
USE OF IN VIVO AND IN VITRO DESENSITIZATION IN THE TREATMENT OF MOUSE PHOBIA: REVIEW AND CASE STUDY

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ABSTRACT

This is a case study of a 45-year-old woman with severe mouse phobia. She had developed the phobia at the age of 10 and this had been due to the fact that her mother had also been phobic of mice. She sought treatment because her phobia had worsened over the last two years, and the fear of suddenly coming across a mouse had caused an avoidance reaction at work. The treatment was a multi-modal approach combining imaginal exposure in hypnosis with in vivo desensitization, both approaches using a hierarchy of scenarios. The therapist also used props to encourage her to view the mouse as a 'friendly' object, as well as pictures of cartoon mice and real mice. Gradually, the woman became desensitized to mice and, after five sessions, having held two dead mice in her hand, made a complete recovery. This improvement was maintained at six-month follow-up.

Key words: mouse phobia, in vitro desensitization, in vivo desensitization, imaginal exposure

INTRODUCTION

Mouse phobia is classified as a specific phobia, animal type in DSM-IV (American Psychiatric Association, 1994) in which the patient often experiences high levels of anxiety and avoidance behaviour when (s)he anticipates, or is exposed to, an animal or insect. The literature search for this study focused its attention on the treatment of specific phobias (animal phobia subtype), while some attention was given to the treatment of other specific phobias. Using PsychInfo, EMBASE, and Medline from 1960 to the present day, it was revealed that specific phobias have been treated using hypnosis (Schneck, 1952; Gustavson & Weight, 1981; Morgan, 2001), psychotherapy (Sperling, 1971), eye movement desensitization and reprocessing (EMDR) (Jongh et al., 1999), group therapy (Öst et al., 1997), virtual reality exposure therapy (VRET) (Carlin et al., 1997), cognitive behavioural therapy (CBT) (Muhlberger et al., 2003; Koch et al., 2004), systematic desensitization (Lang et al., 1970), in vivo desensitization (Thyer, 1981; Arntz & Lavy, 1993), a combination of CBT, psychodynamic, and virtual reality treatment (Kahan, 2000), and flooding (Baum, 1988). It seems that, over the last 50 years, a behavioural approach to treatment has been favoured by clinicians; indeed, all the approaches above, with the exception of the psychoanalytic approach, used some form of desensitization—whether imaginal or in reality—during the course of the treatment. Indeed, Choy et al. (2007), in an extensive review, cited nine stud-

ies on animal phobics all of which used either systematic desensitization (described as imaginal exposure) or in vivo desensitization.

Focusing on the treatment of animal phobics, successful results have been found in the treatment of snake phobia (Rasmussen, 1973; Hunt & Fenton, 2007), spider phobia (Jong et al., 2000), dog phobia (Thyer, 1981; Hoffmann & Odendaal, 2001), bird phobia (Scott, 1970; Lassen & McConnell, 1977), cat phobia (Freeman & Kendrick, 1960), insect phobia (Jones & Friman, 1999), and wasp phobia (Brough et al, 1965; Brown et al., 2003). The general term 'animal phobia', known as zoophobia, often has a childhood onset (Marks & Gelder, 1966), and is twice as common in females (Craske et al., 1996). Patients suffering from a specific phobia (animal subtype) go to lengths to avoid the animal or insect; often they become so fearful of the phobic stimulus that it interferes and restricts day-to-day functioning at work and in social situations.

This anxiety can lead to an immediate panic attack—for instance, an outburst of screaming or shouting—or a highly complex and 'unreasonable' series of avoidance patterns. For instance, an arachnophobic patient, after a prolonged period of ruminations, might be unable to look at a magazine due to an uncontrollable, irrational fear of finding a spider on one of the pages; others would avoid going on holiday because of the fear of coming across a spider on the trip. Indeed, adults recognize that the fear, and its associated behaviour patterns, are excessive and 'unreasonable'; a diagnosis of specific phobia, however, should not be given to an individual who is frightened of snakes and who lives in a village whose inhabitants are constantly encountering venomous snakes. Whatever the subtype of the specific phobia—for instance, animal type, natural environment type, or situational type—they are all, to a greater or lesser extent, associated with the fear of losing control (Kraft & Kraft, 2004).

According to the DSM-IV classification (American Psychiatric Association, 1994), there is an increased risk for family members of developing a specific phobia: in many situations—and particularly in women—offspring develop phobic anxiety as a response to one of the parent's behaviour (Davey et al., 1993; Unnewehr et al., 1998). However, an epidemiological study on genetics, which focused on phobic women ($n = 2163$), suggested that the aetiology of specific phobias arose from a combination of 'modest genetic vulnerability' and traumatic events in childhood (Kendler et al., 1992).

Behaviour therapy has been shown to be extremely effective in the treatment of anxiety, fears, and phobias (Jongh et al., 1999; Antony & Barlow, 2002). In this approach, the therapist constructs a graded series of anxiety-provoking stimuli and, over a period of time, the patient is gradually introduced to more difficult stimuli. The graded hierarchy (Wolpe, 1958) is presented through imaginal exposure in hypnosis (in vitro systematic desensitization) or through real-life exposure in or outside the consulting room (in vivo systematic desensitization). The worldwide literature indicates that monosymptomatic phobias, where the individual has not suffered significant early life trauma, are particularly responsive to in vivo desensitization—viz., prolonged exposure to the conditioned stimuli in a real-life situation (Öst, 1997). In 1969, Bandura et al. analysed the efficacy of desensitization on animal phobics. They found that 92% of subjects were able to handle the feared stimulus (the animal) without fear; this compared favourably to the control group which had a 0% success rate.

Two important studies (Barrett, 1969; Rosen et al., 1976), which focused on the effect of systematic desensitization on subjects with snake phobia, consistently revealed improved subjective anxiety compared to the control condition, although the effects on avoidance behaviour were inconclusive. The latter study (Rosen et al., 1976) also reported reduced heart rate response to the feared stimulus. Interestingly, they found that there was no effect on avoidance post-treatment, whereas, in the Barrett study (1969), which compared desensitization with implosive therapies, it was found that 11 out of the 12 subjects in the desensitization group were able to hold or even touch the snake at the post-treatment stage ($p < 0.01$). This result compared favourably to the control group, where only 1 out of 12 were able to touch the snake after treatment. Barrett (1969) also assessed clinical status using a behavioural approach test (BAT) and found that the gains had been maintained: the author stated that the results showed that systematic desensitization had 'a consistent and continuing effect across subjects and across time', whereas the results in the implosive therapy group were more variable.

In vivo exposure involves patients confronting the phobic stimulus: usually, it is helpful for both patient and therapist to construct a graded hierarchy from the least anxiety-provoking to the most anxiety-provoking. However, in clinical trials, in order to limit confounding results (e.g. Gilroy et al., 2000; Götestam & Hokstad, 2002), researchers have used the same graded hierarchy for all subjects.

Consistently, in both the Gilroy et al. (2000) trial and the Götestam & Hokstad (2002) trial—both of which assessed the treatment of snake phobics—results showed that there was a greater decrease in subjective anxiety in the in vivo group compared to the control condition.

Two studies (Bandura et al., 1969; Egan 1981) compared in vivo exposure to systematic desensitization—the first study (Bandura et al., 1969) assessed the efficacy of desensitization compared with modelling techniques in the treatment of snake phobics, while the second (Egan, 1981) looked at the treatment of aquaphobia using either in vivo or in vitro desensitization. Results in both studies showed that in vivo exposure was significantly more effective than systematic desensitization. Rentz et al. (2003), in a study of dog phobics ($n = 82$), reported that in vivo exposure was not significantly better than imaginal exposure (in hypnosis). Öst et al. (1997) compared in vivo exposure to vicarious exposure: they randomly assigned spider phobics ($n = 46$) to three forms of treatment—in vivo exposure, direct observational/modelling (where subjects observed someone else receiving treatment), and indirect observation using video exposure. Using Jacobson's criteria (Jacobson et al., 1984), there were a greater number of responders in the in vivo group (75%) compared to the direct observation group (7%) and the video observation group (31%) ($p < 0.0005$).

In addition, long term follow-ups have reported that, in the treatment of animal phobias using in vivo exposure, acute treatment gains have either been maintained or have improved still further over time (Arntz & Lavy, 1993; Hellstrom & Öst, 1995; Öst, 1996; Öst et al., 1997; Götestam & Hokstad, 2002).

The literature specifically on the treatment of mouse phobia is scant. Ten Broeke and Jongh (1993) treated a 63-year-old woman with severe mouse phobia. They used in vivo exposure therapy but had not managed to resolve her phobic anxiety. However, they also used EMDR and, after one further session, this resulted in a significant reduction in her anxiety: she was able to be in the same room as a mouse while feeling significantly less anxious. Her improvement was maintained at follow-up.

In Norway, Gøtestam and Berntzen (1997) investigated the efficacy of modelling exposure in the treatment of three pairs of patients ($n = 6$). The first pair (Pair I), both females, suffered from mouse phobia and Pairs II and III, both of which had one member of each sex, had spider phobia. In each case, Patient 1 acted as a 'model' and Patient 2 acted as the 'observer'; however, the experimenters made sure that both patients had an equal amount of exposure time. Further, patients were given the choice to participate as either observer or model: of note, the observers were less willing to be exposed to the feared animal. It was, therefore, assumed that more anxiety would be seen in the Patient 2s (the observers).

In order to assess whether the individual fulfilled the criteria in DSM-III-R (American Psychiatric Association, 1987) for specific phobia, subjects were given an open interview in which they discussed their levels of anxiety. Gøtestam and Berntzen (1997) used the visual analogue scale (VAS) first employed by Hayes and Patterson (1921) using a scale of 0–10, 0 denoting no anxiety at all and 10 denoting maximum anxiety. The VAS anxiety was assessed before approaching an open box in which the feared animal was placed. Each subject was asked to close his or her eyes before approaching the box. They were then assessed using a BAT.

In the study, patients were informed about the rationale of the treatment—that is to say, each step towards the feared animal would gradually reduce anxiety levels. Gradually the Patient 1s ($n = 3$) were encouraged to walk closer to the box, and eventually to touch it first with a pen and then with one finger. The experiments modelled this process for each patient. Patient 2s observed this process.

Results indicated that, in both patients, there were significant reductions in thoughts and somatic complaints regarding the feared animal post-treatment; however, long term results indicate that the Patient 1s (the models) better maintained their improvement compared with the Patient 2s (the observers). The results found in the treatment session (at the intermediate stage) showed that the improvement for both Patient 1 (the model) and Patient 2 (the observer of the model) was nearly at the same level; in addition, the results for the mouse phobics in Pair I, were exactly the same. Although the long term results for Patient 2s were not as significant when compared with the results for Patient 1s, this paper, to some extent, illustrates the value of the modelling effect in therapy and suggests that more research be done in this area. Further, and more importantly, it highlights the importance of gradual in vivo desensitization in treatment.

For some years, VRET has been used in the treatment of many types of phobia including height phobia (North et al., 1998; Emmelkamp et al., 2002), flying phobia (Rothbaum et al., 2002), spider phobia (Carlin et al., 1997), and driving phobia (Wald & Taylor, 2000). In this process, individuals are exposed to a computer-generated, virtual reality environment using body tracking devices, high quality computer graphics, as well as seat and pressure sensors. Carlin et al. (1997) treated a 37-year-old female spider phobic using VRET and concluded that, after 12 weekly one-hour sessions, VR graded exposure was successful.

In the following case study, the therapist (TK) used a multi-modal approach in the treatment of a mouse phobic. Using the principles of systematic desensitization, he combined imaginal desensitization with in vivo exposure; importantly, it was the attention to detail in the hypnosis that, using all the sensory modalities, helped significantly in the treatment.

In addition, TK used children's books and toys in order to provide support and comfort to the patient, and modelled touching both the toys and the plastic mice.

CASE STUDY

Cynthia was a 45-year-old woman who contacted TK for an urgent appointment due to her mouse phobia. In her first consultation, she reported that she had been frightened of mice since the age of 10 and that this had been due to the fact that her mother was phobic; indeed, her mother had been unable to say the words 'mice' or 'mouse', whereas Cynthia was able to do this. She then explained that her phobic symptoms had worsened over the last two years, and that this was related to the fact that there were a lot of mice at her place of work. She described a recent scenario in which a mouse had appeared immediately in front of her and that this had made her feel terrified.

In the hypnosis that followed, Cynthia was asked to imagine a special place—past, present, or future—in which she felt comfortable and relaxed, and capable of maximizing her potential. She described in detail that she saw herself in a garden full of grass and that there was also a path which ascended up to heaven. Having established her special place, the therapist asked her to visualize a toy mouse, 'Mini Mouse'TM, in front of her. It was explained to Cynthia that the mouse was a harmless, 'cuddly toy' which was soft to the touch—the sort of toy that a child would take to bed in order to provide comfort during the night. Still in hypnosis, but only in imagination, Cynthia was invited to sit near Mini Mouse and even to touch her. She was given two trials and, after each one, she was returned to her special place. She was then asked to imagine reading a children's book about a mouse known as 'Maximus Mouse'. Again, Cynthia coped very well with this task. Then she was asked to imagine reading about a second mouse—'Angelina Ballerina'. Cynthia had greater difficulty with this mouse because she could imagine Angelina's tail; however, after two trials, she was able to imagine reading the book without any difficulty. Finally, she was given 'Mini Mouse' to touch—it is important to note that this soft toy is much larger than a real mouse, measures between 25cm and 35cm in height, is dressed, and has no tail.

After disengagement, Cynthia was invited, again, to touch Mini Mouse and to sit with her in close proximity. Cynthia coped very well with this task and seemed to enjoy the challenge. It was clear, however, that her mouse phobia had caused avoidance behaviour: she commented that there were a number of mice on the London Underground and that this had stopped her from using this mode of transport.

In the second session, Cynthia reported that they had employed new contractors to get rid of the mice at work: she described in detail how they strategically placed sticky boards on the floor in order to catch them at night. Each morning, Cynthia would feel compelled to ask how many mice had been caught—it was here that her therapist pointed out that she needed to exercise some control over the mice catching.

Against that, she described a television programme that she had watched last night in which a chosen number of interviewees were required to strike a live rat. However unpleasant the nature of the programme, it was important that Cynthia felt able to watch it: she didn't switch the television off and watched the entire programme.

In the hypnosis, again she chose as her special place the garden with the path leading upwards towards heaven. In imagination, she was presented with some pictures of real

mice and was asked to handle Mini Mouse. After disengagement, TK capitalized on this by asking her to look at pictures of real mice and these were handed to her on separate pieces of paper. At this point, she decided to make two piles: the first pile comprised pictures that she could look at with no difficulty, while the second pile caused her some distress. She was then given two plastic mice to hold, and TK modelled this process. She was able to handle the first plastic mouse because of its unrealistic blue colour; however, she was resistant to touching the grey plastic mouse because of its life-like appearance and its tail. She was also given three or four clothed felt mice to touch.

In the hypnotherapy during the third session, Cynthia was invited to imagine looking through a selection of books on real mice; she was also handed these books one by one and was given the opportunity to open her eyes and look at some of the pages. Whenever this caused her some distress, she was returned to her special place. After the hypnosis, the in vivo therapy consisted of her looking at mice in the same books. Interestingly, and very positively, Cynthia described some of the mice as 'cute', whereas others caused her some distress. She pointed out that she least liked the mice which were lighter, and therefore, more realistic in colour; she also didn't particularly enjoy looking at their tails. It is important to note that she hugged Mini Mouse throughout the session.

At the end of the consultation, TK pointed out that he had bought a dead mouse and that it had been safely stored in the freezer compartment of his fridge; he said that, at some point, when she was ready, she would be given the chance to have a look at it. It was pointed out to her that, eventually, she should be able to touch a real mouse or, at least be able to cope with it in close proximity.

In her fourth session, Cynthia said that she was determined to hold the dead mouse in her hand. She said that she had been open about her therapy at work, and it was obvious that she had been given a tremendous amount of support and encouragement from her work colleagues. They were the same colleagues in her office who had witnessed seeing her vomit into a waste paper basket, screaming blue murder after having seen a dead mouse in the corner of the room.

In the hypnosis, having revisited the toy mice, and having opened her eyes to look at the pictures of real mice in the various books, her therapist constructed a subsequent hierarchy of potentially anxiety-provoking stimuli. Now, with her eyes shut, whenever Cynthia showed signs of distress, she was given ego-strengthening and, where appropriate, she was returned to her special place. Throughout this process, Cynthia was given the chance verbally to feedback her thoughts and feelings. She also held Mini Mouse to her chest throughout. The hierarchy was as follows:

1. Approaching the fridge
2. Opening the fridge door
3. Opening the freezer compartment
4. Taking the wrapped, frozen dead mouse out of the freezer
5. Unwrapping the frozen dead mouse
6. Therapist holding the frozen dead mouse in the palm of his hand
7. Holding the frozen dead mouse in the palm of her hand.

At this point, Cynthia realized that she had to put theory into practice. She crossed her self, in the manner of someone in church, and managed to hold the dead mouse in her hand for several seconds. Cynthia was very pleased with herself. TK also modelled holding the mouse in his hands.

At the beginning of the fifth session, Cynthia explained how important it was for her to have held the dead mouse in her hand. As soon as she left the consulting room, at the end of the previous week's session, she had used her mobile phone to text her work colleagues, and, when she arrived at work, she had a tremendous amount of support from them. She also told her therapist that she had a lot of support from her family.

The seven-stage procedure of session four was repeated in the hypnotherapy: Cynthia was able to cope with each task without crossing herself and with only light reservation. After the hypnosis, she was asked to approach the fridge, to open the ice compartment, and to take out the dead mouse. She unwrapped the packaging and then held the mouse in her hand for over a minute. Cynthia was able to do this, although it took some time. Next, having held the mouse, she placed it on the floor and imagined that it was alive; finally, after several minutes, she put the mouse back into the ice compartment.

At this point, Cynthia was asked to evaluate her anxiety, providing a number from 0 to 10, 0 representing no anxiety at all and 10 representing extreme terror. She reported that, at the beginning of the therapy, her anxiety with regard to mice was at level 10, whereas now, she would put it at level 4. She also commented that, while some people profess not to be frightened of mice, they would be unlikely to want to hold a dead mouse in their hand. She also pointed out that her mother was terrified of mice and, if a mouse were to appear at home, she would scream and the television would be switched off. Cynthia discussed the relevance of her mother's phobia to her own levels of anxiety.

Towards the end of this important session, Cynthia said that she kept a book on mice in her desk at all times in order to force her to look at the cover. She had also decided that it was important to read about mice, and she did this in her spare time.

In the fifth session, her last, Cynthia repeated the seven-stage scenario in hypnosis and managed to hold two dead mice in her hand. Having completed these tasks, she was pleased to report that she was feeling very much better. She commented that she was no longer terrified about the possibility of coming across a mouse at work—dead or alive—and that she felt this problem was not affecting her everyday life. She said that she had been able to go to the shed at the bottom of the garden and tip out the contents of a black bag, knowing full well that there could be a mouse inside. She felt that her therapist was there with her telling her that 'she could do it'. She graded her anxiety with regard to mice at level 2.

At the sixth-month follow-up, Cynthia said that, on one occasion, she had been out in the garden, and that she had come across a live mouse. She explained that, in the past, this would have terrified her and would have stopped her going out into the garden; however, in this instance, she had been able to put on her gloves and discard it without any difficulty. She had made a complete recovery from her mouse phobia.

COMMENT

This study clearly illustrates the importance of using a multi-modal approach in treatment. The patient described in this paper experienced high levels of anxiety and avoidance

behaviour at work. It has been a frequent finding of the author (DK) that it is important in therapy to begin with the easiest of tasks and to move gradually to more and more difficult scenarios. The 'playfulness' of having a toy mouse next to her in the consulting room also augmented the therapy and aided relaxation.

As the patient became more confident, she was encouraged in the hypnosis to look at books on mice and, finally, to imagine a situation, using a graded hierarchy, in which she would hold a dead mouse in her hand. She also practised this final scenario in hypnosis. TK described in great detail this event so that the patient experienced the feared situation using all the sensory modalities. It was immediately apparent that the patient was able to visualize walking towards the mouse, as if she were actually there in the situation. It was important to describe this situation in detail but also to provide her with support: whenever she became anxious, she was returned to her special place.

Kraft and Kraft (2004), reported a case of driving phobia. In this study, the therapist (TK) took considerable care in the hypnotherapy to create a detailed imaginal situation using all the sensory modalities, and it was this verisimilitude, akin to VRET, which helped significantly in the recovery process. However, this is a dual process. In the present study, not only did the therapist provide the patient with detail, but he also asked her for constant feedback, and encouraged her to experience the situation in her own unique way. In order to do this, it is important to provide the patient with the space to create this 'virtual environment' in her imagination. Constant feedback is a vital component in the treatment of specific phobias as much as it is for situational and environmental phobias.

The therapist also modelled holding Mini Mouse and the plastic mice. In this case, he was acting as a 'mastery model' (Götestam & Berntzen, 1997) during the tactile augmentation, and this maximized the level of presence achieved. Importantly, modelling also provides patients with space during the therapy and this, in turn, has the effect of reducing avoidance behaviour (Götestam & Berntzen, 1997). In addition, she was able to see how comfortable her therapist felt when touching the plastic mice, and this was tremendously important for her during her therapy. Further, she was given constant support and encouragement throughout the process.

This encouragement, 'playfulness', and support continued post-hypnosis. The patient was encouraged to talk about her feelings, to sort through pictures of mice, and to work towards the final stage which was to touch a dead mouse in the fridge. In order for the desensitization to be successful, it is essential to work towards touching a real animal (Thorndike, 1931; Carlin et al., 1997). She also continued the desensitization work outside the consulting room; indeed, she kept a picture of a mouse in her desk at work and began to read books about mice. Further, she had a great deal of support from her colleagues and this eventually led to a complete recovery of her phobic anxiety.

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Use of in vivo and in vitro desensitization in the treatment of mouse phobia: review and case study. *Contemporary Hypnosis*, 27(3), pp.184-194. Journal. Archive material Artwork Blog Book Broadcast Chapter of an ed. book Conference proceedings Court case Dictionary entry Dissertation DVD, video, or film. E-book or PDF Edited book Email Encyclopedia article Govt. publication Interview Journal Legislation Magazine Music or recording Newspaper. Online image or video Patent Podcast Presentation or lecture Press release Religious text Report Software Website. Treatments involving in vivo contact with the phobic target also outperformed alternative modes of exposure (e.g., imaginal exposure, virtual reality, etc.) at post-treatment but not at follow-up. Placebo treatments were significantly more effective than no treatment suggesting that specific phobia sufferers are moderately responsive to placebo interventions. Unlike systematic desensitization, which dedicated a number of sessions to relaxation training, modern imaginal exposure approaches tend to omit the relaxation component.

1.2.1.4. Virtual reality and computer assisted exposure. 1.3.4. Are placebo treatments effective in the treatment of specific phobias? Several studies included both a credible placebo control groups (PL) and a wait-list control group (WL) thus. treatment of cancer will be described and demonstrated in vitro and in vivo. In addition, a novel method for a thermographic monitoring of tumor development is implemented in this work. Setup for in vivo thermal measurements and hyperthermic treatment is presented in Fig. 1(b). 100 μ L of the MNP solution was poured into a thermally isolated Eppendorf tube. and treatment procedure as described below, while three mice were the control group (tumor injection only). Mice were treated only after tumor volume had exceeded 30 mm³, which hap