# An evaluation of two clinically-derived treatments for technophobia

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Abstract:

Technology is ubiquitous in our occupational, educational and leisure lives. A fear of interacting with technology can therefore have a major impact on the quality of an individual's life. This is particularly salient within education as an inability to maximise the benefits of technology may limit academic achievement and subsequent opportunities in life. The severity of the anxiety induced by technology has lead to a plethora of research into the prevalence of 'technophobia'. This term may have clinical relevance and has been found to be comparable in severity to more traditional phobias (Thorpe and Brosnan, 2001). This paper presents two studies examining the effect of clinically derived treatments upon levels of anxiety induced by technology. Study one was a 10-week selective desensitisation programme with 16 participants (8 computer anxious, 8 non-anxious). Over this period computer anxiety and coping cognitions were significantly improved in the computer anxious group and become comparable to those of the matched non anxious controls. Study two was a single treatment session for anxiety. 30 Individuals identified as anxious were assigned to either a one-session treatment (n=9) or non-treatment (n=21) group. Initially both groups were significantly more anxious than the non anxious control group (n=59). Subsequent testing established that over the period of an academic year the reduction in anxiety was three times greater in the treated group than the non-treated group such that by the end of the year the treated group no longer differed from the control group, whereas the non-treated group remained significantly more anxious. The implications and limitations of the studies are discussed.

> "I believe I am absolutely, wildly, technophobic. Even when I hear people on the telephone telling me to do various things, I cannot do it. I cannot do my video. I have never used my cash card in the bank and I do not know how to use a computer, I am absolutely terrified…" (C.V.).

The quote above came unprompted from a participant asked to take part in a study examining technophobia in the twenty first century. Technophobia refers to a heightened level of anxiety induced by Information Technology (IT), typically computers, and can be defined as 'an irrational anticipation of fear evoked by the thought of using (or actually using) computers, the effects of which result in avoiding, or minimising, computer usage' (Brosnan, 1998a: 17). This definition draws upon a plethora of research that has identified significant levels of technophobia in virtually every population tested such as the Police, Teachers, Office workers, College students, school children and the General Public (Bonzionelos, 1996; Brosnan and Davidson, 1996; Marcoulides, Mayers and Wiseman, 1995, Rosen and Weil, 1995, Todman and Dick, 1993; See also Brosnan, 1998a; Brosnan and Davidson, 1994; Chua, Chen and Wong, 1999; Maurer, 1994; Rosen and Maguire, 1990; Whitely, 1997). These studies, reviews and meta-analyses consistently report that around a third of all those sampled report a heightened level of anxiety when faced with technology. In one of the larger studies of around 1,300 college students, Rosen, Sears and Weil (1993) report that 37% registered as technophobic. Within the technophobic sample, a far smaller proportion, typically around 13%, report far more aversive reactions to technology, such as sweaty palms and heart palpitations (Rosen et al., 1993). This constitutes around 5% of the entire sample exhibiting classic signs of an anxiety reaction in the presence of IT. People experiencing this level of technophobia are comparable (i.e. not significantly different) in measures of anxiety and phobic

beliefs to those with spider phobia – both groups significantly differing from controls (Thorpe and Brosnan, *in press*). In both cases, individuals may additionally express fear of coming to harm, of losing control or of panicking.

There can be little doubt that the anxiety induced by technology constitutes 'a real phenomenon' (Moldafsky and Kwon, 1994: 302, see also Anthony, Clarke and Anderson, 2000; Bozionelos, 2001; Brosnan, 1998, Gurcan-Namlu and Ceyling, 2003; Rosen and Maguire, 1990) the assessment of which demonstrates both reliability and validity (Chua et al., 1999; Dukes, Discenza and Couger, 1989). Whilst the term technophobia has been used to describe those uncomfortable with and anxious about IT, not all of these individuals would be comparable to traditional clinically-defined phobias. The evidence above, however, suggests the possibility that around 1 in 20 may experience a level of technophobia that is comparable to the more traditional clinically-defined phobias: a figure that has remained remarkably consistent (Todman and Day, *in press*).

The research above suggests that there are a number of overlaps between technophobia and specific phobia as defined by DSM-IV (300.29). There are 7 diagnostic criteria for a specific phobia (p.410-411). These are: (a) an excessive or unreasonable fear is cued by a specific object or situation; (b) exposure to the object invariably provokes an immediate anxiety response; (c) the person recognises that the fear is unreasonable; (d) the phobic situation is avoided or endured whilst anxious; (e) the avoidance or anxiety is distressing or interferes with the person's (academic, occupational, social) life; (f) the phobia is not better accounted for by another mental disorder and finally for children (g) that the duration is at least 6 months. Although the definition of technophobia (see above) was drawn by synthesising the literature on

computer anxiety (see Brosnan, 1998 for a review) it clearly overlaps with these diagnostic criteria, specifically a to e. Concerning criteria (f), it has also been demonstrated that computer anxiety is independent of trait anxiety and does not represent an additional focus of anxiety for generally anxious individuals (or individuals anxious about mathematics; see Rosen and Maguire, 1990 for a meta analysis).

Age and ethnicity are not factors that affect technophobia, although as with spider phobia, females are over represented within the phobic groupings (see Rosen and Maguire, 1990 for a meta analysis). DSM-IV reports that up to 90% of those experiencing specific phobias are female. This is consistent with the computer anxiety research (Brosnan and Davidson, 1994) which has given rise to the term 'The Digital Divide' to reflect the inequality of opportunity that has prevented some females from fully taking part in, and benefiting from, the technological revolution (Cooper and Weaver, 2003). The other major demographic variable of interest is the amount of experience of computing. Those suffering from technophobia have less computer related experience than those who are not (Maurer, 1994; Rosen et al., 1993). As one of the consequences of technophobia is to avoid or minimise the amount of experience gained, this is unsurprising. The relationship between experience and anxiety in the computer anxious is confounded by the fact that additional experience appears to exacerbate rather than reduce their technology-related anxiety: 'far from curing their computerphobia, each additional computer experience strengthens their negative affective reactions and promotes further computer avoidance' (Rosen and Maguire, 1990: 187). The detrimental effects of computer-related experience for

people with technophobia and the similarity of technophobia to traditional phobias has lead Rosen et al. (1993) to call for clinically based interventions.

The understanding of the topic has suffered to some extent from the misappropriation of Seligman's ideas about the place of phobic fear as an evolved adaptation. According to Seligman, phobic fear 'is by definition not readily inhibited by rational means' and 'prepared conditioning is not readily modified by information' (Seligman 1971: 316). For a time, the idea became prevalent that only those stimuli relevant in our ancestral /evolutionary past would become the object of phobic response - this led to misunderstanding of the importance of the cognitive element in the aetiology and maintenance of specific phobias and to the restriction of investigation to common and easily understood (in terms of our hominid past) phobias such as spiders, snakes heights and thunderstorms. In fact, almost any object can become the object of a phobia, including buttons, rhubarb leaves and the bottoms of boats (Thorpe and Salkovskis, 1995, 1997a), many of which defy a simple evolutionary explanation – as is the case with technophobia. Indeed, the role of negative cognitions associated with technophobia has been highlighted by several authors (Heinssen, Glass and Knight, 1987; Smith and Caputi, 2001).

Despite the plethora of research into technophobia, there is little research utilising clinically based interventions. A notable exception is the work of Rosen and Weil (Rosen et al., 1993; Weil et al., 1987) who developed a successful treatment programme based upon the traditional anxiety reduction technique of systematic desensitisation (SD: Wolpe, 1958; 1982). Rosen et al.'s (1993) findings suggested that an SD programme did reduce anxiety and that this effect was long-lasting, resulting in

reduced drop out and higher grades at college. This is consistent with Bozionelos (2001) who has found that the greatest reductions in computer anxiety are associated with earlier computer experiences. Experience has little impact on the computer anxiety of those low in computer anxiety.

College/university students are an important sector of the population to investigate with regard to technophobia: during a psychology student's first year for example, they are required to undertake a great deal of IT-related work, whether it be word processing, statistical analysis or searching the Web or databases. A fear of technology sufficient to inhibit the utilisation of these resources will therefore have a detrimental impact upon the student's learning experience. If this technophobia is comparable in terms of amount of distress, range of underlying cognitions, and is associated with the kinds of escape/avoidance behaviour patterns found in specific phobia (Thorpe and Salkovskis 1998) then it should share some of the underlying beliefs found in these phobias and should be equally susceptible to those treatment strategies found to be successful with people who have specific phobias.

The aim of this paper is therefore twofold. Firstly to conduct a SD computer anxiety reduction programme, extending beyond the assessment of computer anxiety to examine the phobic factors identified by Thorpe and Salkovskis (1998) of coping, harm and disgust; and secondly to evaluate the impact of a single treatment programme (Öst,1989; Öst and Hugdahl 1981; Öst, Salkovskis and Hellström 1991; Thorpe and Salkovskis, 1997) on anxiety responses and these targeted variables.

STUDY 1

Participants:

16 participants were drawn from a student population in a North American college that drew heavily upon local residents returning to education, part time. 8 were identified as suffering from technophobia and 8 were matched non-anxious controls. The treatment group consisted of individuals who volunteered to take part in a Technophobia Reduction Programme (TRP). The controls were matched for age, sex, ethnicity and academic level. There were 6 females (75%) and 2 males in each group and 50% of each group was black and 50% white. Ages ranged from 29-50 with mean of 43 and 40 (respectively, t=0.57, df=15, ns).

Design:

At the beginning off the programme (T1), phobic beliefs were assessed using the phobic beliefs questionnaire (Thorpe and Salkovskis, 1995 - which was initially based on the Agoraphobic Cognitions Questionnaire, Chambless, Caputo, Bright and Gallagher, 1984). For the phobics belief questionnaire, the word 'computer' was substituted for the word 'spider' (both versions elicit comparable levels of response in people with technophobia and those with spider phobia respectively; Thorpe and Brosnan, *in press*). Participants rated how much they believed each of 31 statements to be true on a scale of 0 (I do not believe this thought at all) to 100 (I am completely convinced this thought is true) while imagining that their phobic object is in the room with them. Questions belonged to three categories: harm (e.g. "I would have a heart attack"); coping (e.g. "I would not cope with it"); and disgust (e.g. "I would find it

repulsive"). All three subscales of the phobic beliefs questionnaire were retained to be consistent with previous phobia research.

Participants were also asked to complete the Clinically-Derived Assessment of Technophobia (C-DAT, Brosnan and Rosen, 2001) using the same scale as above from 0 (strongly agree) through to 100 (strongly disagree). This has 6 items derived from the DSM-IV criteria. These were: For anxiety (DSM criteria a-d): 1) My anxiety about computers bothers me. 2) I always feel anxious when using computers. 3) I am more anxious about computers than I should be. 4) I go out of my way to avoid using computers. 5) It is easy for me to use computers. And for importance (DSM criterion e): 6) It is important for me to be able to use computers. This is scored as the phobic beliefs questionnaire but the scale is reversed such that as low score indicates high levels of anxiety. Typically factor analysis reveals 2 factors: anxiety (5 items) and importance (1 item) (Brosnan and Rosen, 2001). A principal components factor analysis (no rotations) confirmed that this structure was valid for this sample accounting for 80% of the variance (60% and 20% respectively).

Participants were also asked whether they were especially afraid of any of the following: Animals, Heights, Closed spaces, Blood/ injury or any other typical specific phobia types but these were not in evidence. Participants were also asked for their age, sex and computer-related experience.

The technophobia Reduction Programme:

A full account of the Technophobia Reduction Programme including its rationale appears in Brosnan, 1998 ( chapter 9) and all participants were supplied with a copy. The programme stresses that computer skills are acquirable (Martocchio, 1994), challenging and beneficial (Crable, Brodzinski, Sherer and Jones, 1994). The use of a friend to model appropriate behaviour using software is encouraged (Gist, Schwoerer and Rosen, 1989; Keeler and Anson, 1995; Leso and Peck, 1992). The TRP is based upon systematic desensitisation programme within which participants develop an individual hierarchy of imagined scenes increasing from low anxiety through to high anxiety situations. Participants then learn to relax in the situation identified as the lowest level of the hierarchy. This can be imagined first before actually attempted. The tasks are then undertaken by the participants and progression up the hierarchy occurs one step at a time, only when perceptions of anxiety have been replaced by perceptions of relaxation at each level.

At the initial group meeting students were asked to undertake the following activity:

'Imagine a scale of anxiety where 0 =no anxiety at all; 10 = only very slightly anxious through to 100 = extremely anxious. Now think of 1 activity that relates to each of the different levels of anxiety for you'. Participants were then presented with a visual analogue scale from 10 (low anxiety) to 100 (high anxiety). The aim was for participants only to attempt the first task, that they had rated as producing only a low anxiety response (with a value of 10) in the first week. Examples of this included not directly interacting with computers ('watching someone else typing into a computer', 'reading about computers') and simple (typically single-click) tasks ('printing a document', 'turning the computer on'). Task 2 (rated 20) to be attempted in week 2

and so on until task 10 (rated 100) was attempted in week 10. Examples of this included using a wider range of hardware or software ('copying files to a floppy disk', 'send email', 'using the Internet') and using a computer publicly ('using a computer in front of someone else').

Each week participants were presented with a time sheet that asked them to log the time spent on the week's task (in minutes) and the feeling of anxiety (from 0 to 100) at the beginning of each task – every time the task was attempted throughout the week. Participants were also asked to detail any non-TRP computer-related activity. The following week, the logs were collected and the next week's logs distributed. This also served as a check that participants felt able to move up to the next level. At the end of the programme (T2) the phobic beliefs and anxiety measures were re-administered and participants were fully debriefed. Two weeks later, participants were asked for their perceptions of the programme. The six responses to this request (75%) appear at the end of the results section. The controls underwent the initial and final assessment sessions, experiencing no intervention in between these times.

## Results

From the logs collected from the participants, the mean times and numbers of tasks attempted were collated. For the programme as a whole a mean of 948 minutes (sd=437; range=292-1766 mins) was spent on the programme. The tasks were attempted a mean of 45 times (sd=29; range=10-93) with a mean anxiety rating across all tasks of 39 (sd=19; range= 18-65). On average, participants spent around 95

minutes per week attempting each task 4 to 5 times – an average of around 20 minutes each weekday.

Table 1 around here

Table 1 contains the means and standard deviations for anxiety and the phobic beliefs (coping, harm, disgust) at the beginning of the programme (T1) and the end (T2) as well as the differences (D) between T1 and T2. The groups were matched for age, sex and subject studied but did differ significantly in anxiety ($t=3.26$, $df=14$, $p<0.01$) at T1. By T2, this difference became non-significant ($t=1.00$, $df=14$, ns). The technophobic group improved by almost 25 points compared to 2 points for the controls, which was very close to significance ($t=1.76$, $df=2$, $p=0.0505$). At T1, The technophobic significantly differed from the controls on all of the anxiety items separately, with the exception of item 4 ‘it is important for me to use computers’. Both groups strongly agreed with this statement. There were no significant differences for the separate items at T2.

A cut off point of 40 (or more) has been used to identify phobic levels on the belief questionnaire (60 or less for coping which scales in the opposite direction, Thorpe and Salkovskis, 1995). At T1, the technophobic group fit into this definition but by T2, the technophobic group were within the normal range. With the exception of the importance item, all separate anxiety items had a mean below 40 at T1 and above 40 at T2 for the technophobic group (controls were always above 40).

At T1 the technophobics were lower in coping cognitions (t=1.69, df=13, p=0.0507), higher in harm (t=3.51, df=14, p<0.01) and disgust (t=2.08, df=14, p<0.05) which were not significant at T2 (coping t=0.15, df=13, ns; harm t=1.19, df=13, ns; disgust t=1.59, df=13, ns). The differences in improvement were significant for coping and harm but not disgust (t=1.92, df=12, p<0.05; t=2.84, df=13, p<0.01; t=0.84, df=13, ns) as would be expected, as disgust is an emotion not necessarily relevant to the issue of computer anxiety and those items were only included in the study in the interest of consistency with previous research..

A within-participant analysis confirmed that the difference across time was significant for the technophobics for anxiety (t=2.47, df=7, p<0.05), coping (t=2.42, df=7, p<0.05) and harm (t=3.52, df=7, P<0.05) cognitions but not for disgust cognitions t=1.65, df=7, ns). The difference across time was not significant for the controls (anxiety t=0.24, df=7, ns; coping t=.17, df=5, ns; harm t=0.88, df=6, ns; disgust t=1.44, df=6, ns), indicating that the treatment was effective in changing beliefs about the consequences of interacting with computers.

As mentioned above, a cut off point of 40 (or more) has been used to identify phobic levels on the belief questionnaire (60 or less for coping which scales in the opposite direction, Thorpe and Salkovskis, 1995). Lack of coping cognitions were endorsed at the phobic levels at T1 but not at phobic levels for harm or disgust cognitions (i.e. less than 40). Coping cognitions were within the normal range by T2. Although there were significant differences in both harm and disgust cognitions, these differences are not within the phobic range of greater than 40 identified by Thorpe and Salkovskis (1995).

Additional qualitative information:

After the researcher had left the institution, participants were asked for their comments concerning the programme by an interested member of permanent Faculty staff.. After the comments had been submitted, participants were asked whether the comments could be forwarded to the researcher or not. The concluding remarks from the 6 participants who gave their permission for the comments to be reproduced appear below (there was no response from the remaining 2):

P1) This class has helped me face my fears about computers. I have been able to decrease my anxiety over computers and increase my knowledge of computers. I now feel more confident and capable when it comes to computers.

P2) I learned a lot about anxiety and how I'm affected by it. At the same time, I learned some valuable computer skills. I realized that computers are everywhere and it is better that everyone learns to feel comfortable using them.

P3) When I volunteered for this project, I had never been on a computer. I would not even think about a computer at all. I would write my papers and have my sister type them for me. Even though I still have some anxiety when it comes to the computer, this project has helped me out a lot. I now have a computer in my home and I even typed my last two papers for this class on my computer.

P4) Some basics can be drawn: First, the admittance that I'm anxious about computers and verbal self-persuasion can be used to overcome my fears. Second, that watching someone else work on the [computer] was very helpful in alleviating my discomfort and fears. Lastly, after doing many functions on the P.C., I found that exploring beyond just the minimal is becoming easier on the computer. I now feel empowered to use the computer at home in a way that is completely within my comfort zone.

P5) I am aware that my anxiety has dramatically lowered. The reduction program worked for me and was well worth the weeks of time and effort. I have noticed other changes too. I no longer stumble over my words when I talk about computers, the quality of my work has increased, and I have opened up to the enjoyment of looking through the Internet for my own interests. Even though I did not come out of the program able to do complicated tasks on computers, I accomplished something more important. I got rid of the anxiety that prevented me from learning about them in the first place.

P6) I believe the program was a success because I no longer avoid computers and my confidence level has greatly increased.

Discussion:

There is some support for the hypothesis that the Technophobia Reduction Programme would result in a lowering of levels of anxiety relating to computers. Assessments of computer anxiety were significantly improved as were beliefs about coping. The data suggest that the programme reduces phobic levels of anxiety and inability to cope, to within the normal range. This is interesting as coping skills were not explicitly taught. The only explicit instructions were relaxation-based. The reports written by participants confirm this. All participants report that they subjectively feel less anxious and more confident, for example participant 4 reported 'I now feel empowered to use the computer…'. The tangible benefits are evident in the report for participant 3 who now types up her own essays rather than writing them up by hand and getting her sister to type them up for her. The ethos of the programme is reflected in participant 5 who reported 'Even though I did not come out of the program able to do complicated tasks on computers, I accomplished something more important. I got rid of the anxiety that prevented me from learning about them in the first place'.

The method proved successful, both in terms of responses to formal assessments and self-perceptions. Additionally, the input from those administering the programme is minimal for most of the programme, typically an hour a week for collection/ distribution of the log sheets (though the initial and final sessions require longer). The group did not report any additional contact with one another as a result of being on the TRP suggesting the programme could be extended to larger numbers. Methodologically, this may allow for the provision of a random allocation to control

and treatments groups, which would be beneficial in evaluating the TRP. It is possible the treatment group would have improved anyway but unlikely, given that they were around 40 years of age and demonstrating technophobia in the final stages of their return to education. 10 weeks is also a significant proportion of an academic semester. If the same benefits could be gained from a shorter clinically-derived treatment, this would also be advantageous. Finally, identifying long term effects of a treatment programme would enhance the evaluation.

STUDY 2:

Study one was successful in anxiety reduction and improving the coping factor associated with phobic beliefs (Thorpe and Salkovskis, 1998) to levels comparable to those found in the non-anxious group. There is evidence to suggest that Technophobics experience similar levels of anxiety to that found in spider phobics (Thorpe and Brosnan, *in press*) and one session treatment has been found to be successful with a variety of phobias including spider phobia (Öst,1989; Öst and Hugdahl 1981; Öst, Salkovskis and Hellström 1991; Thorpe and Salkovskis, 1997) and blood-injury phobia (Öst, Sterner, and Fellanius, 1989).

Thus the second study applies a single session anxiety intervention to people presenting themselves as technophobic. It randomly allocates these participants the intervention or non-intervention group and evaluates the effectiveness of the intervention after an academic year.

Methodology:

Participants:

89 psychology undergraduates were assessed at the beginning and end of their first academic year at University (September and June). 74 (83%) were female, which is consistent with psychology majors across Europe and the USA (Radford and Holdstock, 1995; 1996). The participants' ages ranged from 18 to 41 with a mean age of 21 years (s.d. = 5 years). 85% were 21 or under.

Design:

The original groups were derived from measures used in the diagnosis of more established phobias. Spider phobics report a mean of 40 (s.d. 25) on the first item of the visual analogue scale ('I am anxious about spiders', see above) which is consistent with the demarcations used for grouping phobics in the published literature (Thorpe and Salkovskis, 1998). As the anxiety scale is in the reverse direction (low scores identify high anxiety), technophobics were therefore identified as those with an anxiety score of 60 or below (see Thorpe and Brosnan, in press). This resulted in a third of the sample as being identified as technophobic, which is consistent with the literature described in the Introduction. Those with a score of 60 or below were then randomly allocated to either the treated or nontreated experimental groups. However, due to an administrative error, 5 of those assigned to treatment were accidentally assigned to nontreatment. Although this made for unbalanced groups, it was felt to be preferable to retain all participants within their original allocation and retain them all

within the analysis. The remaining participants formed the control group for comparison. The groups comprised:

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|---|---|---|---|
| Controls: | 47 (80%) females | 12 males | 59 total |
| Treated | 8 (89%) females | 1 male | 9 total |
| Nontreated | 19 (90%) females | 2 males | 21 total |

There were no significant age differences between groups ($F=1.1$, $df=2,87$, ns). 93% of the experimental groups were 21 or under.

Procedure:

Participants were assessed twice. Time 1 (T1) was in the first week of academic term in September. Time 2 (T2) was at the end of this first academic year in June (10 months later). On both occasions the participants were assessed with the C-DAT and Phobic questionnaires described in study 1. An initial question was added to assess perceived tolerance of the stimuli (after Thorpe and Salkovskis, 1998) 'confident are you that you would be able to tolerate being in the same room as a computer right now '. The scale ranged form 0 (not at all confident) to 100 (totally confident).

The Clinically-Derived Assessment of Technophobia was again used, as described in study 1. State and Trait anxiety (Speilberger, 1996) were also assessed to confirm that technophobics did not differ from controls on these variables. Given the independence of these variables to computer anxiety, the single intervention

programme was thought unlikely to impact upon these variables but assessments were taken at the beginning and end to examine this issue.

At T1, participants were asked their age and sex and how many hours per week were spent using a computer (on average) at home and work/college.

The control and untreated groups received no further intervention. The treated group underwent a single one hour intervention session (Thorpe and Salkovskis, 1997) and were given a small book, 'Controlling anxiety' (Fennel and Butler, 1985). A single session of this type has been shown to have long-term beneficial effects (Öst,1989; Öst and Hugdahl 1981; Öst, Salkovskis and Hellström 1991; Thorpe and Salkovskis, 1997).

Multivariate statistics were used to identify the differences between the three groups, followed by T-tests which were primarily used to be consistent with the analysis from study 1. T-tests were conducted between the two experimental groups (treated and nontreated). Both groups were then compared to the control group. As there are two testing sessions, it is also possible to conduct a within-participant analysis (paired-sample T-tests). It was predicted that the treated group would improve to a greater degree than the nontreated group. When comparing to the control group, non-directional hypotheses are made as the means after treatment may be higher or lower than the control group. Occasionally participants did not complete all items, which leads to a small variation in the degrees of freedom reported.

Results:

As would be expected, the control groups used computers twice as much as the experimental groups (12 hours vs. 6 hours per average week) which was significant (t=2.7, df=84, p<0.01). A multivariate analysis revealed that at the beginning of the study (T1) there were group differences in anxiety (F2,85=44.66, p<0.001), Disgust $F_{2,56}$=5.04, p=0.01) and tolerance ($F_{2,54}$=17.91, p<0.001) but not Coping ($F_{2,82}$=1.09, ns) and harm ($F_{2,84}$=1.27, ns). Similarly at the end of the study (T2) there were group differences in Anxiety ($F_{2,86}$=11.05, p<0.001) and Tolerance (F2,87=11.58, p<0.001) but not the cognitions (Coping $F_{2,84}$=1.57, ns; Harm $F_{2,86}$=1.89, ns; Disgust $F_{2,87}$=1.13, ns). When examining the group differences between T1 and T2, there were significant differences for Anxiety ($F_{2,87}$=10.28, p<0.001), Coping ($F_{2,80}$=5.59, p=0.005), Disgust ($F_{2,56}$=6.49, p<0.005) and Tolerance ($F_{2,54}$=11.22, p<0.001) but not Harm ($F_{2,83}$=0.43, ns). The means for all the variables are shown in Table 2, with a T-test analysis of group differences where the multivariate statistics identified group differences.

TABLE 2 ABOUT HERE

Comparison between the two experimental groups: treated and nontreated.

Table 2 shows that there were no differences between the two technophobic groups at T1. By T2, the treated group had less anxiety than the non-treated group (t=1.8, df=28, p<0.05). Relatedly, the difference in anxiety between T1 and T2 was greater for the treated group than the non-treated group (t=1.8, df=27, p<0.05). The increase in coping cognitions was approaching significantly improving for the treated group

(t=1.65, df=27, p=0.056). Finally, the tolerance for computers was higher at T2 for the treated group than the non-treated group (t=2.1, df=28, p<0.05).

Comparisons within each group

A paired t-test analysis confirms that the difference in anxiety is significant for the treated group (t=3.4, 8, p=0.005) but not quite for the nontreated group (t=1.6, 19, ns). Similarly there is an increase in coping cognitions and a decrease in disgust cognitions with no change in harm cognitions for both experimental groups (treated t=3.2, 8, p<0.01; t=2.1, 8, p<0.05; t=1.3, 8, ns; nontreated t=2.6, 19, p<0.01; t=2.7, 14, p<0.01; t=0.4, 19, ns; respectively). There were no within-participant differences for the control group.

Comparisons between the experimental groups and the control group

As one would expect there was a significant difference at T1 in computer anxiety between the control group and both the treated and non-treated experimental group (t=8.4, df=61, p<0.001; t=9.6, df=72, p<0.001) and tolerance (t=4.3, df=39, p<0.001; t=6.0, df=45, p<0.001). There were no significant differences in coping or harm cognitions but there was in disgust cognitions (t=3.1, df=41, ns; t=3.0, df=47, ns).

At T2 there were no significant differences between the control group and the treated group. The nontreated experimental group, however, still significantly differed from the control group in anxiety (t=4.9, df=73, p<0.001) and tolerance (t=4.5, df=73, p<0.001).

Examining the changes between T1 and T2, the control group changed less than both the treated and non-treated experimental groups in anxiety ($t=4.7$, $df=61$, $p<0.001$; $t=2.4$, $df=72$, $p<0.05$) disgust ($t=2.8$, $df=41$, $p<0.01$; $t=3.4$, $df=47$, $p<0.001$) and tolerance ($t=4.3$, $df=39$, $p<0.001$; $t=3.4$, $df=45$, $p<0.001$). Additionally, the difference in coping cognitions was significant between the control group and the treated group ($t=3.0$, $df=60$, $p<0.005$) but not significant between the control the non-treated group ($t=1.8$, $df=71$, ns).

Comparisons with State and Trait Anxiety

There were no between groups differences in state or trait anxiety. The two experimental groups did not differ from each other in state or trait anxiety at the beginning or end of the study. Similarly the 2 experimental groups did not differ from the control group in state or trait anxiety at the beginning or end of the study (all $p>0.05$). Examining the within participant differences also confirmed that there were no significant differences in trait anxiety for all three groups between the beginning and end of the study. There were within-participant differences in state anxiety, however. Both experimental groups significantly reduced levels of state anxiety (treated: $t=4.0$, $8$, $p<0.005$; nontreated: $t=3.1$, $13$, $p<0.01$; control: $t=0.9$, $34$, ns) between the beginning and end of the study.

Examining covariates with changes in anxiety

Conducting ANCOVAs revealed that the differences in anxiety by intervention group remained significant with changes in all three types of belief were entered as covariates (Coping, Harm and Disgust, $F_{2,50}=4.38$, $p<0.05$) , when change in tolerance was entered as a covariate ($F_{2,53}=3.24$, $p<0.05$) and when change in state anxiety was entered as a covariate ($F_{2,54}=8.28$, $p<0.001$).

Discussion:

There were no differences between the experimental groups at the beginning of the study. By the end of the study, the group who had taken part in the intervention were significantly less anxious than the anxious control group to the extent that they did not differ significantly from the control group. The untreated group, however, remained significantly more anxious than the controls (and the treated group by the end of the study). This pattern is repeated in the tolerance item with the treated group feeling significantly more confident of being able to tolerate being in front of a computer. The within-participant analysis highlighted a significant reduction in the treated group that did not occur in the untreated group. Although there were reductions in the phobic beliefs of the treated group, the data suggest that changes in phobic beliefs, tolerance or state anxiety did not underpin the reduction in anxiety.

There were small variations in the harm and disgust cognitions but the means were very low (between 0-10 on a 0-100 scale). The experimental group did score significantly higher on the disgust subscales at the beginning, but not at the end of the study. This suggests that phobic beliefs concerning disgust, whilst not at phobic levels in this group of technophobics, are a significant factor, though the interpretations of

the disgust belief items is likely to be different in this group to those typically found in more disgust-relevant phobias.

Obviously the treatment was not the only IT-related experience the participants had during the study. The non-treated group did improve their levels of anxiety and coping cognitions during this period. However, it is interesting to note that the one-hour treatment session tripled the effect of anxiety reduction that experience alone may have contributed. This is equivalent to the size of the effect (3.5 times) reported by Rosen et al. (1993)

It is important to note that participants in Study 2 have been continuously exposed to IT throughout their academic experience, from the age of 5 onwards. School children's experience of IT between the ages of 5-18, appears to be resulting in some college-bound students who are technophobic – in some cases as anxious about IT as spider phobics are about spiders (Thorpe and Brosnan, *in press*). Study 2 identified that a third of the sample was to some extent technophobic, which is consistent with the literature. The classification process, however, used an item matched from an assessment of spider phobia, suggesting that people with technophobia are as anxious about computers as people with spider phobia are about spiders (on this item at least). Obviously a diagnosis would be based on more than a response to one item but the results are consistent with Bozionelos (2001) who found that an earlier exposure to technology has increased levels of anxiety about technology and that computer anxiety is prevalent in college students.

Conclusion:

The aim of the paper has not been to pathologise technophobia but to highlight it as a legitimate issue for up to a third of the population. With one in 20 experiencing levels of anxiety comparable to traditional phobias (and one in three on specific items) treatment may be an appropriate option. These studies have demonstrated that relatively simple clinically-derived anxiety reduction techniques have a significant impact on perceived levels of technophobia. Many colleges have an individual qualified to perform such a procedure, quickly and efficiently. A 1-hour treatment session demonstrated a tripling in the anxiety reduction over an academic year. The impact of such a brief intervention has been demonstrated, however further research is required to better understand the processes that underpin anxiety reduction.

The Implications also extend beyond education. As many clinical assessments become computerised, computer anxiety can impact upon the performance of the participant on the measure (Browndyke, Albert, Malone, et al., 2002). This is significant as validation of computerised versions of traditional assessments are unlikely to involve technophobics in validation studies. Technophobia has also been identified in almost all occupational settings. As anxiety reduction has been demonstrated to improve academic attendance and the quality of academic work, it seems highly probable that organizations can benefit from addressing this issue. A survey of 10,000 UK office workers identified 25% who reported some symptomatology, and undiagnosed anxiety conditions typically accounted for more days off work that backache and stomach upset (Summerskill, 2001). Technophobia can manifest itself in clinical proportions resulting in severely negative outcomes. This paper has highlighted that technophobia should be addressed as a serious issue

and that great gains can be made through the application of clinically-based anxiety reduction techniques.

Table 1: Comparison between treated and control groups

| N=8,8 | Technophobes | Controls | P |
|---|---|---|---|
| T1: Anxiety | 19.4 (13.5) | 54.0 (26.8) | P<0.01 |
| T1: Coping | 50.2 (17.7) | 65.7 (17.6) | P=0.057 |
| T1: Harm | 16.3 (10.2) | 2.6 (4.3) | P<0.01 |
| T1: Disgust | 9.5 (10.0) | 1.8 (3.1) | P<0.05 |
| | | | |
| T2: Anxiety | 44.3 (21.2) | 55.9 (25.4) | Ns |
| T2: Coping | 64.3 (12.3) | 63.4 (11.3) | Ns |
| T2: Harm | 4.1 (5.1) | 1.5 (2.8) | Ns |
| T2: Disgust | 5.0 (8.3) | 0.0 (0.0) | Ns |
| | | | |
| D: Anxiety | 24.9 (28.5) | 2.0 (23.6) | P=0.0505 |
| D: Coping | 14.1 (16.5) | 2.3 (10.7) | P<0.05 |
| D: Harm | 12.2 (9.8) | 1.1 (3.3) | P<0.01 |
| D: Disgust | 4.5 (7.7) | 1.8 (3.4) | Ns |

Key: T1: Time 1 at the beginning of the academic semester; T2: Time 2 – 10 weeks later; D: Difference between T1 and T2.

Table 2: Comparison between treated and non-treated experimental groups, which are both compared to a control group.

| | treated | non-treated | P | Control | P Treat | P non |
|---|---|---|---|---|---|---|
| T1: Anxiety | 42.0 (17.0) | 45.4 (15.2) | Ns | 72.4 (8.6) | <0.001 | <0.001 |
| T1: Coping | 58.7 (22.2) | 61.9 (15.2) | | 66.2 (17.2) | | |
| T1: Harm | 6.8 (5.5) | 7.3 (8.8) | | 4.9 (6.5) | | |
| T1: Disgust | 8.6 (9.9) | 10.2 (14.9) | Ns | 2.2 (3.7) | <0.005 | <0.005 |
| T1: Tol | 48.9 (35.5) | 50.7 (20.5) | Ns | 84.4 (16.6) | <0.001 | <0.001 |
| | | | | | | |
| T2: Anxiety | 64.3 (12.6) | 53.1 (16.6) | <0.05 | 70.5 (12.0) | Ns | <0.001 |
| T2: Coping | 75.1 (16.3) | 69.5 (14.1) | | 66.9 (14.5) | | |
| T2: Harm | 3.4 (5.2) | 6.4 (6.9) | | 3.8 (5.2) | | |
| T2: Disgust | 1.4 (4.3) | 4.5 (10.1) | | 2.2 (4.8) | | |
| T2: Tol | 92.2 (10.9) | 75.2 (22.5) | <0.05 | 93.1 (11.0) | Ns | <0.001 |
| | | | | | | |
| D: Anxiety | -22.2 (19.9) | -7.8 (20.6) | <0.05 | 2.0 (13.4) | <0.001 | <0.05 |
| D: Coping | -16.3 (15.4) | -7.4 (12.6) | =0.056 | -0.9 (14.0) | <0.005 | Ns |
| D: Harm | 3.3 (7.5) | 0.6 (7.4) | | 1.0 (8.0) | | |
| D: Disgust | 7.1 (10.1) | 9.0 (13.0) | Ns | 0.0 (5.7) | <0.01 | <0.001 |
| D: Tol | -43.3 (30.4) | -30.7 (24.9) | Ns | -8.4 (18.7) | <0.001 | <0.001 |
| | | | | | | |
| T1: State | 37.6 (7.8) | 39.5 (10.3) | | 36.2 (8.6) | | |
| T1: Trait | 38.3 (5.5) | 42.5 (8.7) | | 38.0 (9.5) | | |
| T2: State | 31.8 (6.5) | 33.0 (10.0) | | 33.9 (9.5) | | |
| T2: Trait | 34.9 (8.4) | 38.5 (9.4) | | 38.2 (7.6) | | |
| | | | | | | |

Key: T1: Time 1 at the beginning of the academic year; T2: Time 2 at the end of the academic year; D: Difference between T1 and T2. T tests only conducted when the ANOVA has indicated group differences.

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