Literature Review

The feasibility of using computer-based treatment for specific phobia

Empirical Study

A controlled comparison of computer-based vicarious exposure versus live exposure in the treatment of spider phobia

Lisa Gilroy (B.A.Hons.)

Master of Psychology (Clinical)

School of Psychology

I declare that this thesis contains no material which has been accepted for the ward of any other higher degree or graduate diploma in any university and that to the best of my knowledge and belief, this thesis contains no material previously published or written by another person, except when due reference is made in the text of the thesis.

Signed L Gilroy

Date 21/4/99

Acknowledgments

I would like to thank all those people who helped me complete this thesis.

Special thanks however is extended to the following people: -

* My supervisors Dr Ken Kirkby and Dr. Iain Montgomery for their enduring encouragement, enthusiasm, support and guidance.

* Dr Brett Daniels for his statistical advice, patience and willingness to help.

* The participants: who gave up their valuable time to contribute to this research.

* Finally to my husband, Heath Hadfield whose encouragement and support continue to give me strength.

TABLE OF CONTENTS

Literature Review

Empirical Study

LITERATURE REVIEW

The Feasibility of using Computer-Based Treatment for Specific Phobia

by

Lisa Gilroy (B.A. Hons.)

submitted in partial fulfilment of the requirements

for the degree of

Master of Psychology (Clinical)

University of Tasmania

16th November, 1998

Abstract

An important goal in clinical psychology is the development of safe, cost effective, widely available treatment strategies. This review targets a particular problem, specific phobia, as a reference point in exploring the feasibility of using computers in delivering behavioural treatment for anxiety disorders. This review summaries conventional treatment methods, and evaluates their efficacy and availability. It addresses the advantages as well as the ethical and technical limitations of the use of computers in delivering psychological treatments and reviews current developments and outcome studies. It is concluded that although computer-based treatments are still in their infancy, significant advances have been made in establishing such strategies as an effective, safe and efficient treatment for phobias. Further research to establish computer-based behavioural treatment as a comparable alternative to therapist-directed live exposure for phobias, will allow the efficacy of computer-based treatment to be accurately weighed against the ethical issues.

Anxiety disorders constitute a significant problem in mental health. The National Institute of Mental Health reports that anxiety disorders are the number one mental health problem for American women and second only to drug and alcohol abuse for men (Bourne, 1995). Of the anxiety disorders specific phobia is the most prevalent in the community (Marks, 1986). Conventional treatments for specific phobia place considerable demands on health care resources in terms of time and money (Hassan, 1992). Hence only a small proportion of people suffering from such anxiety disorders will receive treatment. Innovative treatment strategies are required to reduce the cost of treatment and increase access, thus serving more of those in need. Computer-based treatment may offer a potential solution to this problem. Hence this review targets specific phobia as a reference point in exploring the feasibility of using computer-based behaviour treatments for anxiety disorders.

Background information concerning the characteristics and epidemiology of specific phobia are presented. The behavioural, cognitive and cognitive-behavioural treatments are summarised and evaluated in terms of efficacy and availability. The effectiveness of attempts to expand these treatments with self help manuals are then reviewed. It is concluded that computer-based treatments may help to fill the gap between the number of people requiring treatment and those receiving it. The advantages as well as the technical and ethical issues concerned with the use of computers in delivering psychological treatment are presented and recommendations for their safe and ethical use discussed. Finally developments in computer-based behavioural treatments are described and outcome studies reviewed, with suggestions for future research.

Specific Phobia

The Diagnostic and Statistical Manual for Mental Disorders (DSM IV; American Psychiatric Association, 1994) defines specific phobia as a "marked and persistent fear of clearly discernible, circumscribed objects or situations." (p. 405, 1994).

Further to this definition the DSM IV specifies five subtypes of specific phobia. These are animal phobias such as dog and spider phobia; natural environment phobias such as fear of heights or thunder; blood-injection-injury phobias where fear is cued by thoughts of blood for example; and situation phobias such as fear of flying, driving or enclosed places; other types of specific phobias cued by stimuli not covered in the above subtypes, for example space phobia, are also acknowledged.

Characteristics

Specific phobias are predominantly behavioural in nature, in that they are disorders of anxious avoidance of phobic stimuli (Marks, 1987). Anxiety is the central clinical symptom in specific phobias occurring when a phobic person confronts, anticipates confronting, or imagines the phobic stimulus (Hassan, 1992). In order to minimise anxiety the phobic person usually avoids fearful situations or less commonly endures them with significant anxiety. For a diagnosis to be made such avoidance and anxiety must interfere significantly in the persons daily routines, work or relationships and/or cause the person significant distress. It is also stated in the DSM-IV that specific phobias are characterised by the client's awareness of the irrationality of his/her fears. However to what degree this is the case has recently been questioned by investigators examining the cognitive dimension of specific phobias (Arntz, Lavy, van den Berg & van Rijsoort, 1993; Menzies & Clarke, 1995; Thorpe &

Salkovskis, 1995; Williams & Watson, 1985). Studies have provided support that specific phobias are characterised by a range of maladpative cognitions in relation to the phobic stimuli, including danger expectancies (Beck & Emery, 1985; Menzies & Clarke, 1995; Williams & Watson, 1985) and reduced self efficacy (e.g., Bandura, Adams & Beyer, 1977; Biran & Wilson, 1981; Bourque & Ladoceur, 1980; Lee, 1984; Williams & Watson, 1985). The relationship between these cognitions and phobic avoidance however requires further attention.

Epidemiology

Of the anxiety disorders specific phobia is the disorder most frequently found in the population (Marks, 1986). Specific phobias have been estimated to affect 8.4% of the female population and 3.8% of the male population (Regier, Narrow & Rae, 1990) indicating considerable prevalence. Among the specific phobias the subtype of animal phobias, which includes fear of dogs, snakes and spiders, is the most common in the population, with a life-time prevalence of 6.1% (Bourdon, et al., 1988).

Despite the relatively high prevalence it has been acknowledged that many specific phobics do not seek treatment (Emmelkamp, Bouma & Scholing, 1992). This may be due to the fact that specific phobia often does not impact as significantly on the sufferer's life as many of the other anxiety disorders, thus the cost and time involved in seeking appropriate treatment may be more aversive to this population. These factors highlight the importance of developing safe, easily accessible and cost-effective treatment strategies for this disorder.

Psychotherapeutic approaches

A variety of conventional treatments have been used for specific phobia. However a comprehensive review of all approaches is beyond the scope of this paper. The scope is restricted to an examination of the reported efficacy of the behavioural, cognitive and cognitive-behavioural approaches in the treatment of specific phobias.

Behavioural Therapies

Behavioural therapies are considered to be the most effective for specific phobia (Chambless, 1990; Marks, 1987; Michelson & Marchione, 1991). They are based on the hypothesis that most abnormal behaviour is learned, through classical or operant conditioning, so therefore they can be unlearned and more adaptive responses learned instead (Marks, 1987). Accordingly treatment is designed to extinguish or habituate the anxiety response and avoidance by exposing clients to feared stimuli. It should be noted however that there is no one accepted etiological theory which explains specific phobias (see Page, 1991; Emmelkamp et al., 1992 for elaboration), and the mechanisms underlying the success of exposure based behavioural therapies are not yet fully understood (Emmelkamp et al., 1992).

The exposure techniques can be organised on a continuum reflecting the degree to which anxiety buffering is available: from exposure in imagination through to real life; and from systematic graded exposure through to flooding (i.e., exposure to the phobic stimulus at full intensity).

a) Imaginal Exposure

Of the imaginal techniques the most widely used is systematic desensitisation (Wolpe, 1982). In this technique the client is required to systematically work through a hierarchy of fear producing situations in imagination whilst practicing relaxation techniques. Several studies have shown this technique to be effective with specific phobias (e.g., Gelder & Marks, 1968; Gelder, Marks & Wolf, 1967). Despite its success imaginal systematic desensitisation is no longer widely used, particularly since the introduction of the live exposure approach (Hassan, 1992). Further it has been noted that the theory of reciprocal inhibition (i.e., that a response antagonistic to anxiety such as relaxation can be made to suppress anxiety) generally has not been supported (Hassan, 1992; Kazdin & Wilcoxon, 1976). Relaxation has also been shown by various studies to be unnecessary in achieving therapeutic improvement (Kazdin and Wilcoxon, 1976; Marks, 1986; 1987; McNamee, O'Sullivan, Lelliot & Marks, 1989).

b) Live Exposure

Live graded exposure involves exposing the phobic individual to real situations (e.g., real spiders) in a hierarchy of fear producing tasks. With regard to the treatment of specific phobia, the results are unambiguous; live graded exposure has shown to be highly effective (Eysenck, 1987). Further in the great majority of studies live graded exposure has proved to be more effective than imaginary procedures (Crowe, Marks, Agras & Leitenberg, 1972; Dyckman & Bowan, 1978; McReynolds & Grizzard, 1971). Comparisons of live graded exposure and live flooding (ungraded exposure) have indicated similar effectiveness, although clients tend to find the graded exposure more acceptable and are therefore more likely to complete treatment (Page, 1991).

Thus therapist-directed graded live exposure is considered to be the treatment of choice for specific phobia (Chambless, 1990; Hassan, 1992).

Research into the parameters of effective live exposure have consistently indicated that long, continuous exposure periods reduce fear to a greater degree than do shorter periods (Marks, 1987), and that massed treatment sessions are superior to spaced sessions (Foa, Jameson, Turner & Payne, 1980; Marks, 1987). Several recent studies have in fact indicated that intensive live exposure treatment during a single session (up to 3 hours) produces comparable results to those using spaced programs over some ten sessions (Hellstrom & Öst, 1995; Hellstrom, Fellenius & Öst, 1996; Öst, 1989, 1996; Öst, Salkovskis & Hellstrom, 1991; Öst, Hellstrom & Kaver, 1992; Thorpe & Salkovskis, 1997). Such a reduction in treatment time will potentially reduce the cost and increase the availability of effective treatment.

Live exposure has also been used in conjunction with a variety of other techniques including modelling and cognitive treatments. The following sections proceed to examine the efficacy of cognitive treatments and modelling alone and as an adjunct to exposure treatment.

Cognitive Treatments and the Cognitive-Behavioural Approach

Cognitive therapies attempt to change maladaptive thoughts in the expectation that this will result in behaviour change. As mentioned previously numerous studies have identified a range of maladaptive thoughts which characterise specific phobia (e.g., Arntz et al., 1993; Menzies & Clarke, 1995; Thorpe & Salkovskis, 1995; Williams & Watson, 1985). A variety of cognitive treatments have been used with specific phobia (Marks, 1987; Page; 1991) including Rational Emotive Therapy (Ellis, 1991) and Beck's (1970) Cognitive Restructuring which attempt to identify irrational ideas and challenge them.

Other techniques attempt to alter the client's internal dialogue through for example, self-instructional training (Miechenbaum, 1975).

In reviewing the controlled studies in relation to the effectiveness of cognitive therapies for specific phobia it can be concluded that in the great majority of studies cognitive methods alone have little efficacy and when combined with exposure fail to enhance the amount or speed of improvement significantly (Biran & Wilson, 1981; Emmelkamp & Felten, 1985; Emmelkamp et al., 1992; Girodo & Roehl, 1978; Ladouceur, 1983; Marks, 1987). Thus there is little evidence that cognitive strategies are of any use in this population, even when used with live exposure.

Modelling

Another technique that is frequently combined with live exposure is modelling. Modelling involves the phobic individual observing the performance of another underaking exposure and the consequences of this performance. It is assumed that through such observation phobic anxiety is extinguished vicariously (Bandura, 1968; Bandura & Menlove, 1968). Numerous studies have demonstrated the efficacy of modelling techniques in reducing avoidance behaviours associated with specific phobias (e.g., Bandura & Menlove, 1968; Blanchard, 1970; Geer & Turteltaub, 1967; Kazdin, 1974).

Modelling can be presented live (overt modelling), imagined covertly (covert modelling) or displayed on film or by other means (symbolic modelling). Live modelling has generally been shown to be the most effective form of modelling in reducing phobic behaviour (Bandura, Blanchard & Ritter, 1969). Symbolic modelling which involves presenting the model via another medium, such as on a computer screen, has also been shown to be effective (Bandura, 1968; Bandura & Menlove 1968; Blanchard, 1970). It is proposed

that the reduction in efficacy from live to symbolic modelling may be offset by the broader sampling of models and phobic stimuli available in symbolic modelling (Bandura, 1968).

There is sufficient evidence that modelling, whether live or symbolic, is effective in the treatment of phobias. Live and symbolic modelling are most commonly used in conjunction with live exposure therapy, whereby the therapist may model certain actions toward the stimuli in order to demonstrate to the client strategies to overcome their anxiety, and/or utilise symbolic representations of anxiety-inducing stimuli early in treatment before moving on to live stimuli (Kirkby, 1996). In a comparative study, Hassan (1992) found no differences in outcome between live exposure and live modelling with graded live exposure.

The availability and cost of the conventional treatments

Although popular and effective, conventional treatments such as live exposure and live modelling have considerable practical drawbacks. Firstly they often place considerable time demands on clinicians in terms of the length of treatment required for a successful outcome (Marks, 1987). Others have also acknowledged the tedium associated with the therapist administration of exposure hierarchies (Wilson, Omeltschenko & Yager, 1991). Such time may be better used in dealing with more complex problems in psychotherapy. The cost of conventional treatment is also significant, and out of the reach of many (Griest, 1989). Additionally the frequently reported gap between the number of appropriately trained clinicians, and those requiring treatment has often meant the restriction of such treatment to specialist behaviour units which are not readily accessible to many, as well as long waiting lists (Greist, 1989). Clearly innovative solutions are needed to facilitate the provision of effective treatment to large numbers of suffers unable

to access and/or afford conventional behaviour treatments. The recognition of such issues has led to the development of the self-help approach and ultimately to the use of computer-based treatment strategies.

Self Exposure via manuals

An important element of exposure therapy is the homework practice of exposure between sessions (Griest et al., 1980; Marks, 1987; Marks et al., 1983). On the basis of this and the perceived growing need for psychological treatment the efficacy of patient-directed exposure treatment via manual based programs (Al Kubaisy et al., 1992; Ghosh, Marks & Carr, 1988; Marks, 1987; Mathews, Teasdale, Munby, Johnson & Shaw, 1977; Mavissakalian & Michelson, 1983) and manuals combined telephone guided treatment (McNamee et al., 1989) has been investigated. A wealth of data has affirmed the effectiveness of manual based treatments with agoraphobic and mixed phobic samples (Al Kubaisy et al., 1992; Ghosh, Marks & Carr, 1988; Marks 1987; Mathews et al., 1977). Such studies suggest that with minimal therapist contact and the use of a manual, phobic clients can improve comparably to those receiving therapist-delivered therapy.

In relation to specific phobia however studies examining the effectiveness of self-directed exposure via manuals have been less promising. Öst and colleagues (Hellstrom & Öst, 1995; Hellstrom et al., 1996; Öst et al.,1991; Öst et al., 1992) in a series of studies have found that therapist-directed exposure was significantly more effective than self-directed exposure with specific phobics. For example in one study 71% of a therapist-directed group showed a clinically significant improvement compared to only 6% of a self-directed exposure group (Öst et al.,1991). Considering the differences in the success of self-exposure with agoraphobia and that with specific phobia, it has been suggested that specific phobics may be less motivated to carry out self-

exposure as the phobia does not have as much of a substantial impact on their daily functioning (Chambless & Woody, 1990).

Studies have also shown that self help manuals are often plagued by limitations, such as poor readability and poor client compliance in following the manual instructions (Hassan, 1992), as well as relatively high drop out rates (Öst, Stridh & Wolf, 1998). The credibility of the manual and motivation level of the user appear to predict success with manuals (Öst et al., 1998). Despite these limitations self help manuals have extended the availability of treatment for people suffering specific phobia. It appears however that without some therapist input they do not provide a reliable alternative to the conventional treatments for behavioural problems, and for specific phobia the effectiveness is not established, thus other innovations are desirable.

The use of computers in delivering psychological treatment

The potential use of computers in delivering psychological treatment has been discussed in the literature for several decades (Kirkby & Lambert, 1996). There have been considerable advances in the area of computer assisted assessment. Substantial evidence indicates that these techniques are acceptable and sometimes preferred by clients (e.g., Carr & Ghosh, 1983a; Petrie & Abell, 1994), provide accurate and reliable results compared with therapists (Carr, Anill, Ghosh & Margo, 1981; Carr & Ghosh, 1983b; Lucas, Mullin, Luna & McInroy, 1977) and offer a considerable saving of therapist time (Erdman, Klein & Griest, 1985; Lucas et al., 1977). In comparison computer-based treatment has been slow to take off. Today however with the rapid development and increasing acceptance of computer technology, and with the call for innovative treatment strategies, computer-based treatment is ripe for development and penetration into clinical practice. Whether this occurs will depend on several issues including demonstrated efficacy, safety,

acceptability, accessibility and cost (Kirkby & Lambert, 1996). These issues will be examined in the following sub-sections addressing the advantages, ethical and technical limitations of computer-based treatment and the outcome studies on current developments in computer-based programs.

Advantages

The use of computers in the delivery of psychological behavioural treatments offer the client and therapist several advantages in the treatment process. Firstly computers in contrast to a human therapist never become preoccupied, bored, stressed, and rarely have memory problems, thus providing complete objectivity (Ghosh & Griest, 1988). They are also capable of working 24 hours per day, seven days per week without a deterioration in efficiency, thereby potentially helping many more people and providing an extension of treatment for as long as required (Ghosh & Griest, 1988). Given that computers are today widely available and accessible in most locations they clearly have the potential to aid those clients that are underserved by mental health professionals (Erdman et al., 1985).

Reducing the cost of psychological treatment is also important in increasing the availability of therapy to more of those in need. Computers may represent a solution. It has been estimated that computer hardware and software today can be acquired and implemented for less than $1.00 per day, all costs included, over a five year period (Ghosh & Griest, 1988). However it should be acknowledged that the time and expertise needed to develop and evaluate such programs has not yet been fully assessed in the clinical setting (Kirkby, 1996).

Additionally computers are highly reliable in that every question or task can be administered in the same style and order to every client (Carr & Ghosh,

1983a) and treatment elements can be added or removed from the treatment process to assess their relative efficacy (Carr, Ghosh & Marks, 1988). Computers have a great potential in treatment research in elucidating the potent elements of treatment as well as providing an opportunity to clarify the role of the uniquely human characteristics of the therapeutic process (Kirkby & Lambert, 1996; Slack et al., 1991).

Ethical and Technical issues

Despite these advantages several writers have argued against the use of computer-based treatments mainly on ethical grounds. It has been argued that one of the most essential characteristics of therapy is the development of a client-therapist relationship which results in the client feeling valued and accepted by the clinician as a person. Weizenbaum (1977) asserted that computers were unable to nurture a client's emotions and thus may be detrimental. Further that even if effective that it would be unethical to delegate the provision of therapy to a machine (Weizenbaum, 1977). The limitations of computers in lacking the flexibility and intuitive skills of the human therapist in treatment must be acknowledged and accepted, but considered in relation to the efficacy of computer-delivered treatment. It follows that from the perspective of both the clinician and the client it would be highly unethical to withhold effective therapies because they cannot reach the standard of human-delivered therapy, particularly given that there is no possibility of making therapist-delivered treatment universally available (Griest, 1989).

Ethical fears have also arisen in relation to the issue of safety, that is, in the capacity of a computer to handle the complexity of psychological management without undue risk, and the potential side effects of computer-based treatment. From this perspective it is important to develop treatment strategies which have safeguards built into the programs to monitor progress, for example,

prompts to seek therapist assistance and checks of suicidal ideation (Ghosh & Marks, 1987; Griest; 1989). In addition it is vital that all programs pass through controlled evaluations of their efficacy and safety, providing a clearly defined population and guidelines for appropriate levels of clinical supervision so that the programs can be used effectively (Griest, 1989). The possible side effects of computer dependency (Kirkby & Lambert, 1996) and countertherapeutic effects such as nausea, which has been reported with some virtual reality treatments (Carlin et al., 1997), need to be addressed. Clients need to be informed of any side effects and presented with alternative treatment strategies (e.g., therapist directed treatment). This will enable clients to make informed decisions and weigh up the costs and benefits of computer-based treatment.

Another ethical and technical issue is the acceptability of computer-based treatments to clients. It has been argued that many people have a negative cognitive image of the computer in terms of lacking flexibility and being impersonal (Sampson, 1986). There is evidence however to suggest that such perceptions may in fact be due to many of the early computer programs being poorly designed in relation to considering the users prior computer knowledge or cognitive styles (Wilson et al., 1991). With the rapid advancements in computer programming today computers are capable of producing a relatively flexible and personal atmosphere for the client (Carr & Ghosh, 1983a). Recent research has provided considerable support that when programs are designed and programmed by clinicians for the specific purpose of treatment or assessment they have been found to be, with rare exceptions, highly acceptable to clients (e.g., Car & Ghosh, 1983a; Carr et al., 1988; Hassan, 1992; Slack et al., 1991).

Such ethical concerns are important and must be addressed in promoting the advancement of computer-based treatment, however they also must be

viewed in their practical context, of the heavy time demands on clinicians. If computers can deliver effective treatments to certain clients who would otherwise remain untreated they are of great benefit (Carr et al., 1988). In order to further minimise risks and promote the safe use of this tool the development of ethical and legislative safeguards regarding standards for the development and evaluation of treatment programs and guidelines for dissemination of such programs is required (Griest, 1989; Ghosh & Griest, 1988).

Current developments and outcome studies in computer-based behavioural treatments for phobias

The past decade with the increasing use of microcomputers has seen the development of a variety of computer treatment programs at varying degrees of evolution. Computer-based treatment however remains in its infancy in terms of both development and evaluation (Kirkby & Lambert, 1996). For research to advance in this area and for specific applications to be used in clinical practice it is important to exploit the advantages of computers, whilst recognising their limitations, in developing treatments for suitable circumscribed clinical problems.

One such problem which appears particularly amenable to computer automation is the treatment of specific phobia. As discussed earlier specific phobia is a relatively circumscribed disorder which is predominantly behavioural in nature. The treatment of choice, live exposure requires a concise specification of steps to be undertaken in hierarchy construction and presentation and has clearly defined goals and outcome criteria. Given that computers excel at tasks which are relatively routine, repetitive, easily quantifiable it is certainly feasible that a computer can deliver an instructional

dialogue to advise of appropriate steps of exposure and to modify these according to progress (Kirkby, 1996).

In fact in 1969 Lang predicted a future role for computers in behaviour therapy, which has come to pass to some degree. Several early attempts to develop an automated systematic desensitisation treatment for anxiety disorders using earphones and slides to present instruction demonstrated that such a method could be effective in reducing phobic behaviour (Biglan, Villwock & Wick, 1979; Lang, Malamed & Hart, 1970). Further that improvement was not dependent on direct interpersonal interaction with a therapist (Lang, et al., 1970). More recently ambulatory computer devices have been piloted successfully as a component in the treatment of obesity and OCD (Agras, Taylor, Feldman & Losch, 1990; Baer, Minichiello, Jenike & Holland, 1988; Burnett, Taylor & Agras, 1985).

In a pioneering study Ghosh et al. (1988) developed and evaluated the effectiveness of a computer-based treatment for phobias. The program requires the client to go through a structured interview in developing a hierarchical list of phobic situations and graded exposure tasks they are willing to undertake. Following each session self exposure homework instructions are provided. In a controlled outcome study this treatment was compared to the same treatment delivered by a manual or therapist with a sample of 84 mixed phobics. All groups showed significant and comparable improvement on self reported avoidance and anxiety at up to six months follow-up, although no Behavioural Assessment Test was used.

More recent advances in computer-based behavioural treatments are focusing on the capabilities of the computer in presenting complex audiovisual material and in addressing the contribution of symbolic modelling procedures (as outlined earlier). Hassan (1992) in an unpublished thesis

investigated the use of hierarchies of computer-delivered imagery of spiders. These ranged from still images (e.g., drawings) to a film employing symbolic modelling of a therapist demonstrating mastery of exposure with a spider and then a therapist taking a client through such exposure. In a controlled treatment study Hassan (1992) compared this computer treatment with live exposure, live modelling and a wait list control group in a sample of spider phobic participants. All treatment groups also received relaxation. Results showed that all treatment groups had comparable and clinically significant improvement on a Behaviour Assessment Test as well as self reported anxiety, avoidance and cognitions, whereas the control group showed no improvement. The participants also rated the computer treatment as highly acceptable.

Immersive virtual reality techniques, although at the present time rather expensive and cumbersome offer another option for presenting phobic situations. To date single case (Carlin et al., 1997) and pilot studies (Rothbaum et al., 1995) using this technique combined with therapist counselling with phobic subjects have shown promise in reducing phobic avoidance. Although immersive virtual reality program development is early in its evolution with respect to delivering treatment such technology provides a taste of what will be available in the future.

Interactive non-immersive virtual reality computer software has been developed by Kirkby, Daniels & Watson (1992) to simulate exposure therapy for phobic disorders. This treatment program employs "non-immersive" virtual reality technology, such that the phobic client observes and interacts within a virtual world via the two dimensional computer screen and mouse, as in a video game. The program teaches the client the principles of exposure therapy and provides an opportunity for vicarious exposure. This computer treatment program is the most thoroughly evaluated to date.

Four clinical studies using this technique have been completed, and have investigated clinical outcomes in different phobic groups. These studies have found significant improvements from pre to post treatment with this computer-based treatment in terms of improvement in questionnaire ratings of phobic severity in agoraphobic (Harcourt, 1996; Hutchinson, 1992), obsessive compulsive disorder (Clark, Kirkby, Daniels & Marks 1997) and spider phobic (Smith, Kirkby, Montgomery & Daniels, 1997) client groups. These studies however have not included a comparison with non-computer treatment methods.

Future Research

Given the diversity of approaches taken and the limited number of evaluative studies, there is much room for further systematic investigation.

Studies to date have often used small samples, and limited outcome measures. Given that the most predominant and debilitating feature of specific phobia is in most cases avoidance, future studies should include a Behavioural Assessment Test which more realistically measures phobic avoidance in addition to self report questionnaires. Also recent research into the cognitive dimension of specific phobias warrants the investigation of the cognitive variables of self efficacy and danger expectancies in assessing treatment outcome.

Most studies have included self exposure homework for subjects in the treatment groups, which have made it challenging to assess the effect of the computer treatment alone (Kirkby, 1996). In addition further studies could also control for the placebo response to computer treatment.

There has only been one published controlled study which has examined the efficacy of computer-based behavioural treatments in comparison to alternative forms of treatments (i.e., Ghosh et al., 1988) and this did not include a Behavioural Assessment Test. There has been no published study to date which has compared non-immersive virtual reality techniques with the treatment of choice for specific phobia, therapist-directed live exposure.

Synopsis and Conclusion

Anxiety disorders constitute a significant problem in mental health. Of the anxiety disorders, specific phobia is the most prevalent in the community. Whilst effective treatments have been developed for the treatment of specific phobia, these treatments require significant resources in terms of time and money. Hence the availability of these treatments is limited to a small proportion of suffers. Attempts to expand the availability of exposure based therapies for phobias via manual based therapy have shown limited success. A more recent attempt to expand treatment has been the development of computer-based treatment programs.

The ethical issues concerning the use of computers in the delivery of psychological treatments are significant and risks must be minimised. There are several ways in which this can be done, for example by ensuring that all programs are scientifically tested in terms of efficacy, safety and acceptability; that treatment programs have a clearly defined target population and appropriate prompts for therapist assistance; the development of ethical and legislative safeguards surrounding the development and dissemination of such programs will further minimise risks. Given these safeguards and demonstrated efficacy it would be highly unethical to withhold such a cost-effective treatment strategy, given its potential to expand the availability and accessibility of treatment to those underserved by current resources.

It is evident that some important advances have been made in the development and evaluation of computer-based treatments for phobias. The results of outcome studies to date warrant the further development of such computer-based behavioural treatments (Kirkby, 1996). Although current research has been promising there is much room for further systematic investigation. Several methodological problems in previous studies need rectifying, such as small sample sizes and limited outcome measures. Further no published study to date has compared any form of virtual reality treatment with the treatment of choice for specific phobia, therapist-directed live exposure. Information gained from such investigations will contribute substantially to an objective assessment of the value of computer-based treatment methods. It will facilitate assessment of whether of not they should be used as a adjunct or alternative to other treatment methods, and allow the efficacy of this treatment to be accurately weighed against the ethical issues.

References

Agras, W.S., Taylor, C.B., Feldman, D.E., & Losch, M. (1990). Developing computer-assisted therapy for the treatment of obesity. *Behavior Therapy*, **21**, 99-109.

Al Kubaisy, T., Marks, I.M., Logsdail, S., Marks, M.P., Lovell, K., Sungur, M., & Araya, R. (1992). Role of exposure homework in phobia reduction: A controlled study. *Behavior Therapy,* **23**, 599-621.

American Psychiatric Association (APA). (1994) *Diagnostic and Statistical Manual of Mental Disorders*, 4th Edition, (DSM-IV). Washington: American Psychiatric Association.

Arntz, A., Lavy, E., van den Berg, G., & van Rijsoort, S. (1993). Negative beliefs of spider phobics: a psychometric evaluation of the spider phobia beliefs questionnaire. *Behaviour Research and Therapy*, **15**, 257-277.

Baer, L., Minichiello, W.E., Jenike, M.A & Holland, A (1988). Use of a portable computer program to assist behavioural treatment in a case of obsessive compulsive disorder. *Journal of Behaviour Therapy and Psychiatry*, **19**, 237-240.

Bandura, A. (1968). Modelling approaches to the modification of phobic disorders. In E. Porter (Ed.),*The Role of Learning in Psychotherapy.* London, Churchill (pp. 201-223).

Bandura, A., Adams, N.E., & Beyer, J. (1977). Cognitive processes mediating behavioural change. *Journal of Personality and Social Psychology*, **35**, 125-139.

Bandura, A., Blanchard, E.B. & Ritter, B. (1969). Relative efficacy of desensitization and modelling approaches for inducing behavioural, affective, and attitudinal changes. *Journal of Personality and Social Psychology*, **13**, 173-199.

Bandura, A. & Menlove, F.L. (1968). Factors determining vicarious extinction of avoidance behavior through symbolic modelling. *Journal of Personality and Social Psychology*, **8**, 109-116.

Beck, A.T. (1970). Cognitive therapy: Nature and relation to behavior therapy. *Behavior Therapy*, **1**, 184-200.

Beck, A.T. & Emery, G. (1979). *Cognitive therapy of anxiety and phobic disorders.* Philadelphia: Center for Cognitive Therapy.

Biglan, A., Villwock, C. & Wick, S. (1979). The feasibility of a computer controlled program for the treatment of test anxiety. *Journal of Behavior Therapy and Experimental Psychiatry*, **10**, 47-49.

Biran, M., & Wilson, G.T. (1981). Treatment of phobic disorders using cognitive and exposure methods. *Journal of Consulting and Clinical Psychology*, **49**, 886.

Blanchard, E.B. (1970). Relative contributions of modelling, informational influences, and physical contract in the extinction of phobic behavior. *Journal of Abnormal Psychology*, **76**, 55-61.

Bourne, (1995). *The Anxiety and Phobia Workbook.* California: New Harbinger Publications.

Bourque, P. & Ladouceur, R. (1980). An investigation of various performance-based treatments with acrophobics. *Behaviour Research and Therapy*, **18**, 161-170.

Bourdon, D.H., Boyd, J.H., Rae, D.S., Burns, B.J., Thompson, J.W., & Locke, B.Z. (1988). Gender differences in phobias - results of the ECA community survey. *Journal of Anxiety Disorders*, **2**, 227-241.

Burnett, K.F., Taylor, C.B. & Agras, W.S. (1985). Ambulatory computer-assisted therapy for obesity: A new frontier for behaviour therapy. *Journal of Consulting and Clinical Psychology*, **53**, 698-703.

Carlin, A.S., Hoffman, H.G., & Weghorst, S. (1997). Virtual reality and tactile augmentation in the treatment of spider phobia: A case report. *Behavior Research and Therapy*, **35**, 153-158.

Carr, A.C., & Ghosh, A. (1983a). Response of phobic patients to direct computer assessment. *British Journal of Psychiatry*, **142**, 60-65.

Carr, A.C., & Ghosh, A. (1983b). Accuracy of behavioural assessment by computer. *British Journal of Psychiatry*, **142**, 66-70.

Carr, A.C., Ghosh, A., & Marks, E.M. (1988). Computer-supervised exposure treatment for phobias. *Canadian Journal of Psychiatry*, **33**, 112-117.

Chambless, D.L. (1990). Spacing of exposure sessions in treatment of agoraphobia and specific phobia. *Behavior Therapy*, **21**, 217-229.

Chambless, D.L. & Woody, S.R. (1990). Is agoraphobia harder to treat? A comparison of agoraphobics' and specific phobics' response to treatment. *Behaviour Research and Therapy*, **28**, 305-312.

Clark, A. Kirkby, K.C., Daniels, B.A., & Marks, I.M. (1998). A pilot study of computer-aided vicarious exposure for obsessive-compulsive disorder. *Australian and New Zealand Journal of Psychiatry*, **32**, 268-275.

Crowe, M.J., Marks, I.M., Agras, W.S. & Leitenberg, H. (1972). Time-limited desensitization, implosion and shaping for phobic patients: A cross-over study. *Behaviour Research and Therapy*, **10**, 319-328.

Dyckman, J.M. & Cowan, P.A. (1978). Imagining vividness and the outcome of in vivo and imagined scene desensitization. *Journal of Consulting and Clinical Psychology*, **48**, 1155-1156.

Ellis, A., (1991). Rational-emotive treatment of simple phobias. *Psychotherapy*, **28**, 452-455.

Emmelkamp, P.M.G., Bouma, T.K., Scholing, A. (1992). *Anxiety Disorders: A Practitioner's Guide.* New York: John Wiley & Sons.

Emmelkamp, P.M.G. & Felten, M. (1985) The process of exposure *in vivo*, cognitive and physiological changes during treatment of acrophobia. *Behaviour Research and Therapy*, **23**, 219-223.

Erdman, H.P., Klein, M.H. & Greist, J.H. (1985). Direct patient computer interviewing. *Journal of Consulting and Clinical Psychology*, **53**, 760-773.

Eysenck H.J. (1987). Behavior therapy. In H.J. Eysenck and I. Martin (Eds.). *Theoretical Foundations of Behavior Therapy.* New York: Plenum Press.

Gelder, M.G. & Marks, I.M. (1968) Desensitization and phobias: A crossover study. *British Journal of Psychiatry,* **114**, 323-328.

Gelder, M.G., Marks, I.M., & Wolff, H.H. (1967). Desensitization and psychotherapy in the treatment of phobic states: A controlled enquiry. *British Journal of Psychiatry,* **113**, 53-73.

Ghosh, A., & Greist, J.H. (1988). Computer treatment in psychiatry. *Psychiatric Annals*, **18**, 246-250.

Ghosh, A., & Marks, E.M. (1987). Self-treatment of agoraphobia by exposure. *Behavior Therapy*, **18**, 3-16.

Ghosh, A., Marks, I.M. & Carr, A.C. (1988). Therapist contact and outcome of self-exposure treatment for phobias. *British Journal of Psychiatry*, **152**, 234-238.

Greist, J.H. (1989). Computer-administered behavior therapy. *International Review of Psychiatry*, **1**, 267-274.

Harcourt, L. (1997). The differential effect of personality on computer based treatment of agoraphobia. University of Tasmania. Honours Thesis.

Hassan, A. A. M. (1992). A comparison of computer-based symbolic modelling and conventional methods in the treatment of spider phobia. University of Leeds, England. Phd Thesis.

Hellstrom, K., Fellenius, J., & Öst, L.G. (1996). One versus five sessions of applied tension in the treatment of blood phobia. *Behaviour Research and Therapy*, **34**, 101-112.

Hellstrom, K., & Öst, L.G. (1995). One session therapist directed exposure vs. two forms of manual directed self-exposure in the treatment of spider phobia. *Behaviour Research and Therapy,* **33**, 959-965.

Hutchinson, R. (1992). Developments in the treatment of agoraphobia: Potential use of computers. University of Tasmania. Masters thesis.

Kazdin, A.E. (1974). Covert modelling, model similarity, and reduction of avoidance behavior. *Behavior Therapy*, **5**, 325-340.

Kazdin, A.E. & Wilcoxon, L.A. (1976). Systematic desensitization and nonspecific treatment effects: A methodological evaluation. *Psychological Bulletin*, **83**, 729-758.

Kirkby, K.C. (1996). Computer-assisted treatment of phobias. *Psychiatric Services*, **47**, 139-141.

Kirkby, K.C., Daniels, B.A. & Watson, T.J. (1992). An interactive computerised teaching programme for self exposure therapy of avoidant behaviour in phobic disorders. In Sanders M.R., Halford, W.K., (Eds.) Fourth World Congress in Behaviour Therapy Program and Abstracts. Bowen Hills, Queensland: Australian Academic Press, 73.

Kirkby, K.C. & Lambert T.J. (1996). Computer aids to treatment in psychiatry. *Australian and New Zealand Journal of Psychiatry*, **30**, 142-145.

Ladouceur, R. (1983) Participant modelling with or without cognitive treatment for phobias. *Journal of Consulting and Clinical Psychology*, **51**, 942-944.

Lang, P.J., Melamed, B.G., & Hart, J. (1970). A psychophysiological analysis of fear modification using an automated desensitization procedure. *Journal of Abnormal Psychology*, **76**, 220-234.

Lee, C. (1984). Efficacy expectations and outcome expectations as predictors of performance in a snake-handling task. *Cognitive Therapy & Research*, **8**, 509-516.

Lucas, R.W., Mullin, P.J., Luna, C.B.X. & McInroy, D.C. (1977). Psychiatrist and a computer as interrogators of patients with alcohol-related illnesses: a comparison. *British Journal of Psychiatry*, **131**, 160-167.

McNamee, G., O'Sullivan, G., Lelliot, P. & Marks, I. (1989). Telephone-guided treatment for housebound agoraphobics with panic disorder: Exposure vs. relaxation. *Behavior Therapy*, **20**, 491-497.

McReynolds, W.T. & Grizzard, R.H. (1971). A comparison of three fear reduction procedures. *Psychotherapy: Theory, Research and Practice*, **8**, 264-268.

Marks, I.M. (1986). Epidemiology of anxiety. *Social Psychiatry*, **21**, 167-171.

Marks, I.M. (1987). *Fears, Phobias and Rituals*. New York: Oxford University Press.

Mathews, A.M., Teasdale, J., Munby, M., Johnston, D., & Shaw, P. (1977). A home-based treatment program for agoraphobia. *Behavior Therapy*, **8**, 915-924.

Mavissakalian, M., & Michelson, L. (1983). Self-directed in vivo exposure practice in behavioral and pharmacological treatments of agoraphobia. *Behavior Therapy*, **14**, 506-519.

Meichenbaum, D.H. (1975). Self-instructional methods. In F.H. Kanfer & A.P. Goldstein (Eds.), *Helping People Change*. New York: Pergamon Press.

Menzies, R.G., & Clarke, J.C. (1995). Danger expectancies and insight in acrophobia. *Behaviour Research and Therapy*, **33**, 215-221.

Michelson, L.D. & Marchione, K. (1991). Behavioural, cognitive and pharmacological treatments of panic disorder with agoraphobia: Critique and Synthesis. *Journal of Consulting and Clinical Psychology*, **59**, 100-114.

Öst, L.G. (1989). One-session treatment for specific phobias. *Behaviour Research and Therapy*, **34**, 707-715.

Öst, L.G., Stridh, B., & Wolf, M. (1998). A clinical study of spider phobia: Prediction of outcome after self-help and therapist-directed treatments. *Behaviour Research and Therapy,* **36**, 17-35.

Öst, L.G., Hellstrom, D., & Kaver, A. (1992). One versus five sessions of exposure in the treatment of injection phobia. *Behavior Therapy*, **23**, 263-282.

Öst, L.G., Salkovskis, P. M., & Hellstrom, K. (1991). One-session therapist directed exposure vs. self-exposure in the treatment of spider phobia. *Behavior Therapy*, **22**, 407-422.

Page, A.C. (1991). Simple phobias. *International Review of Psychiatry*, **3**, 175-187.

Petrie, K. & Abell, W. (1994). Responses of parasuicides to a computerized interview. *Computers in Human Behaviour*, **10**, 415-418.

Regier, D.A., Narrow, E.W., & Rae, D.S. (1990). The epidemiology of anxiety disorders: The epidemiologic catchment area (ECA) experience. *Journal of Psychiatric Research*, **24**, 3-14.

Rothbaum, B.O., Hodges, L.F., Kooper, R., Opdyke, D., Williford, J.S., North, M. (1995). Effectiveness of computer-generated (virtual reality) graded exposure in the treatment of acrophobia. *American Journal of Psychiatry*, **152**, 626-628.

Sampson, J.P. (1986). The use of computer-assisted instruction in support of psychotherapeutic processes. *Computers in Human Behaviour*, **2**, 1-19.

Slack, W.V., Porter, D., Balkin, R., Kowaloff, H.B., & Slack, CW. (1991). Computer-assisted soliloquy as an approach to psychotherapy. *MD Computes*, **7**, 37-42.

Smith, K.L., Kirkby, K.C., Montgomery, I.M. & Daniels (1997). Computer-delivered modelling of exposure for spider phobia: Relevant versus irrelevant exposure. *Journal of Anxiety Disorders*, **11**, 489-497.

Thorpe, S.J. & Salkovskis, P.M. (1995). Phobic beliefs: Do cognitive factors play a role in specific phobias? *Behaviour Research and Therapy*, **33**, 805-816.

Thorpe, S.J. & Salkovskis, P.M. (1997). The effect of one-session treatment for spider phobia on attentional bias and beliefs. *British Journal of Clincial Psychology*, **36**, 225-241.

Weizenbaum, J. (1977). Computers as "therapists". *Science*, **198**, 354.

Williams, S.L. & Watson, N. (1985). Perceived danger and perceived self-efficacy as cognitive determinants of acrophobic behaviour. *Behaviour Therapy*, **16**, 136-146.

Wilson, F.R., Omeltschenko, L. & Yager, G.G. (1991). Coping with test stress: Microcomputer software for treatment of test anxiety. *Journal of Behaviour Therapy & Experimental Psychiatry*, **22**, 131-139.

Wolpe, J. (1982). *The Practice of Behavior Therapy* (3rd ed.). New York: Pergamon Press.

EMPIRICAL STUDY

A controlled comparison of computer-based vicarious exposure versus live exposure in the treatment of spider phobia

by

Lisa Gilroy (B.A. Hons.)

submitted in partial fulfilment of the requirements

for the degree of

Master of Psychology (Clinical)

University of Tasmania

16th November, 1998

Abstract

The purpose of this study was to examine the efficacy of a computer-based vicarious exposure treatment for spider phobia compared to the standard treatment, therapist-directed live exposure. A total of 45 participants diagnosed with specific phobia (spiders) were included in the study following assessment. Participants were randomly assigned to one of three treatment conditions: computer-based treatment, therapist-directed live exposure treatment or a relaxation placebo treatment. Each treatment group received three 45 minute sessions. Phobic symptomatology was measured at pre treatment and post treatment and at a three month follow-up by the Spider Questionnaire, Fear Questionnaire, Phobic Targets and Work Adjustment Scale and a Behavioural Assessment Test. The results showed that the computer-based treatment was an effective treatment for spider phobia and comparable to therapist-directed live exposure, in producing a significant improvement on all relevant measures of phobic symptomatology. Both the computer-based and live exposure treatments were more effective than the relaxation placebo treatment. The computer-based treatment required substantially less therapist time than that of the live exposure treatment and was rated by participants as a helpful and acceptable treatment. These finding warrant the further development of the computer-based techniques in treating phobic disorders.

Anxiety disorders constitute a significant problem in mental health. Of the anxiety disorders specific phobias are the most common (Marks, 1986) affecting an estimated 8.4% of the adult female population and 3.8% of males (Regier, Narrow, & Rae, 1990). Specific phobia can be defined as a "marked and persistent fear of clearly discernible, circumscribed objects or situations" (Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, [DSM IV] American Psychiatric Association, 1994, p.405). Among the specific phobias the subtype of animal phobias, which includes fear of dogs, snakes and spiders, is the most common in the population, with a life-time prevalence of 6.1% (Bourdon, et al., 1988). Such high prevalence rates warrant the development of cost-effective, safe and widely available treatment strategies.

Treatment efforts for specific phobia have predominantly focused on exposure procedures in attempting to reduce phobic symptomatology. The effectiveness of live exposure treatment has been well established and is often considered to be the treatment of choice for specific phobia (Chambless, 1990; Marks, 1987). Standard live exposure treatment involves exposing the client to a series of graded phobic stimuli in real life, usually across weekly sessions, until habituation is achieved (Marks, 1987). Research into the parameters of effective live exposure have consistently indicated that long, continuous exposure periods reduce fear to a greater degree than do shorter periods (Marks, 1987), and that massed treatment sessions are superior to spaced sessions (Foa, Jameson, Turner & Payne, 1980; Marks, 1987). In fact recent studies have indicated that intensive live exposure treatment during a single session (of up to three hours) produces comparable results to those produced using spaced programs over several weeks (Hellstrom & Öst, 1995; Hellstrom, Fellenius & Öst, 1996; Öst, 1989; Öst, Hellstrom & Kaver, 1992; Öst, Salkovskis & Hellstrom, 1991; Thorpe & Salkovskis, 1997).

Unfortunately the demand for live exposure treatment continues to outstrip the number of appropriately trained therapists required to provide it (Griest, 1989; Hassan, 1992). These treatments are thus often restricted to specialist behavioural clinics which are not accessible to many (Griest, 1989). Also the costs of such treatment are out of the reach of many individuals (Greist, 1989).

Attempts to expand the availability of effective treatment: Computer-based therapy

One way of increasing the availability of exposure treatment is via the computer delivery of treatment. Computer-based treatments are a recent innovation predominantly due to initial technological difficulties and concern regarding the ethical issues relating the limitations of computers in achieving the standard and safety of human-administered therapy (Lawrence, 1986). However with advances in computer technology and programming, recent research has provided support that when computer programs are designed for the specific purpose of therapy they can provide a personal atmosphere, adequate safeguards, flexibility and with rare exceptions are highly acceptable to clients (Carr & Ghosh, 1983; Hassan, 1992).

Behavioural therapy particularly lends itself to computer automation, as it requires the concise specification of steps and has clearly defined goals and outcome criteria (Kirkby, 1996). Early automated behavioural treatment programs for anxiety disorders (e.g., Biglan, Villwock & Wick, 1979; Lang, Melamed, & Hart, 1970) demonstrated that therapeutic change is not dependent on direct interpersonal interaction with a therapist. Despite the promising findings of early studies over the past several years there has only been a relatively small number of computer-based behavioural treatments developed, at varying stages of evolution (e.g., Agras, Taylor, Feldman &

Losh, 1990; Baer, Minichiello, Jenike, & Holland, 1988; Carlin, Hoffman & Weghorst, 1997; Burnett, Taylor & Agras, 1985; Rothbaum et al., 1995) . Controlled outcome studies comparing these innovative treatment strategies with therapist-directed live exposure treatment however have been scarce, with only one published study by Ghosh et al., (1988) and one unpublished thesis by Hassan (1992) to date.

Comparative outcome studies

Ghosh et al. (1988) developed and evaluated a text-based computer-delivered behavioural treatment for phobias. The program requires the client to go through structured interviews in developing a hierarchical list of phobic situations and tasks they are willing to undertake for self exposure homework. In a controlled outcome study this computer-based treatment was compared with the same treatment delivered by a therapist and a self-help manual with a sample of 84 mixed phobics. All groups demonstrated significant and comparable improvement on self-ratings of avoidance and anxiety at post treatment and at one and six month follow-ups. A limitation of this study however was that it did not employ a Behaviour Assessment Test which provides for a more realistic assessment of improvement.

More recent developments are exploiting the capabilities of computers in presenting high quality audiovisual material and in addressing the contribution of modelling in treating specific phobias. Modelling has been consistently shown to be effective in the treatment of phobias (Bandura & Menlove,1968; Blanchard, 1970; Kazdin, 1974) and is often used as a adjunct strategy in standard live exposure therapy (Marks, 1987). Of particular interest symbolic modelling, which involves presenting the model via a medium such as a computer, whereby the model is not physically present, has been shown to be effective in the treatment of phobias (Bandura, 1968; Bandura &

Menlove, 1968; Blanchard, 1970). Although research suggests that symbolic modelling is less effective than live modelling (Bandura, Blanchard & Ritter, 1969) it is argued that the reduction in efficacy may be offset by the possibility of a wider sampling of models and phobic stimuli (Bandura, 1968).

Hassan (1992) in an unpublished thesis reported the development and evaluation of a computer-based treatment for spider phobia utilising symbolic modelling. In this program hierarchies of still images (e.g. drawings) and a video clip showing a therapist demonstrating exposure therapy with a client are delivered to the participant, providing symbolic modelling of live exposure.

Hassan (1992) compared this computer-based treatment with therapist-directed live exposure, live modelling, and a wait list control group. In this study 36 spider phobics received between four and five treatment sessions. Results revealed that all treatment groups had a comparable and clinically significant improvement on a Behavioural Assessment Test and questionnaire ratings of distress. Thus the results of this study and those of Ghosh et al. (1988) highlight the potential effectiveness of computer-based treatments in providing a similar level of improvement in phobic symptomatology as that achieved with therapist-directed treatments such as live exposure.

Other approaches in computer-based treatment

The above programs have been based either on text instructions for exposure homework (Ghosh et al., 1988) or on presenting non-interactive hierarchies of audiovisual displays in which the participant simply observes the phobic stimuli or a client receiving exposure (Hassan, 1992). Virtual reality techniques, although at the present time rather expensive and cumbersome offer another option for presenting phobic situations. To date a single case (Carlin et al., 1997) and a pilot study (Rothbaum et al., 1995) using this

technique combined with therapist counselling with height and spider phobic subjects have shown some promise in reducing phobic avoidance. Although virtual reality program development is early in its evolution with respect to delivering treatment such technology provides a taste of what will be available in the future.

An interactive computer-based treatment for phobic disorders which simulates exposure therapy has recently been developed by Kirkby, Daniels & Watson (1992). This treatment program employs "non-immersive" virtual reality technology, such that the phobic client observes and interacts within a virtual world via the two dimensional computer screen and computer mouse, as in a video game. The program teaches the client the principles of exposure therapy and provides an opportunity for vicarious exposure.

Four clinical studies using this technique have been completed, and have investigated clinical outcomes in different phobic groups undertaking the computer-based treatment. These studies have found significant improvements from pre treatment to post treatment in questionnaire ratings of phobic severity in spider phobic (Smith, Kirkby, Montgomery & Daniels, 1997) agoraphobic (Harcourt, 1997; Hutchinson 1992) and obsessive compulsive (Clark, Kirkby, Daniels & Marks, 1998) client groups. These studies however have not included comparison with non-computer treatment methods, so do not address the critical issue of the efficacy of computer-based vicarious exposure compared to standard therapist-directed live exposure.

The current study proceeds to advance this line of research by investigating this issue in spider phobics. As no previous study has controlled for the contribution of non-specific effects of treatment, a relaxation treatment will be employed in this study as a psychological placebo. Relaxation has high acceptability and face validity but has been found to have no significant

therapeutic effect when employed without specific instruction on its use in phobic encounters (Marks et al., 1993). Phobic change will be measured by the Spider Questionnaire, Fear Questionnaire, Phobic Targets and Work Adjustment Ratings Scale, and a Behavioural Assessment Test (BAT) which provides for a more realistic assessment. Assessment will be extended three months beyond the end of treatment to determine the durability of the treatment effects.

It was hypothesised that:

1) Both the live exposure and computer-based treatment conditions would lead to significant decreases in spider phobia on all measures, but that the relaxation placebo condition would remain at approximately pre treatment level.

2) That the observed improvement in spider phobia in the live exposure and computer-based treatments would be maintained at three month follow-up.

Method

Participants

Participants were recruited via newspaper advertisements and public notices (Appendix 1). Participation was voluntary and no payment was offered. The study was approved by the Ethics Committee of the Royal Hobart Hospital. Inclusion criteria were: a diagnosis of specific phobia (spiders) using the Composite International Diagnostic Interview (Andrews, Morris-Yates, Peters, & Teerson, 1993); age16 and 60 years; minimum duration of phobia of one year; no similar treatment in the past; and no concurrent non-anxiety psychiatric disorder; no history of affective disorder or psychosis. Only females were recruited to exclude gender as a possible confounding variable.

Fifty six females responded to the advertisements of whom fifty presented for assessment. Two failed to meet the diagnostic criteria. Five (four from the relaxation condition and one from the live exposure condition) did not complete the full treatment program due to: time constraints (three), moving interstate (one), and having already undergone the treatment allocated (one). The remaining forty five participants were randomly assigned to one of the three treatment conditions.

Materials

Participants were assessed with the following measures:

1. Composite International Diagnostic Interview - respondent administered version (CIDI - A) (Andrews, Morris-Yates, Peters & Teerson, 1993). The CIDI-A provides an assessment of mental disorders according to DSM III-R criteria.

2. National Adult Reading Test (NART) (Nelson, 1983). The NART is an estimate measure of intellectual ability.

3. Spider Questionnaire (SQ) (Watts & Sharrock, 1984). Comprises 43 items rated as true or false. 33 items reflect phobic vigilance, internal preoccupation and avoidance/coping. Five items address factual knowledge about spiders and the remaining five are related to non-specific aspects of spider phobia. Higher scores indicate more self reported fear.

4. Fear Questionnaire (FQ) (Marks & Mathews, 1979). This questionnaire measures phobic severity on several analogue scales. It has a high test-retest reliability (0.79-0.93) on all measures (Marks & Mathews, 1979). It results in four scores: *Main phobia* refers only to the target phobia (i.e., spider phobia), rated on a scale ranging from 0 'would not avoid it' to 8 'always avoid it'; *Total phobia* refers to the sum of the agoraphobia, blood-injury and social phobia sub-scores. It covers 14 common phobic situations each rated on a scale ranging from 0 'would not avoid it' to 8 'always avoid it'. *Anxiety-depression* is the sum of five questions about emotions, on a scale ranging from 0 'hardly at all' to 8 'very severely troublesome'. *Global phobia* refers to all phobic symptoms, not just the target phobia, and is rated on a scale ranging from 0 'no phobias present' to 8 'very severely disturbing/disabling'.

5. Phobic Targets (PT) and Work and Adjustment Ratings Scales (WARS) (Watson & Marks, 1971). The phobic problem (e.g., spiders) and four goals in relation to the phobia are identified by the participant. These are rated in relation to perceived discomfort on a scale ranging from 0 'none' to 8 'very severe'. The amount of impairment the phobia causes in the participant's work, family life, home management, social and private leisure and level of depression are also rated on a scale ranging from 0 'not at all' to 8 'very seriously'.

6. Behavioural Assessment Test (BAT). This test involves 11 increasingly difficult tasks in approaching a spider. These are displayed in Figure 1. A score of 2 is given for a completed step and 1 for a step attempted but not completed (Hassan, 1992). Higher scores reflect less avoidance. In this study the BAT room was 6 x 3 metres and was well illuminated. The live huntsman (Delena Cancerides) spider, measuring 10-12cm (Appendix 2) was placed in a transparent container on a table about 4-5 metres away from the door of the BAT room. Each participant was requested to complete as much as she could of the 11 steps in the BAT. The participants were instructed to stop whenever they felt excessive anxiety and were instructed not to push themselves forward if they felt excessively fearful. The researcher accompanied each participant during the BAT to ensure complete understanding of each step, and to record subjective units of distress following completion, or attempt without completion, of each step. Following the BAT the researcher stayed with the participant ensure the participant's anxiety did not remain excessive on leaving.

Instructions

You are required to perform the following steps in the same order of presentation.

Your level of anxiety will be assessed at every step and you should stop performing the step and immediately leave the room whenever you begin to feel excessively anxious.

Steps

1	Open the door and enter the room.
2	Reach the table on which the transparent container holding the live spider is placed.
3	Look at the spider therein.
4	Touch the container with your hand.
5	Lift the container and hold it using both hands.
6	Hold the container close to your face and observe the details of the spider therein.
7	Put the container on the table and open it without removing the lid completely.
8	Remove the lid and let the spider loose on the table.
9	Catch the loose spider and replace the lid of the container.
10	Re-open the container, have the spider on the table and handle it using both hands.
11	Replace the spider in the container and close it.

Figure 1. The Behavioural Assessment Test (BAT) adapted from Hassan (1992).

7. Subjective Units of Distress Scale (SUDS). SUDS was used to measure participant anxiety during the BAT. This is a 10 interval visual analogue scale ranging from 0 'no anxiety' to 100 'extreme anxiety' (Appendix 3).

8. Treatment Acceptance and Helpfulness. After completion of the treatment phase of the study participants were asked to indicate their perception of treatment acceptance and helpfulness on an analogue scale ranging from 1 'not helpful (acceptable) at all' to 7 'extremely helpful (acceptable)'. Separate scales were used for acceptance and helpfulness (Appendix 4).

Procedure

Participants attended sessions individually. There were two one hour pre-treatment assessment sessions, followed by three 45 minute treatment sessions (spaced approximately two weeks apart), then a one hour post treatment assessment and a three month follow-up assessment. The researcher delivered both the assessment and treatment sessions.

1. Pre-treatment assessment

This session involved explaining the rationale and objectives of the project via verbal explanation and an information sheet (Appendix 5), obtaining written consent (Appendix 6), answering questions, obtaining demographic details (Appendix 7) and completing the CIDI-A. For ethical reasons all participants were informed that one of the three treatment conditions might not be of assistance, but not which one. Participants diagnosed as having specific phobia (spiders) using the CIDI-A then entered the next pre-treatment assessment phase. This session involved administering a battery of tests and questionnaires in the following order: NART, FQ, SQ, PT, WARS, and the BAT

including SUDS. Participants were randomly assigned to one of the three treatment groups.

2. Three treatment conditions

2.1 Therapist-directed live graded exposure

The following procedure for administering live graded exposure was employed following Hassan (1992). Treatment commenced with an introduction to the treatment rationale stressing habituation, that is, participants were informed that if they stayed long enough in the phobic situation instead of escaping or avoiding that they would find that more and more anxiety provoking situations could be managed without undue anxiety. Participants were reassured that they were in control and that they would not be forced into any particular encounter with the phobic stimulus.

The participant was then instructed exactly how to carry out exposure using an initial presentation of five pictorial representations of spiders (ranging from a drawing to photos of increasing large spiders) (Simon-Brunet, 1994) and then moving onto a standard sequence of 10 steps of increasingly fearful phobic stimuli, similar to those in the BAT. No relaxation exercises were used in the exposure sessions.

The participant was asked to view each photo for at least 30 seconds but were allowed to stop if their anxiety became excessive. The same picture was then viewed again. When all pictures could be viewed with little or no anxiety, the graded tasks involving the live spider were introduced. The live huntsman (Delena Cancerides) measured approximately 10-12cm. Progress through the steps in the graded exposure tasks was paced by the participant and the researcher in consultation with regard to the participant's anxiety and

willingness to proceed to the next step. SUDS ratings of less than 20 were used as a guide to move to the next step after three successful exposures to the step below. Live exposure steps commenced with the participant standing four metres away from the spider which was in a transparent container on a table, then moving to about 1.5 metres away sitting on a chair, then sitting directly in front of the spider, handling the sealed container in which the spider was held, lifting the lid of the container, touching the spider gently with a pen, touching the spider in the container wearing gloves, letting the spider loose on the floor, catching it with the container and a piece of cardboard, and handling the spider with bare hands out of the container. The therapist assisted whenever the participant lost control of the spider.

The second and third treatment sessions began with the last point in the sequence that the participant managed to perform easily and fearlessly in the preceding session. No exposure homework was given.

2.2 Computer-based vicarious exposure treatment

The program instructed participants in vicarious exposure for spider phobia. The introduction begins by describing the symptoms of a client suffering from spider phobia, and informs the participant of the effectiveness of exposure therapy in treating spider phobia. The participant is then asked by the computer to assist the phobic patient (screen figure) to resolve her fear of spiders. A demonstration and practice session commences. The screen scenario then begins and the participant is required to direct the screen figure (using a mouse point and click technique) into various rooms in a house containing spiders (spider picture, plastic spider, dead spider and live spider). As the participant directs the screen figure around the house the computer provides an anxiety thermometer to give the participant feedback on the level of anxiety the screen figure is feeling in particular situations. The computer

also provides a running score which increments with exposure behaviour. A target score of 2000 is the goal, by which stage the screen figure shows no anxiety, thus simulating habituation. Figure 2 shows two typical screen scenarios.

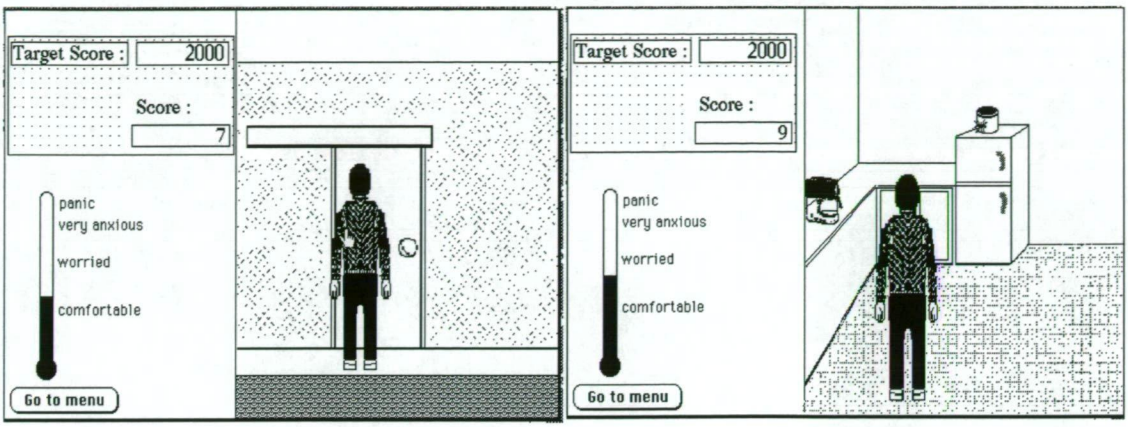


Figure 2. Computer-based vicarious exposure typical screen scenarios.

In the initial session the researcher stayed with the participant for approximately five minutes to answer any questions, and then left the participant to work through the program. No exposure homework instructions were given by the researcher or by the computer.

2.3 Progressive Muscle Relaxation

An audio tape of Progressive Muscle Relaxation was used to deliver the rationale and relaxation treatment (New Harbinger Publications, 1987). The long and short versions of Jacobson's complete deep muscle relaxation were repeated twice to fill the 45 minute treatment sessions.

At the commencement of each treatment session the researcher spent several minutes with the participant to ensure that they were comfortable. Participants sat in a cushioned chair in a quiet room. The treatment comprised of

relaxation only, without instructions for imaginal exposure. No exposure homework instructions were given to the participants.

3. Post-treatment and follow-up assessments

Both sessions involved an assessment battery of the following tests: FQ, SQ, PT, WARS and the BAT including SUDS. A further self rating of treatment usefulness and acceptance was obtained from participants following completion of the treatment sessions.

Design and Analysis

This study employed a 3 x 3 mixed design. The between groups variable being treatment group (computer-based treatment, live exposure treatment, relaxation placebo treatment). The dependent variables being repeated measures across sessions (pre treatment, post treatment and follow-up) on the FQ, SQ, PT, WARS, BAT and SUDS. 3 groups x 3 assessment phase repeated measures ANOVA were performed to test the effect of each treatment group on the phobic ratings for each dependent measure across the study. Fisher's protected LSD tests were used for post hoc pairwise comparisons. Differences in age, NART, ratings of helpfulness and acceptability of treatment between the three groups were examined using one way ANOVA. Greenhouse-Geisser epsilon corrections were performed on all effects involving repeated measures factors.

Results

1. Group differences at pre-treatment

ANOVA indicated that there was no significant difference in age or NART scores between the treatment groups. The mean age of participants was 34.5 for the live group, 28.5 for the computer group and 36 for the relaxation group. Mean NART score was 116 for the live group, 112 for the computer group and 113 for the relaxation group. There was no significant difference between the groups on the pre-treatment assessment of SQ, the four FQ scores, BAT and SUDS score.

2. Treatment Effects on Phobic Ratings

2.1 Spider Questionnaire

ANOVA showed a significant interaction between group and assessment phase ($F(4,76)=3.37$, $p=0.02$) on the Spider Questionnaire. These results are displayed graphically in Figure 3. Post hoc tests indicate that the live exposure and computer groups both showed a significant improvement in spider phobia from pre to post ($p=0.0001$ for both) and pre to follow-up assessments ($p=0.0001$ for both). The relaxation group showed no significant improvement from pre to post assessment, however there was a significant improvement from pre to follow-up assessment ($p=0.002$). Post hocs tests showed that there was no significant difference between groups at follow-up assessment, however that both live and computer group ratings were significantly different from the relaxation group at post assessment ($p=0.007$ and $p=0.045$ respectively). Results indicate no significant difference in improvement between the computer and live groups at post assessment.

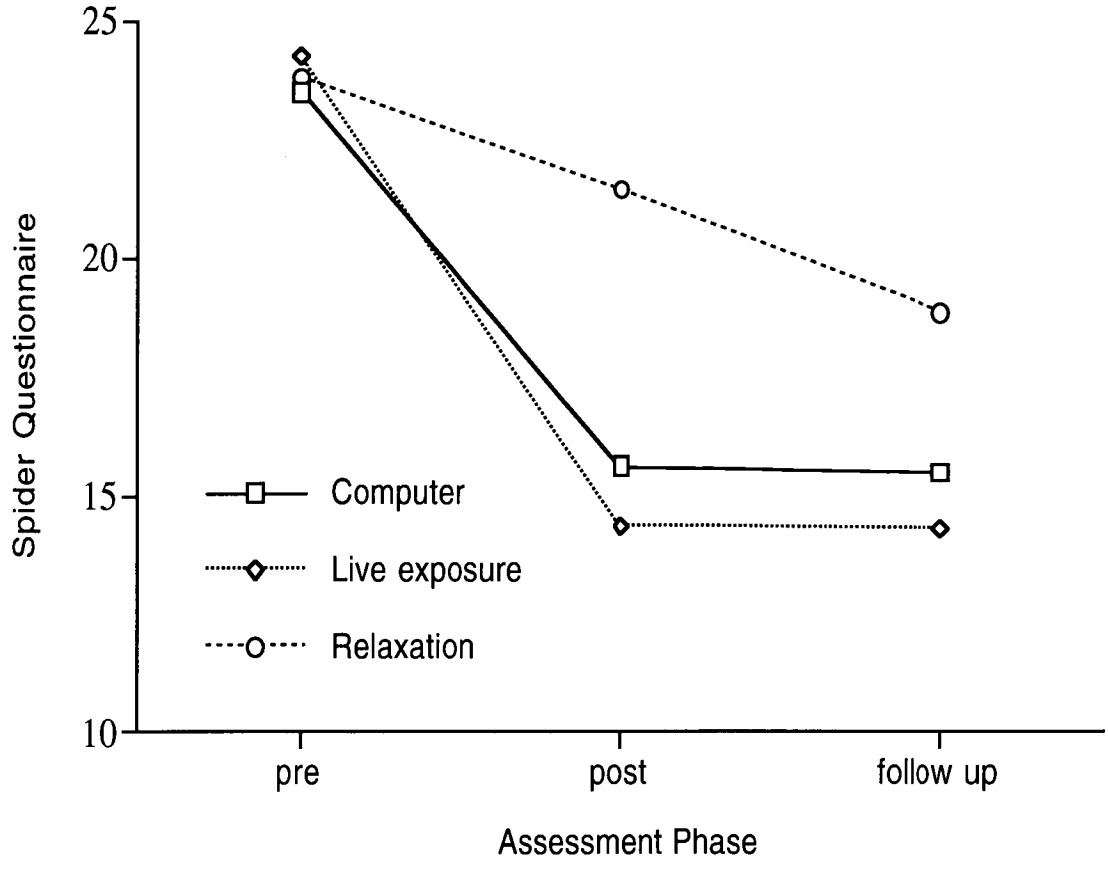


Figure 3. Mean score for each treatment group on the Spider Questionnaire across assessment phases.

2.2 Fear Questionnaire

The means and standard deviations for the three treatment groups on the FQ components across assessment phases are presented in Table 1.

Table 1. Means and *(standard deviations)* for all treatment groups on the FQ across assessment phases.

Group	Phase	FQ Main	FQ Global	FQ Total	FQ Anx/Dep
Live					
	Pre	8.00 *(0)*	5.92 *(1.89)*	19.08 *(11.12)*	9.46 *(10.57)*
	Post	3.92 *(2.35)*	2.85 *(2.08)*	15.08 *(10.06)*	6.46 *(9.35)*
	Fup	3.08 *(2.61)*	3.31 *(2.56)*	17.85 *(11.06)*	3.92 *(3.55)*
Comp					
	Pre	7.71 *(0.61)*	5.93 *(1.07)*	21.29 *(10.36)*	11.93*(10.72)*
	Post	4.79 *(1.89)*	3.64 *(1.65)*	23.93 *(14.50)*	7.75 *(2.07)*
	Fup	4.07 *(1.86)*	3.43 *(1.60)*	20.07 *(12.98)*	6.00 *(6.60)*
Relax					
	Pre	7.69 *(0.63)*	6.07 *(1.73)*	16.36 *(16.81)*	5.71 *(6.02)*
	Post	6.92 *(1.19)*	5.29 *(2.13)*	14.57 *(12.62)*	4.36 *(4.91)*
	Fup	5.92 *(2.36)*	4.29 *(2.27)*	15.35 *(11.24)*	3.86 *(4.15)*

2.2.1 Main Phobia

ANOVA showed a significant interaction between group and assessment phase on ratings of main phobia ($F(4,72)=4.72$, $p=0.003$). Post hoc tests indicated that the live exposure and computer groups both showed a significant improvement in spider phobia from pre to post ($p=0.0001$ for both) and pre to follow-up assessments ($p=0.0001$ for both), but not from post to follow-up. Means however suggest that the improvement at post assessment was maintained at follow- up. The relaxation group showed no significant improvement from pre to post assessment, however there was a significant improvement from pre to follow-up assessment ($p=0.005$). Post hoc tests showed that both live and computer groups were significantly different from

relaxation group at post assessment (p=0.0005 and p=0.02 respectively), but not significantly different from each other at post assessment. At follow-up there was a significant difference between live and relaxation groups only (p=0.008).

2.2.2 Global Phobia

Results showed a significant interaction between group and assessment phase on ratings of global phobia (F(4,76)=2.71, p=0.04). Post hoc tests indicated that the live exposure and computer groups both showed a significant improvement in global phobia ratings from pre to post (p=0.0001 for both) and pre to follow-up assessments (p=0.0007 and p=0.0001 respectively), but not from post to follow-up assessments. The relaxation group showed no significant improvement from pre to post assessment, however did show a significant improvement from pre to follow-up and post to follow-up assessment (p=0.0002 and p=0.03 respectively). Post hoc tests indicated that there no significant differences between groups at follow-up assessment, however that both live and computer groups were significantly different from relaxation group at post assessment (p=0.0009 and p=0.02 respectively). There was no significant difference between the live and computer groups at post assessment.

2.2.3 Total Phobia and Anxiety-Depression

There was no significant interaction for main effects for total phobia.

Results show a main effect for assessment phase on anxiety-depression ratings (F(2,76)=5.871, p=0.004). Post hocs show a significant improvement in anxiety-depression ratings from pre to follow-up for the computer group only

(p=0.025). There was no significant improvement across assessments for the relaxation and live treatment groups.

2.3 Phobic Targets and Work Adjustment Ratings Scale

Means and standard deviations for Phobic Targets and Work Adjustment Ratings Scale are displayed in Table 2. Results indicated that at pre-treatment there was a significant difference in ratings between the computer and live groups (p=0.009) and the live and relaxation groups (p=0.006) for target 1, but no significant difference between the computer and relaxation groups. Means indicate that the live exposure group had a significantly lower rating on target 1 than the computer and relaxation groups at pre assessment. Post hoc tests show a significant difference at pre assessment between the live exposure and relaxation groups for target 3 (p-=0.029). Means indicate that the live exposure group had significantly lower ratings on target 3 than the computer and relaxation groups at pre assessment. Post hoc tests show a significant difference in private life ratings between the computer and relaxation groups at pre assessment (p=0.05). The relaxation group had a significantly lower distress level in terms of private life at pre assessment.

Fisher's protected LSD tests indicated a significant improvement from pre to post assessment and pre to follow-up assessment in phobic problem ratings (disturbance) and the depression, home, private life ratings on the WARS for both the live exposure and computer groups ($p<0.05$ in each case), but not for the relaxation group. There was no significant difference in improvement at post or follow-up assessment in ratings of phobic problem or home life for the live and computer groups. The relaxation group showed an improvement from pre to follow-up assessment in ratings of phobic problem only (p=0.01). The computer group also showed a significant improvement on ratings of work life from pre to post and pre to follow-up assessments ($p<0.01$ in each case).

Table 2 Means and *(standard deviations)* for the various components of the PT and WAS for the three treatment groups across sessions.

Group	Phase	Work Adjustment Scale						Phobic Problems and Targets				
		Family	Social Leisure	Home	Private Leisure	Depre-ssion	Work	Problem	Target 1	Target 2	Target 3	Target 4
Live	Pre	0.31 *(1.1)*	0.69 *(.95)*	3.15 *(1.9)*	2.92 *(1.6)*	1.85*(1.95)*	0.46 *(0.9)*	5.77*(1.70)*	6.69 *(1.7)*	6.85 *(1.3)*	6.40 *(1.8)*	6.69 *(2.4)*
	Post	0.15*(0.55)*	0.23 *(.61)*	0.92 *(1.0)*	0.69 *(0.9)*	0.31*(0.75)*	0.31 *(0.8)*	2.08 (1.32)	2.21 *(2.1)*	2.15 *(1.2)*	3.60 *(2.7)*	3.00 *(2.8)*
	Follow-up	0 *(0)*	0.46 *(.78)*	0.46 *(0.8)*	0.54 *(0.8)*	0.36*(0.96)*	0.31 (0.9)	3.31 (2.53)	2.92 *(3.0)*	3.15 *(3.0)*	3.73 *(3.2)*	2.92 (2.9)
Computer	Pre	0.93 *(1.0)*	1.5 *(2.4)*	2.29 *(2.5)*	3.29 *(2.2)*	1.36*(1.78)*	1.29 *(1.7)*	6.07 (1.77)	7.57 *(0.6)*	7.14 *(1.1)*	6.73 *(1.6)*	7.07 *(1.3)*
	Post	0.64 *(.93)*	0.36 *(1.1)*	1.0 *(1.6)*	1.07 *(1.1)*	0.57*(1.28)*	0.43 *(0.9)*	3.43 (1.28)	3.50 *(1.9)*	3.50 *(2.0)*	3.60 *(2.4)*	4.29 *(2.2)*
	Follow-up	0.57 *(.85)*	0.71 *(1.6)*	0.93 *(1.6)*	1.0 *(1.2)*	0.21*(0.80)*	0.29 *(1.1)*	3.93 (1.98)	3.71 *(2.2)*	3.00 *(2.5)*	3.67 *(2.8)*	4.07 *(3.2)*
Relaxation	Pre	1.0 *(0.7)*	1.57 *(1.7)*	2.71 *(2.2)*	1.79 *(1.6)*	1.29*(2.02)*	0.43 *(1.2)*	5.79 (2.08)	7.64 *(0.7)*	7.43 *(0.8)*	7.60 *(0.6)*	7.57 *(0.9)*
	Post	0.71 *(1.3)*	1.57 *(1.5)*	2.14 *(1.4)*	1.57 *(1.2)*	0.64*(1.01)*	0.29 *(0.7)*	4.93 (2.13)	6.14 *(1.8)*	6.50 *(1.3)*	6.53 *(1.9)*	7.07 *(1.5)*
	Follow-up	0.50 *(1.3)*	1.5 *(1.7)*	1.93 *(2.2)*	1.5 *(1.8)*	0.57*(1.28)*	0.57 *(1.2)*	4.57 (2.71)	5.93 *(2.1)*	5.93 *(2.5)*	5.53 *(2.7)*	6.21 *(1.7)*

There was no significant improvement in ratings of social and family life in any of the groups. Means were low for all groups at pre assessment on ratings of depression, family life, social, private leisure and work life.

Results indicated that there was a significant improvement in target ratings for all self defined targets for all groups from pre to post and post to follow-up assessments ($p<0.05$ in each case), with the exception of Target 4 for which the relaxation group showed improvement from pre to follow-up assessment ($p<0.001$) but not from pre to post assessment.

2.4 Behavioural Assessment Test (BAT)

The results for each group on the BAT across assessment phases are displayed graphically in Figure 4.

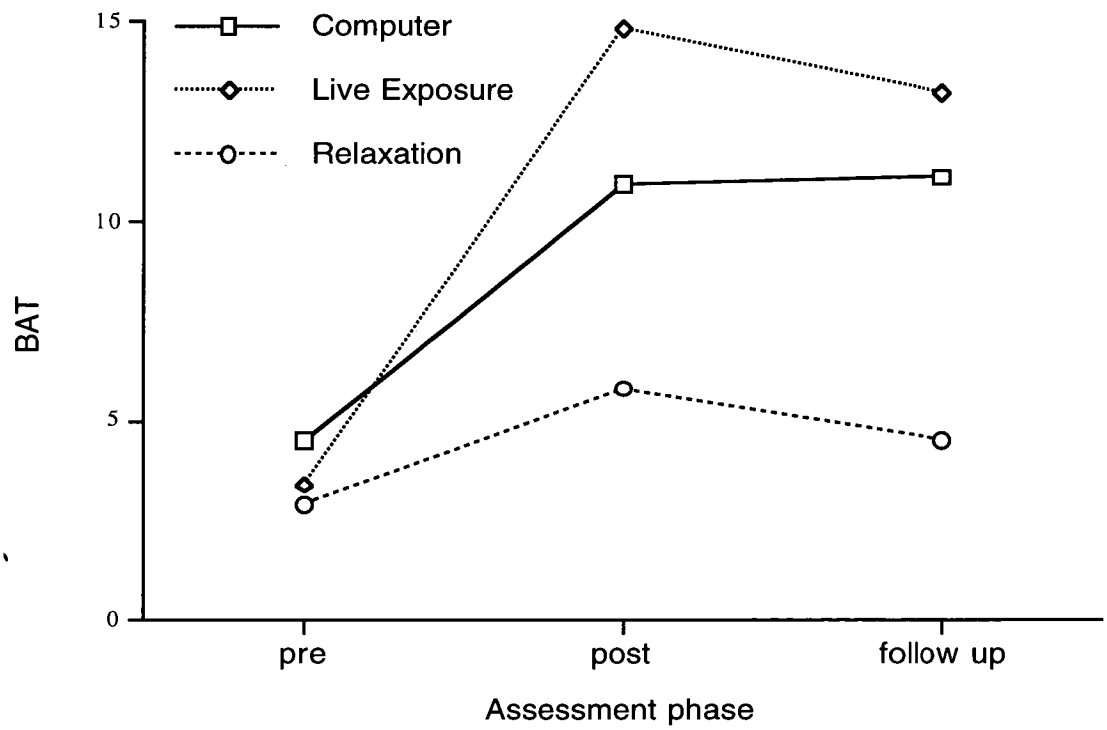


Figure 4. Means for each treatment group on the BAT across assessment phases. Note that higher scores indicate greater approach behaviour.

Results show a significant interaction between group and assessment phase on the BAT ($F(4,76)=7.55$, $p<0.0001$). Post hoc tests indicate that there was a significant improvement for the live ($p=0.0001$), computer ($p=0.0001$) and relaxation groups ($p=0.02$) from pre to post assessment. There was a significant improvement for the computer ($p=0.0001$) and live groups ($p<0.0001$) between pre and follow-up assessments, indicating that the improvement was maintained. There was no significant difference in the scores for the relaxation group between pre and follow-up assessments, indicating the improvement at post assessment was not maintained in the relaxation group. There was no significant improvement for the live, computer or relaxation group from post to follow-up assessment. Post hoc tests also show that there was a significant difference between all groups at post assessment ($p<0.02$) and a significant difference between the computer and relaxation groups ($p=0.002$) and live and relaxation groups ($p=0.0001$) at follow-up assessment. There was no significant difference between the computer and live groups at follow-up assessment.

2.5 Subjective Units of Distress (SUDS)

Mean ratings for each treatment group on SUDS during the BAT across assessment phase are displayed in Figure 5.

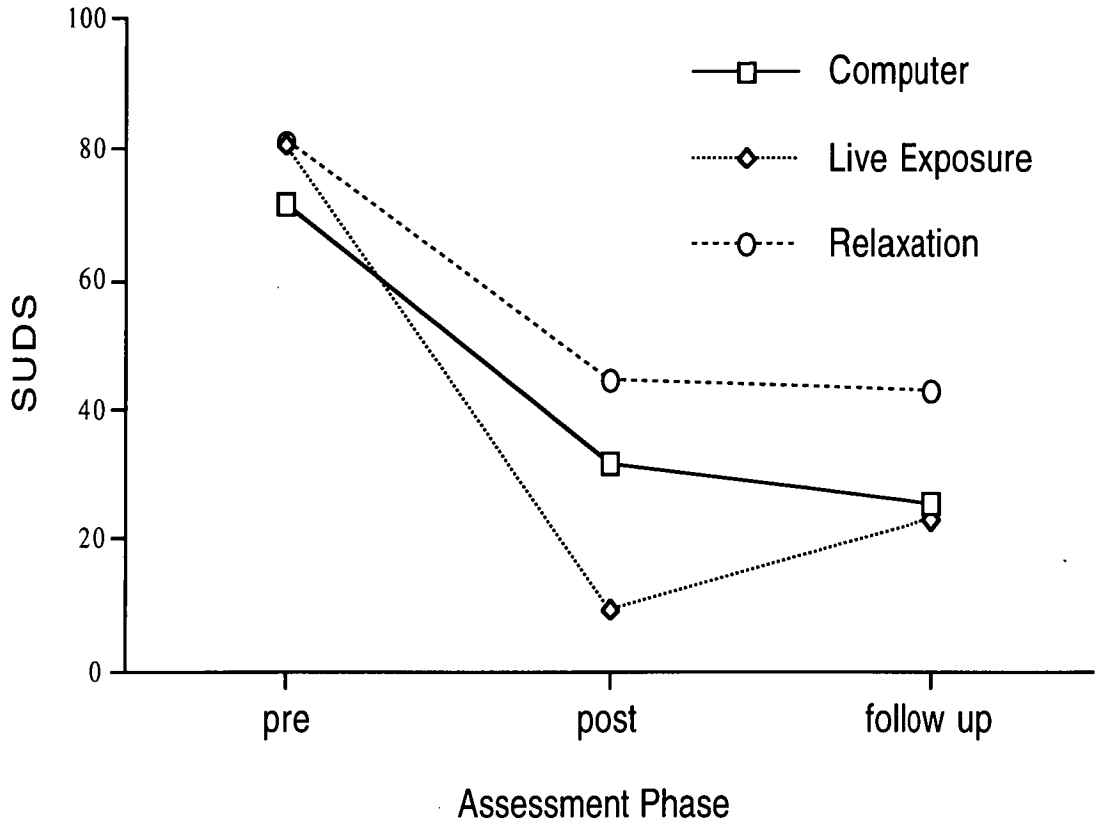


Figure 5. Mean SUDS ratings for each treatment group during the BAT across assessment phase.

Results show a significant interaction between group and assessment phase on SUDS ($F(4,68)=2.62$, $p=0.04$). Post hoc tests showed that the live group showed a significant decrease in SUDS ratings from pre to post assessment ($p=0.0001$), and significant increase from post to follow-up ($p=0.05$), however an overall improvement in SUDS ratings from pre to follow-up assessment ($p=0.0001$). The computer and relaxation groups also showed a significant improvement from pre to post assessment ($p=0.0001$ and $p=0.003$ respectively), and from pre to follow-up assessment ($p=0.0001$ and $p=0.002$ respectively), but not from post to follow-up assessment.

2.6 Summary of improvement and clinical significance

Table 3 displays the percentage improvement for each treatment group from pre to follow-up assessment on each outcome variable. Percentage improvement scores were calculated on the difference between pre-treatment and three month follow-up ratings.

Table 3. Percentage improvement for each treatment group on outcome measures from pre to follow-up assessment.

Group	SQ	FQ Main	FQ Global	FQ Anx/ Dep	PT Prob	PT 1-4 Avge	WARS Avge	BAT	SUDS
Live	41	62	44	59	43	53	78	75	72
Comp	34	48	42	50	36	50	66	60	64
Relax	21	23	30	33	21	22	26	36	47

Percentages suggest that improvement for both the live and computer treatment groups was substantial. Carr, Ghosh & Marks (1988) suggest that an improvement of 50% reflects clinical significance. Using this criteria it can be observed that for the live exposure group improvement was clinically significant on six of the nine relevant outcome measures, while for the computer based treatment improvement was clinically significant on five of the nine outcome measures. The relaxation group did not show a clinically significant improvement on any of the outcome measures.

2.7 Estimated therapist-participant contact

Table 4. Estimated duration of therapist-participant contact for each treatment group.

Group	Sessions (No.)	Therapist-Participant Contact (Mins)	Total Duration (Mins [Hrs])
Live	3	135	135 (2.25)
Comp	3	30	135 (2.25)
Relax	3	30	135 (2.25)

As shown in Table 4 the live exposure group required the greatest amount of therapist time totaling 2.25 hours, whereas both the computer-based treatment and relaxation treatment groups required only 30 minutes of therapist time. All groups received 2.25 hours of treatment.

3. Computer-based vicarious exposure treatment scores

Results indicate the mean score on the computer treatment for session 1 was 1587, increasing to a mean of 1821 for session 2 and to 1898 at session 3. ANOVA shows a significant main effect across treatments ($F(2,28)=4.06$, $p=0.03$). Post hocs indicate that there was a significant improvement in scores from session one to session two ($p=0.05$) and session one to session three ($p=0.01$), but not from session two to session three.

4.Treatment acceptance and helpfulness

Table 5 shows the means and standard deviations for ratings of acceptance and helpfulness of treatment for the live, computer and relaxation groups.

Table 5. Means and *(standard deviations)* for treatment acceptance and helpfulness.

Group	Acceptance	Helpfulness
Live	6.40 *(1.06)*	6.40 *(1.12)*
Computer	5.07 *(1.67)*	4.80 *(1.74)*
Relaxation	4.73 *(1.53)*	3.47 *(1.69)*

Mean scores suggest that all treatments were viewed as being moderately to extremely acceptable at post assessment. ANOVA showed a significant difference between groups on self ratings of treatment acceptability ($F(2,42)=5.62$, $p=0.007$). Post hoc tests indicate that the live exposure treatment was significantly more acceptable to participants than the relaxation treatment ($p=0.003$) and the computer treatment ($p=0.02$). There was no significant difference in acceptability between the relaxation and computer treatments.

There was a significant difference between groups on ratings of treatment helpfulness ($F(2,42)=13.63$, $p<0.0001$) at post assessment. Post hoc tests indicate that the live exposure treatment was rated as significantly more helpful than the computer ($p=0.007$) and relaxation treatments ($p=0.0001$). The computer treatment was rated as significantly more useful than the relaxation treatment ($p=0.02$).

Discussion

The purpose of this study was to compare two forms of treatment for spider phobia: therapist-directed live exposure and a computer-based vicarious exposure treatment. A relaxation treatment was also included to control for the non-specific effects of treatment. It was predicted that on all measures of phobic symptomatology that both the live exposure and computer-based treatment groups, but not the relaxation treatment group, would show significant improvement. Secondly that any improvement in the active treatment groups would be maintained at three month follow-up.

General Findings

The results showed that these predictions were supported to a large extent. This study found that both the computer-based vicarious exposure treatment and the live exposure treatment induced significant therapeutic changes in spider phobic symptoms across a multitude of indices. This improvement was observed in both the overt behavioural (BAT) and cognitive/subjective domains (SQ, FQ, PT, WARS and SUDS). On almost all measures there was no significant difference in the degree of improvement between the live exposure and the computer-based treatment groups at post treatment or at three month follow-up. All the means for the live exposure group indicated somewhat greater success for this group. Nevertheless the differences are non-significant suggesting comparable efficacy of the two treatments. Results showed that the relaxation placebo group also showed significant improvement from pre treatment to follow-up on some of the subjective symptom indices, but not the BAT. However improvement was significantly lower than in the two active treatment groups. Improvement reported in the live exposure and computer-based treatment groups at post treatment was maintained at three month follow-up.

Despite the overall improvement on all scales measuring phobic symptomatology for the computer and live exposure groups, there were three subscales on which no improvement was reported. The total phobia subscale of the FQ which measures agoraphobic, blood-injury and social phobia symptoms, and the social life and family questions on the WARS. Given that the total phobia subscale refers mainly to phobias other than spider phobia, it is unlikely that it would accurately reflect change in the phobia of interest. Similarly the lack of significant improvement across all groups observed in ratings of family and social life may be due to the relatively low impact spider phobia has on daily functioning in these areas as compared with other anxiety disorders (Chambless & Woody, 1990), rather than a failure of the active treatments to induce therapeutic improvement.

There were also two exceptions to the comparable pattern of improvement between the live exposure and computer-based treatments. Firstly, on the BAT the live exposure group performed significantly better than the computer-based treatment group at post-treatment. This difference on the BAT was not observed at follow-up and may reflect the live exposure groups recent exposure to the BAT-like treatment methods, when measured at post treatment. Secondly the computer-based treatment group but not the live exposure group showed a significant improvement in anxiety-depression ratings on the FQ from pre to follow-up assessment. An examination of the means suggests that this trend was also present for the live exposure group.

Inconsistent with the hypothesis was the finding that the relaxation placebo group showed improvement from pre-treatment assessment to follow-up assessment on subjective ratings on the SQ, FQ, PT and SUDS. This improvement was however substantially lower than that achieved in the two active treatment groups. Also there was no significant improvement from pre treatment assessment to follow-up assessment on the more objective

behavioural assessment test. Using Carr et al.'s (1988) criteria of a 50% reduction in symptoms as indicating clinically significant improvement the relaxation group failed to achieve this on any of the outcome measures, whereas the live exposure and computer-based treatment groups similarly met this criteria for the majority of the relevant outcome measures (six out of nine for the live exposure group and five out of nine for the computer treatment group).

Comparison with previous studies

The results suggesting the effectiveness of this computer-based treatment in reducing spider phobia symptoms supports Smith et al. (1997) previous study investigating this treatment method. Smith et al. (1997) reported a mean improvement of 4.75 points on the SQ, 1.75 points on the Main Phobia Scale of the FQ, and 2.16 points on PT questions across three computer-based treatment sessions with spider phobics. Similarly this study showed a mean improvement of 7.92 on the SQ, 2.92 on FQ, 3.4 on PT, further supporting the effectiveness of the computer-based treatment in reducing spider phobia symptomatology. Also in both studies there was a systematic increase in participants scores on the program from session one to session two, with improvement being maintained in session three, suggesting increased proficiency in the interactive scenarios and supporting the use of the computer-simulation in successfully training participants in behavioural skills.

In reviewing the improvement reported using other computer-based treatment programs for phobias the results of this study are also comparable. Ghosh et al. (1988) using a text-based computer program for phobias reported an estimated mean improvement from pre treatment to three month follow-up ranging from 50-55% in scores on the FQ. In this study similarly there was a mean improvement of 42%-50% for the relevant questions on the FQ. Ghosh

et al. (1988) reported an estimated improvement of 63% for PT from pre treatment to three months follow-up, also comparable to the 50% improvement reported over the same time period in this study. However whilst participants in Ghosh et al.'s (1988) study received on average 6.2 treatments sessions, participants in this study received only three treatment sessions which may account for the discrepancy in the strength of findings. The similar pattern of improvement however between the live exposure treatment and the computer-based treatment across assessment phases reported by Ghosh et al. (1988) is also consistent with the findings of this study, and provides support the comparable efficacy of such computer-based treatments with therapist-directed live exposure.

Hassan (1992) using a computer treatment program for spider phobia also based on symbolic modelling principles reported a somewhat greater level of improvement for participants on the Spider Questionnaire which measures subjective distress, with a mean 51% improvement compared to an average 34% improvement in this study. Participants in this study however had considerably lower questionnaire scores at pre assessment (mean of 23.56) compared with those reported by Hassan (1992) (mean of 37.8), and achieved a post treatment score some four to five points less (indicating greater improvement) than the participants in Hassan's (1988) study. Hassan (1992) also reported that the majority of participants in his computer group were able to complete the BAT to the final step following treatment (step 10 or 11) with a mean 65% improvement, compared to an average approach to step five or six in this study and an improvement of 60%. Pre-treatment levels however again differed in the two studies, with a mean pre treatment approach to step two in this study compared with a mean pre treatment approach to step four reported by Hassan (1992). Further this discrepancy in strength of therapeutic effects may be explained by considering several methodological differences between the studies. Firstly Hassan (1992) employed an extra 1.5 - 2 treatment

sessions and instructed participants to be confident of completing the BAT prior to ceasing treatment. Secondly all treatments were complemented with relaxation and factual knowledge regarding spiders, the later at least may have influenced improvement on the SQ, which includes five questions regarding factual knowledge about spiders. Thirdly the spider employed in the Hassan's (1992) BAT measured only 6cm, which is approximately half the size of the spider used in the present study which measures 10-12cm.

Again consistent with the present study and that of Ghosh et al. (1988), Hassan (1992) also found no significant differences between the treatment effects of the computer-based treatment compared to therapist directed live exposure and live modelling at post assessment, further supporting the comparability of computer-based methods with therapist directed treatment for phobias.

In relation the efficacy of the therapist-directed live exposure treatment employed in this study, the results showed that for most outcome measures there was a 50% or greater improvement in symptomatology using the spaced (3 x 45 minutes sessions fortnightly) treatment program. However only a small proportion (15%) of participants were able to get within one or two step of completing the BAT at follow-up assessment. Many of the studies investigating live exposure treatment report almost complete remission (as measured on BAT) in the majority of participants following live exposure treatment (e.g. Chambless, 1990; Marks, 1987). These studies however often employ 10 or more sessions of exposure (Chambless, 1990). Comparison is further confounded by the duration and number of sessions employed and also the addition of cognitive, educational, relaxation techniques (Marks, 1987). It is likely that given a greater number of live exposure sessions the majority participants in this study would have gone on to achieve complete remission, similar to that achieved by Chambless (1990).

Recent research has indicated that one prolonged exposure session of up to three hours (Hellstrom & Öst, 1995; Hellstrom, Fellenius & Öst, 1996; Öst, 1989; Öst, Hellstrom & Kaver, 1992; Öst, Salkovskis & Hellstrom, 1991) produces similar improvement to that of approximately 10 spaced sessions (e.g. Chambless, 1990). Although these results have not been replicated by a disinterested group to date, future research concerning the effectiveness of the computer-based treatment in comparison to therapist directed treatments would benefit from employing this prolonged one session live exposure methodology.

Acceptance and advantages of the computer-based treatment

While participants in this study rated the live exposure treatment as more acceptable and helpful than the computer and relaxation treatments these differences were not reflected in the symptom severity measures. Furthermore the overall moderate to extremely high ratings of acceptability of all treatments suggests that client resistance would not be sufficient to prevent the use of the computer treatment. In further support of this was a zero attrition rate in the computer-based treatment group during the treatment phase. In considering the usability of the computer-based vicarious exposure treatment, none of the participants in this study reported difficulties in following the automated instructions, or directing the figure around the house. As touch screen and voice recognition technology become more available this will further increase the ease with which such treatment can be self administered.

A major advantage of the computer-based treatment in this study is the substantial reduction in therapist time spent per client during treatment sessions. Whereas the live exposure treatment in this study involved 2.25 hours of therapist contact, the computer treatment involved only 30 minutes of

therapist contact. Overall the findings in this study suggest that this computer-based vicarious exposure technique can provide an effective alternative to live exposure therapy in spider phobia.

Methodological Issues

There were several methodological weaknesses in the present study. The same person, who was a Masters student in psychology administered both the assessments and treatments. A blinded design would reduce the possibility of bias in future research. Additionally the sample size of 15 participants per group meant that type II errors cannot be excluded as an explanation for there being no significant difference between the live exposure and computer-based treatments. However in support of the present findings, the results were consistent across a range of outcome assessments, and the study detected differences between the two active treatments and the placebo treatment.

Conclusions

The results of this study provide support for the efficacy of the computer-based vicarious exposure treatment as an acceptable, practical and effective treatment in relieving spider phobic symptoms. Further these results suggest that computer-based vicarious exposure techniques can provide a comparable alternative to standard therapist-directed live exposure therapy in spider phobics. These findings warrant the ongoing development and investigation of computer-based treatment strategies for phobias. Given that computer technology is becoming increasingly more accessible and rapidly decreasing in cost, programs of this nature provide a real possibility of extending psychological treatments to those currently under-served. Important areas for future research include, comparison of the efficacy of prolonged one session therapist directed live exposure such as that reported by Öst (1989)

with the computer-based treatments; replication of the treatment studies using computer-based methods by disinterested groups; and the use of blinded designs in comparative treatment studies.

References

Agras, W.S., Taylor, C.B., Feldman, D.E., & Losch, M. (1990). Developing computer-assisted therapy for the treatment of obesity. *Behavior Therapy*, **21**, 99-109.

American Psychiatric Association (APA). (1994) *Diagnostic and Statistical Manual of Mental Disorders*, 4th Edition, (DSM-IV). Washington: American Psychiatric Association.

Andrews, G., Morris-Yates, L., Peters, L., & Teerson, M. (1993). *Composite International Diagnostic Interview CIDI-Auto* (Version 1.1). Sydney: World Health Organisation.

Baer, L., Minichiello, W.E., Jenike, M.A & Holland, A (1988). Use of a portable computer program to assist behavioural treatment in a case of obsessive compulsive disorder. *Journal of Behaviour Therapy and Psychiatry*, **19**, 237-240.

Bandura, A. (1968). Modelling approaches to the modification of phobic disorders. In E. Porter (Ed.),*The Role of Learning in Psychotherapy.* London, Churchill (pp. 201-223).

Bandura, A., Blanchard, E.B. & Ritter, B. (1969). Relative efficacy of desensitisation and modelling approaches for inducing behavioural, affective, and attitudinal changes. *Journal of Personality and Social Psychology*, **13**, 173-199.

Bandura, A. & Menlove, F.L. (1968). Factors determining vicarious extinction of avoidance behavior through symbolic modelling. *Journal of Personality and Social Psychology*, **8**, 109-116.

Biglan, A., Villwock, C. & Wick, S. (1979). The feasibility of a computer controlled program for the treatment of test anxiety. *Journal of Behavior Therapy and Experimental Psychiatry*, **10**, 47-49.

Blanchard, E.B. (1970). Relative contributions of modelling, informational influences, and physical contract in the extinction of phobic behavior. *Journal of Abnormal Psychology*, **76**, 55-61.

Bourdon, D.H., Boyd, J.H., Rae, D.S., Burns, B.J., Thompson, J.W., & Locke, B.Z. (1988). Gender differences in phobias - results of the ECA community survey. *Journal of Anxiety Disorders, **2**, 227-241.*

Burnett, K.F., Taylor, C.B. & Agras, W.S. (1985). Ambulatory computer-assisted therapy for obesity: A new frontier for behaviour therapy. *Journal of Consulting and Clinical Psychology*, **53**, 698-703.

Carlin, A.S., Hoffman, H.G., & Weghorst, S. (1997). Virtual reality and tactile augmentation in the treatment of spider phobia: A case report. *Behavior Research and Therapy*, **35**, 153-158.

Carr, A.C., & Ghosh, A. (1983). Response of phobic patients to direct computer assessment. *British Journal of Psychiatry*, **142**, 60-65.

Carr, A.C., Ghosh, A., & Marks, E.M. (1988). Computer-supervised exposure treatment for phobias. *Canadian Journal of Psychiatry*, **33**, 112-117.

Chambless, D.L. (1990). Spacing of exposure sessions in treatment of agoraphobia and specific phobia. *Behavior Therapy*, **21**, 217-229.

Chambless, D.L. & Woody, S.R. (1990). Is agoraphobia harder to treat? A comparison of agoraphobics' and specific phobics' response to treatment. *Behaviour Research and Therapy*, **28**, 305-312.

Clark, A. Kirkby, K.C., Daniels, B.A., & Marks, I.M. (1998). A pilot study of computer-aided vicarious exposure for obsessive-compulsive disorder. *Australian and New Zealand Journal of Psychiatry*, **32**, 268-275.

Foa, E.B., Jameson, J.S., Turner, R.M., & Payne, L.L. (1980). Massed vs. spaced exposure sessions in the treatment of agoraphobia. *Behaviour Research and Therapy*, **18**, 333-338.

Ghosh, A., Marks, I.M. & Carr, A.C. (1988). Therapist contact and outcome of self-exposure treatment for phobias. British Journal of Psychiatry, 152, 234-238.

Greist, J.H. (1989). Computer-administered behavior therapy. *International Review of Psychiatry*, **1**, 267-274.

Harcourt, L. (1997). The differential effect of personality on computer based treatment of agoraphobia. University of Tasmania. Honours Thesis.

Hassan, A. A. M. (1992). A comparison of computer-based symbolic modelling and conventional methods in the treatment of spider phobia. University of Leeds, England. Phd Thesis.

Hellstrom, K., Fellenius, J., & Öst, L.G. (1996). One versus five sessions of applied tension in the treatment of blood phobia. *Behaviour Research and Therapy*, **34**, 101-112.

Hellstrom, K., & Öst, L.G. (1995). One session therapist directed exposure vs. two forms of manual directed self-exposure in the treatment of spider phobia. *Behaviour Research and Therapy,* **33**, 959-965.

Hutchinson, R. (1992). Developments in the treatment of agoraphobia: Potential use of computers. University of Tasmania. Masters thesis.

Kazdin, A.E. (1974). Covert modelling, model similarity, and reduction of avoidance behavior. *Behavior Therapy*, **5**, 325-340.

Kirkby, K.C. (1996). Computer-assisted treatment of phobias. *Psychiatric Services*, **47**, 139-141.

Kirkby, K.C., Daniels, B.A. & Watson, T.J. (1992). An interactive computerised teaching program for self exposure therapy of avoidant behaviour in phobic disorders. In Sanders M.R., Halford, W.K., (Eds.) Fourth World Congress in Behaviour Therapy Program and Abstracts. Bowen Hills, Queensland: Australian Academic Press, 73.

Lang, P.J., Melamed, B.G., & Hart, J. (1970). A psychophysiological analysis of fear modification using an automated desensitisation procedure. *Journal of Abnormal Psychology*, **76**, 220-234.

Lawrence, G.H. (1986). Using computers for the treatment of psychological problems. *Computers in Human Behavior*, **2**, 43-62.

Lee, C. (1984). Efficacy expectations and outcome expectations as predictors of performance in a snake-handling task. *Cognitive Therapy & Research*, **8**, 509-516.

Marks, I.M., Swinson, R.P., Basoglu, M., Kuch, K., Noshirvani, H., O'Sullivan, G., Lelliott, P.T., Kirby, M., McNamee, G., Sengun, S., & Wickwire, K. (1993). Alprazolam and exposure alone and combined in panic disorder with agoraphobia: A controlled study in London and Toronto. *British Journal of Psychiatry*, **162**, 776-787.

Marks, I.M. (1986). Epidemiology of anxiety. *Social Psychiatry*, **21**, 167-171.

Marks, I.M. (1987). *Fears, Phobias and Rituals.* New York: Oxford University Press.

Marks, I.M. & Mathews. A.M. (1979). Brief standard self-rating for phobic patients. Behaviour *Research and Therapy*, **17,** 263-267.

Nelson, H.E. (1983). *National Adult Reading Test* (NART). Windsor: Nfer-Nelson.

New Harbinger Publications, I. (1987). *Progressive Relaxation and Breathing* [Audio tape]. Oakland CA: New Harbinger Publications Inc.

Öst, L.G. (1989). One-session treatment for specific phobias. *Behaviour Research and Therapy*, **34**, 707-715.

Öst, L.G., Hellstrom, D., & Kaver, A. (1992). One versus five sessions of exposure in the treatment of injection phobia. *Behavior Therapy*, **23**, 263-282.

Öst, L.G., Salkovskis, P. M., & Hellstrom, K. (1991). One-session therapist directed exposure vs. self-exposure in the treatment of spider phobia. *Behavior Therapy*, **22**, 407-422.

Regier, D.A., Narrow, E.W., & Rae, D.S. (1990). The epidemiology of anxiety disorders: The epidemiological catchment area (ECA) experience. *Journal of Psychiatric Research*, **24**, 3-14.

Rothbaum, B.O., Hodges, L.F., Kooper, R., Opdyke, D., Williford, J.S., North, M. (1995). Effectiveness of computer-generated (virtual reality) graded exposure in the treatment of acrophobia. *American Journal of Psychiatry*, **152**, 626-628.

Simon-Brunett, B. (1994). *The silken web: A natural history of Australian spiders*. Chatswood: Reed Books.

Smith, K.L., Kirkby, K.C., Montgomery, I.M. & Daniels (1997). Computer-delivered modelling of exposure for spider phobia: Relevant versus irrelevant exposure. *Journal of Anxiety Disorders*, **11**, 489-497.

Thorpe, S.J. & Salkovskis, P.M. (1997). The effect of one-session treatment for spider phobia on attentional bias and beliefs. *British Journal of Clinical Psychology*, **36**, 225-241.

Watson, J.P., & Marks, I.M. (1971). Relevant and irrelevant fear and flooding - a crossover study of phobic patients. *Behaviour Therapy*, **2**, 257-293.

Watts, F.N. & Sharrock, R. (1984). Questionnaire dimensions of spider phobia. *Behaviour Research and Therapy*, **22**, 575-580.

APPENDIX 1

1 Newspaper advertisement

Spiders Spiders Spiders
Do you have a persistent and excessive fear of spiders? The University of Tasmania is currently investigating several treatments for **Spider Phobia** and is looking for volunteers to receive free treatment as part of this study. For more information contact Lisa Gilroy on BH (03) 62 264 885.

2. Poster (Enlarged)

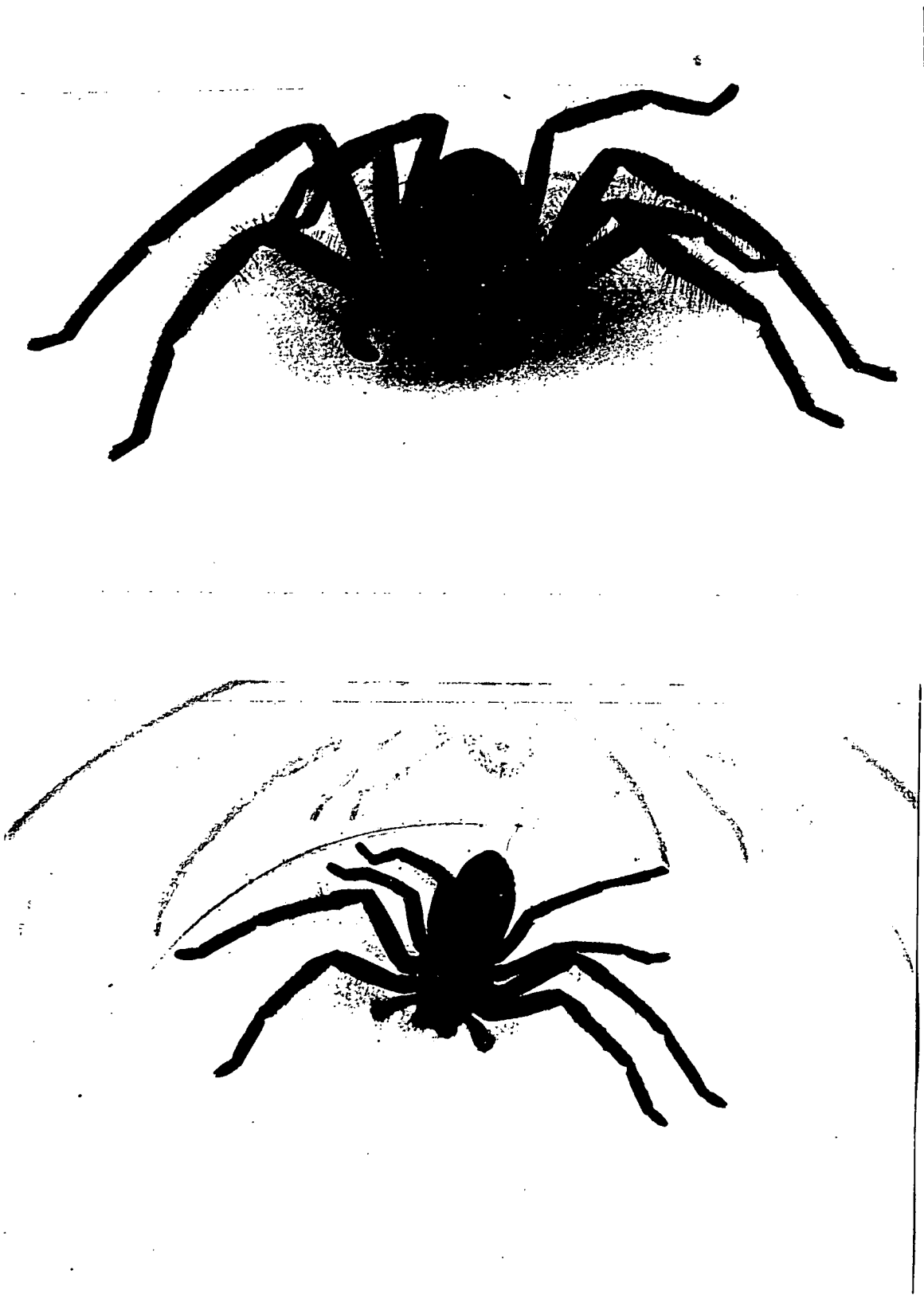
Spiders Spiders Spiders

Do you have a persistent and excessive fear of spiders? The University of Tasmania is currently investigating several treatments for **Spider Phobia** and is looking for volunteers to receive free treatment as part of this study. For more information contact Lisa Gilroy on

BH (03) 62 264 885

APPENDIX 2

Huntsman Spider (Delena Canceridies)



APPENDIX 3

BAT - STEP NO. ____

1. Indicate the level of anxiety you feel at this stage.

I	I	I	I	I	I	I	I	I	I	I
0	10	20	30	40	50	60	70	80	90	100
No Anxiety									Extreme Anxiety	

APPENDIX 4

HELPFULNESS/ACCEPTABILITY OF TREATMENT

This brief questionnaire aims to find out your experience of the treatment program you have recently completed, it's usefulness and acceptability in helping you to overcome your fearfulness of spiders. Your responses are confidential.

1. Which treatment group did you participate in? (Please circle)

Computerised Modelling of Exposure
Live Graded Exposure
Progressive Muscle Relaxation

2. How useful do you feel this treatment was in helping you overcome your fear of spiders?

I	I	I	I	I	I	I
1	2	3	4	5	6	7
Not at all helpful						Extremely helpful

2. Did you find this treatment acceptable in helping you deal with your fearfulness of spiders?

I	I	I	I	I	I	I
1	2	3	4	5	6	7
Unacceptable					Extremely Acceptable	

If unacceptable (below 4) please feel free to indicate why you found the treatment unacceptable

_____

_____

3. Do you have any other comments on this treatment program (e.g. suggestions for improvement, problems you had in completing the program, please continue on the back page if needed)

_____

_____

APPENDIX 5

Information Sheet

Computerised modelling of exposure versus exposure *in vivo* in the treatment of spider phobia

Purpose of the study: to develop effective treatments for individuals with spider phobia. The study compares three treatment methods based on well established principles of behaviour treatment. The first of these is real life therapist-guided exposure treatment to spiders. The second is practice on a computer-based simulation of treatment of spiders. The third is relaxation. The aim of the study is to see how effective these approaches are, and help understand ways in which they might work.

To be included in the study we need to confirm you have a phobia of spiders, without other mental disorder, and are in satisfactory general health. We will also check how much trouble you currently have with spiders by a short test to see if you can approach a spider.

Initially you will be asked some questions, and to complete a number of questionnaires which will let us know relevant details about your fear of spiders and your general mental and physical health. You will receive one of the three types of treatment we are comparing, the details of which will be fully explained to you beforehand. You will also have the opportunity to ask any questions. After you have completed the treatment phase which will involve three sessions, your progress will be assessed on two occasions, the last three months after you finish.

As you know, the anxiety you experience about spiders can be unpleasant and may include emotions of fear and worrying thoughts, wishing to avoid the situation, physical discomforts such as palpitations, sweating and over breathing. You may experience some of these symptoms during the study. Advice will be available to deal with these symptoms if they unduly trouble you. The aim of the study is to reduce your fear of spiders, however it cannot be guaranteed that the treatment will be effective for you.

Every effort will be made to ensure confidentiality of research data, and only the researchers will have access to identifying data. The results of the study may be published in journal articles but contain only group results and not information identifying you personally.

Participation in this study is entirely voluntary. You may withdraw at any time without prejudice to any future care. You will be assisted to overcome any anxiety experienced during the study, however if you are not able to tolerate this you will be withdrawn from the study and assisted to regain your composure.

There is no payment for participating in this project. On the other hand there will be no charge for the treatment you will receive in the study.

If you require further information at any stage please contact Lisa Gilroy on (03) 62 264 885. You may also contact Dr. Kirkby on (03) 62 264 885 or after hours on (03) 62 282 971 or the Department of Emergency Medicine on (03) 62 388 423. If you have any concerns of an ethical nature or complaints about the manner in which the project is being conducted you may contact the Ethics Committee on (03) 62 228 160.

Appendix 5 (continued)

This project has been approved by the Acute Care Program Ethics Committee. If you wish to seek information regarding the overall results of the study please contact Lisa Gilroy or Dr Kirkby. Further if you choose, your general practitioner will be informed of your participation in the study and of your progress. Should you require further assistance with your phobia after the study is completed, or if you have withdrawn from the study, then Dr Kirkby is available to discuss and assist with appropriate referral.

You will be given copies of the information sheet and consent form to keep. Thank you for your cooperation.

APPENDIX 6

CONSENT FORM

Computerised modelling of exposure versus exposure *in vivo* in the treatment of spider phobia: Cognitive and behavioural changes

1) I have read and understood the 'Information Sheet' for this study.

2) The nature and possible effects of the study have been explained to me.

3) I understand that the study involves the following procedures:

- Completing interviews and questionnaires at different stages
- Assessing whether I can approach a spider, and how anxious I am then
- Having treatment through relaxation, exposure to spiders with the help of therapist, or through using a computer program about spiders to overcome fear of them.

4) I understand that I may experience mental or physical symptoms of anxiety.

5) I have been informed that the results of the study may not be of direct benefit to my medical management.

6) Any questions I have have been answered to my satisfaction.

7) I agree to participate in this investigation and understand that I may withdraw at any time without prejudice to my future medical care.

I agree that research data gathered for the study may be published provided that I cannot be identified as a subject.

Name of **subject**.....

Signature.....

Name of **witness**.....

Signature.....

Researcher Section:

I have explained this study and the implications of participation in it to this volunteer and I believe that the consent is informed and that he/she understands the implications of participation.

Name of **researcher**.....

Signature..... Date.....

APPENDIX 7

PERSONAL DATA SHEET

Subject No. _ _ _ _ _ _ _ _

Name:_____

Address:_____

_____ **Post code**_____

Phone: Home_____**Work**_____

General Practitioner's Name (if you wish your GP to be informed of your participation and progress) _____

Address_____

Phone_____

Main Phobias:_____

How long have you had this phobia/s_____

Date of Birth_____**Age**_____

Are you currently taking any medication for psychological or physical conditions?

_____

_____

Are you taking any medication for a phobic condition?

_____

Have you in the past taken any medications for psychological condition/s? If so, what conditions?

_____

Do you have a heart condition or any other serious physical condition?

_____

_____

APPENDIX 8

Raw Data

SUBJECTID	GROUP	SQ_PRE	FQ_MAIN	FQ_TOT	FQ_ANX_DEP
96lg001	RELAX	33	8	3	5
96lg002	COMP	28	8	32	5
96lg003	COMP	18	7	22	24
96lg004	LIVE	20	8	32	3
96lg005	COMP	28	7	24	7
96lg006	COMP	27	8	3	0
96lg007	RELAX	27	8	64	16
96lg008	COMP	18	8	11	0
96lg010	LIVE	23	8	23	6
96lg012	LIVE	20	8	10	4
96lg013	LIVE	26	8	28	10
96lg014	LIVE	19	8	15	0
96lg016	RELAX	27	8	24	2
96lg017	RELAX	17	6	7	0
96lg018	LIVE	31	8	30	1
96lg019	RELAX	19	7	11	6
96lg022	COMP	26	8	21	8
96lg023	LIVE	23	8	12	0
96lg026	RELAX	23	8	5	3
96lg027	LIVE	11	7	12	4
96lg028	LIVE	28	8	22	30
96lg029	COMP	24	8	30	18
96lg031	COMP	30	8	21	18
96lg032	RELAX	31	8	7	0
96lg034	LIVE	27	8	12	13
96lg037	COMP	27	8	22	31
96lg038	COMP	26	8	13	7
96lg040	LIVE	28	8	6	18
96lg041	LIVE	23	8	39	30
96lg042	RELAX	20	8	15	2
96lg043	LIVE	24	8	18	7
96lg045	COMP	21	8	42	17
96lg046	COMP	26	8	15	28
96lg047	LIVE	23	8	57	16
96lg048	RELAX	13	8	30	5
96lg049	COMP	22	8	38	8
96lg051	LIVE	24	8	1	1
96lg052	COMP	20	8	22	1
96lg053	RELAX	23	7	0	4
96lg054	RELAX	30	8	10	2
96lg055	RELAX	27	8	32	2
96lg056	RELAX	24	8	14	17
96lg057	RELAX	18	8	14	2
96lg058	COMP	14	6	14	0
96lg059	RELAX	20	8	7	16

FQ_PRES_	DISTURBANC	SCORE_TARG	SCORE_TARG	SCORE_TARG	SCORE_TARG
7	7	8	7	8	8
4	4	8	7	6	8
6	6	7	8	6	6
7	6	8	7	6	8
7	6	8	7	8	8
7	7	8	8	8	8
8	8	6	7	8	8
6	8	7	7	7	7
7	8	8	6	8	8
4	4	7	8	8	8
8	8	8	4	1	0
7	6	4	8	6	6
7	7	8	8	8	8
6	2	8	8	7	6
6	6	6	6	6	6
3	7	8	8	7	8
7	7	8	7	7	8
2	4	4	8	8	8
8	7	8	8	8	8
2	8	6	8	7	8
8	6	8	8	8	8
6	2	7	8	8	8
6	6	8	8	5	5
3	3	6	6	6	8
7	7	8	6	8	8
7	8	8	8	8	8
6	8	8	8	8	8
5	5	6	8	5	8
6	8	8	8	6	8
6	6	8	7	8	6
3	3	8	6	6	7
5	5	8	6	4	4
6	6	7	7	7	7
6	6	4	6	7	8
5	3	8	8	8	8
6	6	8	7	8	8
7	4	4	6	6	4
5	7	8	7	8	8
6	7	8	8	8	8
8	7	8	8	8	6
7	6	8	7	7	8
7	8	7	8	8	8
6	6	8	8	8	8
3	3	6	4	3	6
4	3	8	6	7	8

WORK_SCORE	PRIVATE_SC	SOCIAL_SCO	HOME_SCORE	FAMILY_SCO	DEPRESSION
0	2	0	0	3	0
0	0	0	1	0	0
0	0	0	0	0	6
0	5	0	4	0	5
0	4	7	0	0	0
6	6	5	6	0	0
0	2	0	3	0	3
0	0	0	0	0	0
2	4	2	1	0	3
0	2	0	3	0	0
0	2	1	2	0	0
0	5	0	6	0	0
0	0	2	4	0	0
0	0	0	0	0	0
0	5	0	4	0	0
0	3	3	4	6	0
0	7	0	7	2	0
0	0	0	2	0	2
0	5	5	6	0	6
0	0	0	3	5	0
0	4	2	4	0	4
3	3	1	2	2	1
1	5	5	3	3	3
0	3	2	4	0	0
2	2	0	2	0	0
2	2	0	1	0	0
1	4	1	4	1	0
0	3	2	4	4	4
2	2	2	0	0	4
0	4	2	4	0	0
0	2	0	7	0	2
3	3	2	2	0	3
0	6	0	6	2	3
0	2	4	3	5	3
4	0	4	2	0	2
0	2	0	0	0	1
0	2	0	2	0	0
1	3	0	0	1	1
0	1	0	1	3	0
2	0	2	7	0	0
0	2	0	1	0	1
0	2	2	2	0	5
6	0	0	4	0	0
1	1	0	1	2	1
0	1	0	0	2	1

TOTAL_BAT	TOTAL_SE	TOTAL_SUDS	TOTAL_DE_B	TOTAL_DE_I	NART_IQ
3	50	80	0	0	123.85
3	30	70	0	0	113.89
5	60	40	0	0	111.4
3	80	90	0	0	113.06
3	10	90	0	0	109.74
3	10	80	80	90	109.74
3	50	50	0	0	113.06
3	10	90	0	0	110.57
3	50	100	0	0	112.23
3	5	65	0	0	120.53
13	60	80	20	40	123.02
3	50	50	0	0	117.21
0					108.08
2	100	80	60	80	119.7
2	50	80	0	0	119.7
2	55	70	0	0	119.7
7	5	95	0	0	108.08
3	35	80	0	0	118.04
3	10	50	0	0	117.21
1	50	100	50	10	118.87
2	60	100	0	0	113.06
3	30	80	0	0	113.06
2	70	100	0	0	114.72
2	100	100	0	0	112.23
2	100	90	0	0	114.72
3	70	50	0	0	113.06
2	20	80	0	0	116.38
2	99	70	0	0	115.55
2	50	85	0	0	112.23
3	40	80	60	80	111.4
3	50	80	20	30	113.89
6	100	40	0	0	106.42
3	70	50	0	0	107.25
3	20	80	70	90	118.87
13	80	70	0	0	110.57
7	70	75	0	0	113.06
3	50	80	0	0	110.57
13	40	70	0	0	114.72
1	5	90	0	0	120.53
1	5	90	0	0	106.42
2	50	100	0	0	104.76
2	100	90	0	0	103.1
0					118.87
3	50	60	0	0	118.04
3	20	50	0	0	118.87

POST_SUBJE	POST_GROUP	POST_SQ_TO	POST_MAIN_	POST_TOTAL	POST_TOTAL
96lg001	RELAX	30	7	2	3
96lg002	COMP	28	8	21	6
96lg003	COMP	19	6	13	6
96lg004	LIVE	8	2	25	6
96lg005	COMP	13	4	27	6
96lg006	COMP	12	5	7	0
96lg007	RELAX	25	8	48	15
96lg008	COMP	17	6	8	0
96lg010	LIVE	13	7	18	6
96lg012	LIVE	12	6	5	1
96lg013	LIVE	9	2	0	0
96lg014	LIVE	3	2	10	0
96lg016	RELAX	21	5	10	0
96lg017	RELAX	8	6	7	0
96lg018	LIVE	17	4	29	34
96lg019	RELAX	22	5	9	4
96lg022	COMP	14	6	36	3
96lg023	LIVE	13	2	9	0
96lg026	RELAX	23	8	9	2
96lg027	LIVE	14	5	15	4
96lg028	LIVE	26	8	16	15
96lg029	COMP	13	2	21	25
96lg031	COMP	16	6	26	8
96lg032	RELAX	27	6	6	1
96lg034	LIVE	20	4	21	4
96lg037	COMP	21	8	40	1
96lg038	COMP	14	2	4	5
96lg040	LIVE	20	8	14	9
96lg041	LIVE	15	4	32	6
96lg042	RELAX	17	7	11	2
96lg043	LIVE	11	1	16	1
96lg045	COMP	20	2	47	20
96lg046	COMP	23	6	17	8
96lg047	LIVE	21	4	46	16
96lg048	RELAX	9	2	28	5
96lg049	COMP	18	6	44	15
96lg051	LIVE	20	4	1	2
96lg052	COMP	9	5	34	3
96lg053	RELAX	20	6	1	5
96lg054	RELAX	27	8	18	0
96lg055	RELAX	29	8	26	6
96lg056	RELAX	25	8	9	3
96lg057	RELAX	14	4	1	2
96lg058	COMP	10	3	11	0
96lg059	RELAX	18	8	20	15

POST_PRESE	POST_DISTU	POST_SCORE	POST_SCORE	POST_SCORE	POST_SCORE
5	2	7	7	8	8
3	3	8	4	4	4
2	2	8	8	8	7
2	1	0	0	0	0
3	3	2	2	4	2
3	3	2	4	2	3
8	7	6	7	7	7
4	2	2	3	6	8
6	2	6	2	4	2
3	3	5	5	8	7
0	1	1	0	1	0
1	2	0	0	0	0
6	6	7	7	8	8
3	2	7	7	6	4
3	3	1	1	0	2
4	5	3	6	1	8
6	2	3	3	7	7
2	0	1	0	6	2
8	8	8	8	8	8
1	5	4	6	7	6
6	4	4	3	6	7
1	2	2	5	2	3
5	5	5	6	4	3
3	3	5	5	6	8
3	2	1	4	4	2
7	4	6	2	4	6
2	5	3	5	6	4
3	3	2	3	3	4
2	2	4	2	2	8
7	5	6	6	8	4
0	0	0	2	2	1
3	4	4	2	1	4
4	4	4	4	4	4
4	3	2	3	5	6
2	2	8	6	4	6
5	6	3	1	1	6
6	4	4	6	6	4
3	3	1	2	0	1
3	7	6	8	6	8
8	6	4	8	8	6
6	6	8	7	7	8
7	7	3	3	7	8
5	5	6	6	7	5
3	3	4	2	1	2
4	3	8	6	7	8

POST_WORK_	POST_SOCIA	POST_PRIVA	POST_HOME	POST_FAMIL	POST_DEPRE
0	0	0	2	4	0
0	0	1	2	0	0
0	0	0	0	0	4
0	0	0	0	0	0
0	0	1	0	0	0
2	0	0	1	0	0
0	0	3	3	0	3
0	0	0	1	0	0
0	0	0	0	0	2
0	2	0	0	0	0
0	0	0	0	0	0
0	0	0	1	0	0
0	2	0	4	0	0
0	0	0	0	0	0
0	0	1	1	0	0
0	3	3	2	2	0
0	0	3	0	2	0
0	0	0	0	0	0
0	4	3	4	0	2
0	0	0	2	2	1
0	1	2	3	0	0
0	1	0	2	2	0
0	4	3	1	1	0
0	4	2	2	0	0
2	0	2	2	0	0
2	0	1	1	2	1
0	0	2	2	0	0
0	0	1	1	2	2
2	0	0	0	0	0
0	2	2	4	0	0
0	0	1	2	0	0
2	0	1	0	0	0
0	0	2	6	2	3
0	1	1	1	0	7
2	3	2	1	0	0
0	0	2	0	0	0
0	0	2	2	0	0
0	0	0	0	0	0
0	0	2	2	2	0
2	2	0	3	0	0
0	0	2	1	0	1
0	2	2	2	0	2
5	0	0	5	0	0
0	0	0	0	0	0
0	0	1	0	2	1

POST_TOTAL	POST_TOTAL	POST_TOTAL	POST_TOTAL	POST_TOTAL	POST_COMP_
11	10	20	0	0	
10	50	30	0	0	2007
3	55	80	0	0	1178
18	100	0	0	0	
16	50	40	0	0	1035
3	50	50	0	0	638
5	100	50	0	0	
4	10	30	0	0	254
14	70	0	0	0	
15	100	10	0	0	
17	100	0	0	0	
20	100	0	0	0	
1	50	90	30	80	
16	90	10	0	0	
14	100	10	0	0	
3	50	75	0	0	
14	100	10	0	0	2008
15	100	0	0	0	
0	0	50	0	0	
10	100	40	0	0	
8	90	30	0	0	
14	50	30	0	0	2000
8	100	30	0	0	2007
4	70	60	0	0	
15	100	10	0	0	
10	100	80	0	0	2007
14	100	0	0	0	1586
15	100	25	0	0	
18	100	0	0	0	
6	90	70	20	50	
10	100	20	0	0	
16	100	0	0	0	2263
8	90	40	0	0	791
17	100	10	0	0	
14	100	0	0	0	
14	100	30	0	0	2015
14	100	20	0	0	
15	100	5	0	0	2004
14	100	70	0	0	
0					
3	70	50	0	0	
2	100	40	0	0	
3	80	90	0	0	
14	45	20	0	0	2005
3	50	50	0	0	

POST_COMP_	POST_COMP_	POST_USEFU	POST_ACCEP	FUP_SUBJEC	FUP_GROUP
		4	4	96lg001	RELAX
2013	2013	3	5	96lg002	COMP
2009	2013	1	1	96lg003	COMP
		7	7	96lg004	LIVE
1008	2003	5	5	96lg005	COMP
2004	2014	7	7	96lg006	COMP
		1	1	96lg007	RELAX
250	274	7	7	96lg008	COMP
		5	7	96lg010	LIVE
		6	7	96lg012	LIVE
		7	7	96lg013	LIVE
		7	7	96lg014	LIVE
		2	3	96lg016	RELAX
		2	6	96lg017	RELAX
		7	7	96lg018	LIVE
		6	6	96lg019	RELAX
2012	2014	6	5	96lg022	COMP
		7	7	96lg023	LIVE
		1	7	96lg026	RELAX
		6	6	96lg027	LIVE
		3	4	96lg028	LIVE
2004	2013	6	6	96lg029	COMP
1936	2004	5	6	96lg031	COMP
		6	5	96lg032	RELAX
		7	7	96lg034	LIVE
2017	2010	4	4	96lg037	COMP
2006	2007	6	6	96lg038	COMP
		7	4	96lg040	LIVE
		7	7	96lg041	LIVE
		3	5	96lg042	RELAX
		7	6	96lg043	LIVE
2021	2023	4	4	96lg045	COMP
2001	2032	3	3	96lg046	COMP
		7	7	96lg047	LIVE
		5	5	96lg048	RELAX
2017	2034	4	4	96lg049	COMP
		6	6	96lg051	LIVE
2008	2015	7	7	96lg052	COMP
		3	4	96lg053	RELAX
		4	4	96lg054	RELAX
		2	7	96lg055	RELAX
		3	4	96lg056	RELAX
		5	5	96lg057	RELAX
2010	2008	4	6	96lg058	COMP
		5	5	96lg059	RELAX

FUP_SQ_TOT	FUP_FQ_PRE	FUP_FQ_PRE	FUP_FQ_ANX	FUP_FQ_PRE	FUP_DISTUR
16	2	1	0	2	1
21	4	12	9	6	6
6	0	11	1	0	1
11	1	20	0	2	1
12	4	5	0	3	5
27	8	41	10	8	8
16	6	14	0	5	4
15	4	13	5	5	6
14	2	3	2	2	3
26	8	28	10	8	8
1	1	27	0	1	1
19	8	11	0	6	6
3	3	16	2	2	2
20	2	27	6	2	2
23	8	7	3	3	7
17	7	28	6	5	2
11	3	11	0	2	2
27	8	12	4	8	8
28	7	12	2	6	5
9	2	16	7	2	1
17	6	16	11	3	6
25	6	9	0	3	4
15	3	20	7	3	3
30	6	28	0	6	5
9	3	6	4	2	5
7	0	12	9	1	1
16	6	31	7	6	7
20	7	13	3	6	6
7	2	36	1	1	0
20	2	43	22	2	1
24	5	16	7	4	6
11	2	26	5	2	2
15	5	44	15	4	6
20	3	1	1	6	4
9	4	30	3	3	4
8	4	1	0	2	2
28	8	16	0	7	8
24	4	33	6	4	6
19	3	15	13	3	3
7	2	3	0	1	3
14	8	14	8	4	1

FUP_SCORE_	FUP_SCORE_	FUP_SCORE_	FUP_SCORE_	FUP_WORK_S	FUP_PRIVAT
4	4	4	4	0	0
6	8	6	8	0	0
0	0	0	0	0	0
4	0	2	0	0	0
8	7	7	7	4	3
8	8	8	8	4	4
2	2	6	8	0	0
4	2	2	0	0	0
5	7	7	7	0	0
8	4	1	0	0	2
0	0	0	1	0	0
6	5	7	7	0	0
6	7	6	4	0	0
0	0	0	2	0	2
4	8	4	8	0	0
2	3	7	7	0	3
0	0	8	3	0	0
8	8	8	8	0	5
7	7	8	8	0	0
1	3	0	0	0	0
2	4	3	1	0	2
5	6	6	8	0	3
2	4	2	1	1	0
8	3	6	7	0	0
3	5	6	3	0	2
2	2	0	3	0	0
7	7	6	7	3	1
7	7	8	5	0	2
0	1	3	1	0	1
4	0	0	2	0	0
4	4	4	7	0	2
8	5	3	5	2	3
3	1	1	5	0	2
3	7	5	5	0	1
2	2	0	0	0	0
2	2	2	5	0	0
8	8	8	6	2	0
6	7	8	7	0	1
3	0	3	8	0	3
3	0	1	2	0	0
8	8	0	4	0	0

FUP_SOCIAL	FUP_HOME_S	FUP_FAMILY	FUP_DEPRES	FUP_TOTAL_	FUP_TOTAL_
0	0	0	0	3	80
0	0	0	0	8	80
0	0	0	0	18	100
0	0	0	0	14	100
4	4	0	0	3	30
4	4	4	2	0	
0	1	0	0	4	50
0	0	0	0	14	90
2	0	0	0	7	100
1	2	0	0	13	60
0	0	0	0	18	100
0	0	0	0	0	
0	0	0	0	2	100
1	0	0	0	14	100
0	0	0	0	3	50
0	0	2	0	14	100
0	0	0	0	14	100
5	6	0	6	3	
0	0	0	0	3	80
0	0	0	0	14	80
1	1	0	0	3	100
3	2	0	0	4	100
0	1	0	0	18	100
5	0	2	0	4	60
0	2	1	0	14	100
0	0	0	0	18	100
2	0	0	3	5	70
2	3	0	0	6	80
0	1	0	0	15	100
0	0	0	0	18	100
0	5	2	3	10	100
2	2	0	0	14	90
0	0	0	0	14	100
0	2	0	2	14	100
0	0	0	0	18	100
0	0	0	0	14	90
2	6	0	0	0	
0	1	0	0	9	100
3	3	3	0	3	50
0	0	1	0	18	100
0	0	0	0	2	100

FUP_TOTAL_	FUP_TOTAL_	FUP_TOTAL_	FUP_USEFUL	FUP_ACCEPT	FUP_H_W_QU
20	0	0	7	7	4
30	0	0	2	2	0
0	0	0	7	7	7
0	0	0	6	6	4
60	0	0	4	5	5
			1	1	1
70	0	0	7	7	2
20	0	0	7	7	5
0	0	0	5	7	4
80	20	40	7	7	3
0	0	0	7	7	2
			4	4	1
80	60	80	6	6	2
10	0	0	6	6	6
70	0	0	4	4	3
30	0	0	6	6	2
0	0	0	7	7	4
			1	1	0
60	0	0	3	4	1
10	0	0	7	7	4
20	0	0	6	6	5
20	0	0	5	5	1
30	0	0	7	7	5
90	0	0	2	2	5
5	0	0	6	6	3
15	0	0	7	7	3
60	0	0	3	5	0
50	0	0	3	4	1
10	0	0	7	5	5
0	0	0	7	7	5
20	0	0	3	3	0
10	0	0	5	5	1
10	0	0	4	4	0
15	0	0	6	6	1
0	0	0	5	5	4
0	0	0	5	7	4
			2	2	0
60	0	0	2	2	4
60	0	0	3	3	4
15	0	0	7	7	7
60	0	0	4	5	2

FUP_H_W_QU
0
0
1
0
1
0
0
1
1
1
0
0
0
1
0
0
4
0
0
2
0
0
0
0
2
0
0
0
0
1
0
0
0
0
0
5
0
0
0
1
1