions. The CTS correlates positively with its own subscales, and negatively with the CARS and its subscales. Likewise, the CARS correlates positively with its own subscales and negatively with the CTS and its subscales as noted. Apart from the high correlations between each scale and their own subscales (r = 0.61 to 0.96), almost all the other correlations, with a few marginal exceptions over 0.60, range from weak to moderate (r = 0.10 to 0.59). In general the correlation patterns are systematic and expected, and are fairly similar between the two groups. Also, the associations overlap enough to show commonality, and sufficient difference to indicate uniqueness.

In the second cluster of correlations (located at the bottom right of the matrix), the associations between the regular use of Microsoft facilities, are as expected positive, although the relationships are at weak to moderate levels. Again there are similarities between the two groups, and results suggest that students who make use of one facility are likely to use the other computer facilities as well (although Email stands out as the weakest link).

In the third cluster of associations, the other two clusters are associated with each other and in general show that students with high CTS (positive self-perception) are more likely to use the four computer facilities presented, and students high in CARS (anxiety) are less likely to use these facilities. Most of the associations are statistically significant, although almost all are weak. In general, the positive associations (CTS) are a little stronger than the negative associations (CARS). Although the trends are in the same directions for both Turkish and UK groups, it can be seen that the associations for CTS total scores are slightly stronger for UK students in three of the four facilities (r = 0.25 to 0.26), and are also stronger in the negative direction for CARS in all four associations (r = -0.13 to –0.17).

Table 4. Correlation coefficients and descriptive statistics for self-reported Turkish and UK computer phobia scales and use of computer facilities (UK values are in brackets).

	CTS	NCC	PCLC	CE	CARS	ICLA	CTA	OCL	MWord	MExcel	MPPoint	Email
CTS	1	.87*** (.87***)	.75*** (.71***)	.61*** (.64***)	-.39*** (-.53***)	-.40*** (-.54***)	-.36*** (-.35***)	-.28*** (-.33***)	.21*** (.16**)	.15** (.25***)	.15** (.25***)	.17*** (.26***)
NCC		1	.43*** (.35***)	.24*** (.28***)	-.37*** (-.64***)	-.38*** (-.64***)	-.36*** (-.65***)	-.24*** (-.43***)	.18*** (.13*)	.15** (.13*)	.17*** (.20***)	.13** (.23***)
PCLC			1	.52*** (.55***)	-.23*** (-.19***)	-.23*** (-.19***)	-.21*** (.12*)	-.20*** (-.17**)	.15** (.10*)	.08 (.16**)	.05 (.13*)	.17*** (.12*)
CE				1	-.24 (-.10*)	-.25*** (.14**)	-.18*** (.04)	-.20*** (.03)	.14** (.15**)	.07 (.24**)	.07 (.17**)	.13** (.15**)
CARS					1	.96*** (.95***)	.78*** (.75***)	.89*** (.76***)	-.06 (-.13*)	-.10* (-.17**)	-.09* (-.16**)	-.02 (-.14**)
ICLA						1	.65*** (.59***)	.77*** (.58***)	.-.06 (-.12*)	-.07 (-.18***)	-.07 (-.16**)	-.03 (-.10)
CTA							1	.67*** (.59***)	-.09* (-.12*)	-.14** (-.11*)	-.10* (-.17**)	-.03 (-.10)
OCL								1	-.03 (-.09*)	-.08 -.08	-.10* (-.11*)	-.01 (-.16*)
M Word									1	.41*** (.36***)	.30*** (.26***)	.21*** (.27***)
M Excel										1	.38*** (.45***)	.16*** (.31***)
M PPoint											1	.10* (.23***)
Email												1
Mean	76.68 (70.00)	40.67 (44.21)	20.47 (15.64)	15.54 (10.15)	37.54 (37.90)	22.02 (24.08)	7.32 (6.50)	9.74 (7.32)	1.89 (1.96)	1.63 (1.80)	1.73 (1.68)	1.89 (1.95)
SD	10.44 (12.87)	7.00 (8.80)	3.25 (3.97)	2.99 (3.64)	14.05 (13.25)	8.43 (9.27)	2.98 (2.69)	4.69 (3.08)	.31 (.19)	.48 (.40)	.44 (.46)	.31 (.22)

*** Correlation is significant at the 0.001 level (2-tailed), ** Correlation is significant at the 0.01 level (2-tailed and * Correlation is significant at the 0.05 level (2-tailed).

When one-way Analysis of Variance was applied to the gender groups presented in Table 5, gender differences were found on 7 of the 8 F-tests ($p < .001$), with the exception of the CARS total scale ($p > .05$). These differences were explored further by Tukey's post hoc tests, and it was found that Turkish male mean scores were significantly higher than UK male ($p < .01$) and female ($p < .001$) scores, but did not differ from the Turkish female students on the CTS total scale score. However, at subscale level, UK males are higher than Turkish males ($p < .001$) and females ($p < .001$), but do not differ from their male counterparts on NCC ($p < .001$). A consistent pattern emerges in relation to PCLC and CE in that the Turkish males ($p < .001$) and females ($p < .001$) have higher means than both their male and female counterparts, although there are no gender differences within either the Turkish or UK groups.

Table 5. One-way ANOVA for culture/gender differences on CTS/CARS scales and subscales.

	n	CTS Mean (sd)	NCC Mean (sd)	PCLC Mean (sd)	CE Mean (sd)	CARS Mean (sd)	ICLA Mean (sd)	CTA Mean (sd)	OCLA Mean (sd)
UK Male	102	72.66 (12.28)	45.87 (8.11)	16.01 (3.90)	10.77 (3.49)	36.07 (12.85)	22.52 (8.73)	6.24 (2.72)	7.31 (3.31)
UK Female	261	68.96 (12.97)	43.56 (8.99)	15.49 (4.00)	9.91 (3.67)	38.61 (13.36)	24.69 (9.42)	6.60 (2.67)	7.32 (2.99)
TR Male	230	77.38 (10.83)	41.27 (7.10)	20.37 (3.60)	15.74 (3.06)	36.62 (14.60)	21.17 (8.70)	7.24 (3.10)	9.80 (4.75)
TR Female	227	75.98 (10.01)	40.06 (6.87)	20.58 (2.87)	15.34 (2.91)	38.47 (13.44)	22.88 (8.08)	7.41 (2.86)	9.69 (4.63)
F(3,816)		25.72***	16.89***	122.85***	183.54***	1.58	6.62***	6.13***	23.96***

*** $p < .001$.

In relation to the CARS scale, no significant gender differences emerged in total scale scores as shown by the low F-value ($p > .05$). However, a Tukey's post hoc test revealed that female UK students have a significantly higher level of Interactive Computer Learning Anxiety than Turkish males ($p < .001$), although all other comparisons on the ICLA subscale were non-significant. Furthermore, Tukey's tests also showed that both Turkish males ($p < .001$) and females ($p < .001$)

have significantly higher levels of Consumer Technology Anxiety than their UK counterparts. In conclusion, it can be seen that each scale provides useful complementary information and comparison across the subscales help to identify patterns that are disguised in overall scale scores.

A one-way Analysis of Variance was then applied to differences across the UK and Turkish users and non-users, and it was found that all F-values were statistically significant ($p < .001$) on all 8 tests (2 scales and 6 subscales), as can be seen in Table 6. Post hoc analyses on CTS revealed that Turkish users had significantly higher means than Turkish non-users ($p < .001$), and than UK regular users ($p < .001$) and non-users ($p < .001$). However, it is remarkable that there are no significant differences in mean scores between Turkish users and non-users at PCLC and CE subscale levels.

When the one-way Analysis of Variance was applied to the CARS scale and subscales across the same user/non-user groups, significant differences were identified by the F-tests ($p < .001$) as can be seen as Table 5. When these were further explored it was evident that the mean patterns show that regular home users reported lower anxiety on CARS total scale and subscales. Post hoc Tukey tests show that UK non-users have a significantly higher level of computer anxiety than UK regular users ($p < .001$) and Turkish non-regular users ($p < . 001$). In contrast, there were no significant differences when the Turkish non-regular users were compared across the UK and Turkish regular users ($p > .05$). Therefore, it emerges that all significant differences between the various groups are accounted for by the high anxiety scores of the UK non-users group. It should also be noted that the mean differences are markedly larger for UK non-users on ICLA, and are also statistically significant in relation to all other groups ($p < .001$). However, the mean scores between all the other groups on this subscale are very similar. On the Consumer Technology Anxiety subscale, the UK non-users group again emerges with the highest anxiety scores and these differ significantly from UK regular users ($p < . 001$), but this time Turkish regular users reported higher anxiety than their UK counterparts ($p < . 05$). Finally, on the OCLA subscale, post hoc tests demonstrated that UK non-users were again higher on anxiety than UK ($p < .05$). In conclusion, it is clear that the pattern of anxiety responses is complex when analysed at subscale level – this both helps to uncover disguised effects and shows that the direction of effect can change from one group to the next.

Table 6. One-way ANOVA for culture/regular home users differences on CTS/CARS scales and subscales.

	n	CTS Mean (sd)	NCC Mean (sd)	PCLC Mean (sd)	CE Mean (sd)	CARS Mean (sd)	ICLA Mean (sd)	CTA Mean (sd)	OCLA Mean (sd)
UK Users	291	72.80 (11.23)	46.11 (7.22)	16.09 (3.93)	10.60 (3.63)	35.79 (12.20)	22.65 (8.57)	6.14 (2.48)	7.00 (2.91)
UK Non-users	72	58.68 (12.95)	36.53 (10.38)	13.81 (3.60)	8.35 (3.08)	46.42 (13.99)	29.86 (9.80)	7.93 (3.02)	8.63 (3.42)

TR Users	140	79.78 (9.94)	42.83 (6.69)	21.06 (3.12)	15.89 (3.01)	36.14 (13.00)	21.34 (7.97)	7.05 (2.71)	9.15 (4.32)
TR Non-users	317	75.32 (10.38)	39.71 (6.93)	20.21 (3.28)	15.39 (2.98)	38.16 (14.47)	22.32 (8.62)	7.44 (3.09)	10.00 (4.83)
F (3,816)		63.48***	54.03***	136.27***	196.52***	12.87***	17.77***	14.12***	28.92***

*** $p < .001$

IV. CONCLUSIONS and RECOMENDATIONS

This research investigated whether British and Turkish students' computer phobia levels differed on the scales and subscales of CARS and CTS when compared by culture, gender and computer experience. It emerged that 68% of the Turkish students and 67% of the UK students reported no computer phobia in response to the CARS, with residuals of 32% and 33% respectively reporting some level of computer phobia. Although these results are comparable with previous research (Mcilroy, Bunting, Tierney & Gordon, 2001; Weil & Rosen, 1995), the cross-cultural similarities found are not mirrored in the CTS findings, where 79% of the Turkish sample compared to 59% of the UK students is positive in their computer self-concept, leaving 21% and 41% respectively being classified as computer phobic at some level.

It may be debatable whether the term "phobic" is too strong to describe many of the students classified as such in this day when computer use is so extensive and prevalent (Rainer, Laosethakul & Astone, 2003). However, any form of diffidence or reticence in computer use at university level may prove a serious disadvantage to students in contemporary universities (Breen et al., 2001). It is important for this reason to continue to monitor students' attitudes to computers, especially if students from disadvantaged backgrounds are to enter university and the laudable goal of "wider participation" is to be fulfilled. There is sufficient evidence from the present study to suggest that a substantial number of students report a deficiency in confidence that may for some reflect a deficiency in competence in their approach to computer practice.

The cross-cultural similarities and differences reported in Table 2 are also reflected in the t-tests presented in Table 3, in which 7 of the 8 tests are statistically significant ($p < .001$). Equality of mean scores on the CARS between the two cultural groups, and higher mean scores for the Turkish students on the CTS mirror the patterns of the percentages in Table 2. However, comparisons at subscale level reveal trends that are contrary to the overall pattern (e.g. UK students are higher on one CTS subscale and one CARS subscale). Moreover, strong individual differences are evidenced by the standard deviations, demonstrating considerable overlap between the two groups, even where there are mean differences. It is evident therefore that there are differences both within and between the groups, and from this study there is no typical student pattern of responses that can be classified

as a cultural stereotype in computing (Weil & Rosen, 1995). The present study illustrates the added value of a subscale approach to the results in order to tease out patterns that may be disguised at scale level (Mcilroy et al., 2001).

The difference in response patterns observed in relation to the CARS and CTS measures confirm the contention of Szajna (1994) that more than one measure of computer phobia should be used. This study adds further value to the research by exploring indicators of actual computer use. Table 4 shows that in general positive self-concept is associated with more computer use. Moreover, negative attitudes are associated with avoidance, as suggested by the broader anxiety literature (Rachman, 1998). Although none of the associations is strong, the positive associations of CTS with use are stronger than the negative association of CARS with use. Perhaps this may suggest that the focus on positive computer self-concept may be the optimum method of enhancing computer use in students (Bozionelus, 2002).

In relation to gender differences, Table 5 shows that although there is little difference between Turkish males and females, both are higher on CTS than both UK males and females. This pattern is also reflected on the subscales PCLC and CE but is reversed on the NCC subscale. Moreover, in relation to CARS there is no difference in gender overall, but on the ICLA subscale, UK females have higher anxiety than Turkish males ($p < .001$). Also, on the CTA subscale both Turkish males and females had higher anxiety than their UK counterparts ($p < .001$). It can be concluded that gender differences across culture are evident on the CTS overall but not on the CARS, but these differences can be pinpointed more precisely with reference to the subscales. However, the cross-cultural differences are generally stronger than the gender differences. Although earlier research had identified gender differences, this was later found to be subsumed when controlling for other factors such as experience (e.g. Chua et al., 1999). The present study adds further information to this literature base by comparing gender within and between culture on identical response measures. Whether perception of gender equality in computer confidence and competence will translate into more women occupying traditionally male dominated vocations associated with IT remains to be seen (Tsai et al., 2001; Küskü, et al. 2007; Brown et al., 2008).

It can be seen in Table 6 that Turkish regular computer users overall had higher CTS than all other groups, and that the differences between Turkish regular users and non-regular users is explained by one subscale (NCC). Lowest scores of all across CTS scale and subscales are with UK non-regular users (this is also consistently lower than the scores related to gender reported in Table 5). When examined from the other standpoint (i.e. CARS), the pattern is the same in that the UK non-regular users are higher on overall anxiety score than all other groups although there are some minor variations on the subscales, CTA and OCLA. Again the mean score for UK non-users is higher on CARS than all gender groups reported in Table 6, and the same pattern is reflected in one subscale (ICLA).

At first glance it appears that regular use has more impact in explaining attitudes and approach to computers than gender when assessed by mean

comparisons. Experience has been found to be salient in explaining computer phobia over and above gender (Anthony, Clarke & Anderson, 2000). However, the present study has thrown up the anomaly that although Turkish non-regular users are less positive in their computer self-concept than Turkish users, they are more positive than UK users and non-users (CTS), and much less anxious than UK non-users (CARS). Perhaps this may be because non-regular use in Turkey is seen as more of an economic issue which therefore restricts opportunity and access to computers (Bozionelos, 2004; Tekinarslan, 2008), whereas UK non-regular users may see their behaviours as related to anxiety, avoidance and negative perception.

A strength of the study is the direct cross-cultural comparison between the two samples of students from a variety of study disciplines, and although some cross-cultural data are available (Weil & Rosen, 1995), this study is more recent and augments the previous research with the inclusion of comparative demographic material. The study is also consistent with the call to use more than one measure of computer phobia and to examine the phenomenon more comprehensively with reference to positive and negative indicators (Szajna, 1994; Bozionelus, 2002). The presence of anxiety may lead to inhibition or avoidance (Zeidner, 1998), but the absence of positive self-concept may reflect lack of motivation or even negative perception of the value of the targeted behaviours. A further strength of the findings is the quality of the data in that reliabilities are high, correlations are in the expected directions, measures have successfully elicited both individual differences and group differences and the demographic measures have identified groups of students within each sample that may have problems in their attitudes and approach to computers.

An additional strength of the study is the association of the two computer phobia measures with various indicators of computer practice relevant to undergraduate study programmes. Although this was limited to self-report measures in this study, and may therefore suffer from problems stemming from "common method variance", it is at least an attempt to look at specific and relevant computer practice.

Although it may be argued that self-report methods are prone to response distortion, social desirability and impression management, it can be retorted that there is minimal reason for this to happen in the present study given that students were not assessed on the exercise and were assured that their responses would be anonymous in a quantitative analysis. Given such conditions, it is argued that self-report measures may be advantageous because students are best placed to estimate their own aggregate behavioural patterns over time and across situations. Moreover, even if perceptions are somewhat distorted, it is conceivable that perception may be just as motivating or de-motivating as reality (Bunz, Curry & Voon, 2007).

In spite of the above arguments, it would be a useful complement to the present research to monitor behavioural indicators of computer practice such as attendance at computer classes or the number of times (and duration) that students

access IT facilities related to their study programme. What still remains an uncertainty is the extent to which computer use translates into overall academic enhancement or achievement. Although the facilities are in place to enhance performance (e.g. electronic journals facilitate up-to-date literature searches) there is no guarantee that duration of time spent using computers equates with quality outcomes in terms of overall academic achievement. Also, students with less computer skills may work hard to compensate for this with concerted attention to other academic pursuits. Furthermore, excessive use of computers could prove to be a distraction for some students, and perhaps therefore complementary research for the future could address the role of computer addiction in the academic setting.

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