The National University of Ireland

Examining the Roles of Acceptance, Suppression and Other Therapeutic Strategies in Anxiety and Relaxation

Thesis submitted to the Department of Psychology, Faculty of Science, in fulfilment of the requirements for the degree of Doctor of Philosophy, National University of Ireland, Maynooth.

Christopher Wilson B.A. (Hons.)

October 2009

Research Supervisor: Dr. Yvonne Barnes-Holmes

Table of Contents

To Nazila.

Acknowledgements

Acknowledgements

Thanks to my supervisor Dr. Yvonne Barnes-Holmes for her guidance, patience and support.

To Prof. Dermot Barnes-Holmes for all of his help, Derek Walsh for all of his technical assistance in conducting the experiments and all of the staff and NUIM for their kindness over the years.

Thanks to everyone who participated in the studies and to Mark Boyle, Ciara Norton, Siobhán Kelly, Aisling Roche, Amy McDonald, John Walshe and Muireann Ní Domhnaill for their hard work and assistance in collecting the data.

To my parents and family, who probably wonder what I've been doing all these years.

Finally, to Nazila, for keeping me going through all of it.

List of Tables

List of Figures

List of Appendices

Abstract

Abstract

The current thesis examined the influence of acceptance, suppression and other coping strategies on levels of physiological and self-reported anxiety, induced experimentally by academic tasks. The research program comprised four automated experimental studies. Chapter 1 provides a review of the available literature on relaxation techniques, including empirical evidence of their utility, theories of underlying processes and the role of various psychological strategies. Chapter 2 comprises Experiment 1 (n=60) that compared five intervention components with placebo. The first part of the intervention comprised Progressive Muscle Relaxation (PMR) Training or Placebo, coupled thereafter with a specific strategy that was intended to supplement the PMR Training/Placebo in terms of reducing participant anxiety induced by the academic test. Specifically, participants were instructed to engage in acceptance or suppression (or placebo) in response to task-induced anxiety.

Mean skin conductance level (SCL) increased for all conditions from Baseline-Test, suggesting that the target academic test did increase physiological anxiety, as predicted. Subjective anxiety also increased significantly and subjective relaxation decreased significantly from pre- to post-experiment. Mean SCL decreased for all conditions from Test-Post-test/intervention, suggesting some small influence for the interventions and/or for practice (because Placebo also changed). Although we predicted that the Acceptance Instruction would be associated with smaller increases in anxiety than both Suppression and Placebo, the data from Experiment 1 indicated no significant effect for condition, hence failing to confirm this hypothesis. However, Placebo+Acceptance showed the smallest increase in anxiety from Baseline-Test, the largest decrease from Test-Post-test and the smallest overall increase from Baseline-Post-test. Nonetheless, the

strong similarities across conditions made comparisons between the first and second parts of the interventions difficult.

For Experiment 2 (n=20) reported in Chapter 3, a new type of anxiety-inducing academic test was constructed that involved an on-going stressor and the repeated introduction of a visual stimulus (a neutral image), which the Suppression group only (not Control) were instructed to suppress. In theory, the continued effort of suppressing the image might serve to increase anxiety levels during the task for the Suppression group, relative to participants who are not instructed to suppress the image. A secondary aim of the study was to examine whether the instruction to suppress the stimulus affected participants' habituation to its appearance and we predicted that habituation would be disrupted in Suppression, but not in Control. Mean SCL between Baseline and Test increased significantly for participants in the Suppression Condition, but not in Control. The study also included analyses of skin conductance response (SCR) as a means of measuring habituation to the presence of the visual stimulus. The dominant pattern of responding in Control was Habituation. In contrast, response patterns in Suppression were either Inconsistent or indicative of Increasing Arousal.

Experiment 3 (n=80) reported in Chapter 4 attempted to examine the efficacy of acceptance and suppression interventions, using a modified version of the task protocol developed in Experiment 2. We also examined differences in anticipatory arousal and event arousal in response to the discreet stimulus presentations. The study also included Mindfulness and Endurance Interventions, which are topographically similar to acceptance. The results from Experiment 3 confirmed some of our predictions. First, we predicted that Suppression and Placebo would be less effective at diminishing anxiety than Mindfulness and Acceptance and indeed Acceptance was the only condition that showed decreased physiological anxiety and differed significantly from the other two conditions

between Tests 1 and 2. Analyses of the anticipatory arousal data indicated that Mindfulness, Suppression and Placebo decreased, while Acceptance and Endurance increased. On event arousal, all participants increased, with the largest recorded on Mindfulness, Suppression and Endurance. The differences between anticipatory and event arousal that occurred between conditions indicate that some strategies may result in expectation of decreased arousal prior to an event (i.e. reduced anticipatory arousal), but increased arousal in response to the event itself (i.e. increased event arousal), while other strategies have the opposite effect.

Experiment 4 (n=95) reported in Chapter 5 attempted to examine the impact of expectation on the efficacy of acceptance and suppression, as well as the other strategies examined in Experiment 3. Experiment 4 was identical to the previous study, with the exception that the interventions were condensed and presented to participants as short strategies that were "proven to work". The primary aim of this modification was to explicitly highlight the possible influence of expectation on relaxation. We predicted that expectation would reduce the efficacy of Acceptance resulting in increased anxiety and exacerbate the effects of Suppression resulting in larger increases in anxiety from pre- to post-intervention than all other conditions. We made no specific predictions in relation to the other strategies. While the previously positive outcomes associated with Acceptance were reduced, no significant differences were found between conditions. In addition the largest increase in arousal was observed in the Mindfulness Condition, as opposed to Suppression. As such, we failed to confirm our hypotheses. Differences between anticipatory and event arousal were observed; however, patterns were different from those recorded in the previous study.

The current research extends previous work on the utility of acceptance and suppression and is the first to examine the role of acceptance in a relaxation context.

Overall, the findings provide evidence for the utility of acceptance as a relaxation strategy and support previous evidence that suppression can lead to increased arousal, even where the intent is to relax.

Chapter 1
General Introduction

The Process of Relaxation

Chapter 1

The Process of Relaxation

On the surface, the idea of relaxation is a simple one. Relaxation appears to involve a state of equilibrium that is free from physical or psychological tension, which then culminates in the subjective experience of "being relaxed". This process may, therefore, be seen as the antithesis of anxiety, stress and worry, and is synonymous with freedom from extraneous demands and a general feeling of wellbeing. It is no surprise that relaxation *techniques*, designed to invoke such a positive outcome, are the subject of considerable popularity.

Relaxation techniques are a standard component in most forms of behaviour therapy (Poppen, 1998). Indeed, over 2,000 published studies have reported the use of relaxation in the treatment of more than 200 medical and psychological disorders (Smith, 1999). So general are the benefits of relaxation training considered to be that the treatment is advocated even when not considered clinically essential, because it is believed to facilitate or enhance positive patient attitudes to treatment of underlying conditions (Lichstein, 1998).

At least part of the therapeutic and personal appeal of relaxation techniques derives from the view that they are easily understood and applied, and are driven by relatively simple mechanisms. As a result, specific clinical training and/or knowledge of the techniques are generally believed unnecessary for their use (Goldfried & Davidson, 1994). Indeed, in spite of the breadth of literature in the scientific and self-help arenas, relaxation techniques tend to be applied with the understanding that they are basically interchangeable and are associated with the same therapeutic outcome - the state of relaxation (Smith, 1996). However, consensus on the *nature* of the state of relaxation by

many laypersons belies considerable debate amongst researchers about the relaxation *process*. In short, different relaxation techniques may be more or less effective in producing the desired outcome.

Structured Techniques

Yoga is recognised as the first formal system of meditation and is often proposed as the earliest structured relaxation technique (Feuerstein, 1975). It has been a defining influence in the majority of Eastern religions and related ancient philosophies that have used meditation as a generic human practice for clarity of thought (Malhotra, 1963). Although yoga contains many different features that have emerged across the different religious and philosophical traditions, a number of common threads dictate the physical and psychological aspects of the techniques. In physical terms, a comfortable posture and slow respiration are universal requirements (Rama, 1979). In psychological terms, one is required to focus and concentrate one's attentions on a single object (e.g. a mantra) to clear the mind of errand thoughts. Taken together, the aim of these efforts is to enable practitioners of yoga to achieve a state of total enlightenment or altered consciousness.

There now exits a myriad of techniques that are commonly subsumed under the label ‘relaxation' and that are directly or indirectly derived from the physical and psychological features described above. For example, the need to regulate respiration has given rise to techniques such as Focused Breathing. Assuming a comfortable posture is often reinterpreted through techniques such as Progressive Muscle Relaxation (PMR) and Massage. The focusing of attention may still be used with Mantras or may be recast and expanded through Imagery.

Progressive Muscle Relaxation was perhaps the first *therapeutic* use of relaxation techniques and remains the most common. According to Jacobson (1938), PMR requires that a practitioner discriminate between the physical sensations that indicate that a

muscle is `turned on' and those that signal that a muscle is `turned off'. For Jacobson, the learning curve for such discriminations requires many sessions of explicit training over the course of several years and should involve direct practice with all muscle groups. The emphasis on extensive, specialised knowledge and practice emerged from Jacobson's belief that relaxation had, at its core, skeletal muscle tension. As a result, extensive training was necessary because the subtle discriminations of our skeletal musculature are beyond the realm of normal awareness. Since its conception, various forms of PMR have developed, although most recent versions are frequently shorter in length than Jacobson's original programme (Bernstein, Carlson, & Schmidt, 2007).

Autogenic Training (AT) borrows heavily from hypnosis and relies on autosuggestion for the purposes of achieving a state of physical and psychological equilibrium (Luthe & Schuktz, 1965). For example, a practitioner might be encouraged to say "My right arm is heavy" or "My heartbeat is calm and regular" as a means of evoking these separate physical outcomes. From this perspective, there is an important distinction between autosuggestion and actual movement.

Focused Breathing was a strong traditional component in Eastern meditation, but in contemporary usage it is often employed as a stand-alone relaxation technique that does not necessarily require integration with other components (Matsumoto & Smith, 2001). The core skill appears to involve paying conscious attention to your own respiration and monitoring its rhythm. In short, the aim is to control and slow down breathing over time.

Imagery (or visualisation), as the term implies, involves the creation of some form of visual imagery. The imagery can be self-generated or guided by a therapist and the nature of the desired visual effect is widely variable across techniques (Harding, 1996).

Meditation is sometimes used as a catch-all for any or all of the techniques above. However, a number of specific varieties of meditation exist and these are generally

differentiated by the directing of mental attention. For example, a practitioner might focus: intensively on one particular object; on all mental events that enter the field of awareness; or on both (Bond, Ospina, Hooton, Bilay, Dryden et al., 2009).

While the above list comprises the techniques most commonly associated with relaxation, it is far from exhaustive. For example, relaxation may sometimes include elements of *hypnosis* (Vickers & Zollman, 1999) or *biofeedback* (Paran, Amir, & Yaniv, 1996). Taken together, relaxation when described in common parlance can incorporate anything an individual does to reduce mental or physical stress. However, these may have only the loosest associations with more traditional forms and objectives.

The Clinical Efficacy of Relaxation

Clinical outcome data on the success of relaxation techniques is mixed. Relaxation techniques have been included as a component of successful treatment programmes for: Stress (Nassiri, 2005); Generalised Anxiety Disorder (GAD: Hoyer, Beesdo, Gloster, Runge, Höfler, & Becker, 2009); Hypertension (Paran, Amir, & Yaniv, 1996); Multiple Sclerosis (Ghafari, Ahmadi, Nabavi, Anoshirvan, Memarian, & Rafatbakhsh, 2009); and Alcoholism (Barton, 2005); as well as many other disorders. Meta-analyses of such studies present a positive view of relaxation on the whole. For example, in a recent review of relaxation techniques for the treatment of anxiety, Manzoni, Pagnini, Castelnuovo and Molinari (2008) found relaxation to have been consistently effective, with medium to large effect sizes, over a ten year period.

However, relaxation techniques are not always effective. Indeed, a number of authors have expressed concern at the 'cookbook' fashion in which relaxation techniques are generally prescribed and practiced (e.g. Poppen, 1998; Smith, 1996). Specifically, these authors have stressed that arbitrarily applying techniques without due care can be

detrimental to the practitioner and can even induce a full-blown state of panic (Adler, Craske, & Barlow, 1987).

The Process of Relaxation

There is general consensus that relaxation involves three core processes, namely: muscular responding, autonomic responding and cognitive responding (Poppen, 1998). The evolution of an ever-increasing array of available relaxation techniques has inevitably resulted in the fact that some reconcile more readily than others with processes deemed central to relaxation itself.

Muscular and Autonomic Processes

The *muscular* feature of relaxation was first introduced by Jacobson in the development of PMR and is central to all muscular relaxation techniques (MRTs). Consistent with Jacobson's emphasis on muscular tension, these techniques are designed to remove undesirable physiological states that are associated with muscular stress. Indeed, MRTs have been successfully employed in the treatment of a wide range of physiological disorders, including hypertension and asthma (Conrad & Roth, 2007).

The *autonomic* component of relaxation is designed to redress the balance between sympathetic and parasympathetic activity in the autonomic nervous system. In this context, relaxation is characterised by a reduction in sympathetic activity and a corresponding increase in parasympathetic activity that results in reduced heart rate, respiratory rate, blood pressure and oxygen consumption. In fact, Benson's Relaxation Response Theory centred on a definition of relaxation as a state of parasympathetic control. Common examples of relaxation techniques with primary autonomic emphases include meditation, focused breathing and biofeedback. Most theorists postulate some level of interaction between muscular and autonomic processes in relaxation. On the one hand, muscular processes can influence autonomic responding. For example, MRTs are

believed to influence peripheral physiological systems and thus contribute to a reduction in sympathetic arousal. On the other hand, autonomic processes can influence muscular responding. For instance, meditative techniques that emphasise breathing also advocate specific body postures (Benson, 1975). Interestingly, although many theorists accept a muscular-autonomic crossover in the process of relaxation, not all agree that muscle tension is a contributing factor in stress (Conrad & Roth, 2007).

Cognitive Processes

The cognitive processes likely involved in relaxation are more difficult to measure than either autonomic or muscular responding. However, there is general consensus that they are at least as central to the desired outcomes (Smith, 2001) and some authors have even suggested that cognitive processes are the most defining element of relaxation. This is often based on the belief that cognitive appraisals made at each stage of the relaxation process further influence physiological arousal and ultimately determine the success of the technique. Indeed, Conrad and Roth (2007) went so far as to suggest that the efficacy of MRTs, for example, may be no more than a "psychological placebo" (p. 244).

Attempts to identify the cognitive component of relaxation have focused primarily on attention. Directly or indirectly, most relaxation techniques advocate some form of *selective* attention to certain stimuli in the field of awareness, while simultaneously not attending to others (Boals, 1978). In particular, these techniques advocate self-focused attention towards internal events (e.g. bodily sensations) to increase awareness of mental and physical processes (Bond et al., 2009). For example, PMR uses self-focused attention for changes in muscular tension. In contrast, meditative techniques emphasise self-focused attention on all mental events (Walsh & Shapiro, 2006).

The focusing of attention on physical processes such as heart rate is generally considered to be conducive to relaxation because it allows greater regulation of physical

processes, which in turn leads to reductions in autonomic arousal (Walsh & Shapiro, 2006). Recent empirical evidence offered some support for this view when different types of neurological activity resulted from focusing attention on physical responses compared with general self-focused attention (Thomson, Garry, & Summers, 2008). However, Conrad, et al. (2007) have argued that the object of attention is not pivotal because focusing is itself the central aspect.

The Relaxation Paradox

Although attention is well established as an important feature of both the relaxation process and outcome, there is empirical evidence to suggest that successful relaxation requires more than focused attention. First, even practitioners who employ focused attention as part of established techniques can fail to obtain a relaxed state. This has been referred to as *relaxation induced anxiety* (Heide & Borkovec, 1984). Second, individuals diagnosed with psychological conditions that contain strong elements of anxiety have been observed to engage in high levels of focused attention. Indeed, Borden, Lowenbraun, Wolff and Jones (1993) reported that Panic Disordered (PD) patients had *higher* levels of self-focused attention than controls. Furthermore, Wells (1990) reported that using AT with a panic disordered patient resulted in increased self-focus, increased frequency of panic attacks and increased intensity of anxiety.

Findings by Wegner, Broome and Blumberg (1997) offered a possible account for inconsistent relaxation and anxiety outcomes. In this study, the experimental group were simply instructed "to relax" during a stress-inducing task, while the control group were not. The results demonstrated that the experimental participants displayed greater increases in physiological arousal than controls. Wegner et al. concluded that participants' explicit efforts to relax were counter-productive and thus facilitated the ironic outcome.

Indeed, as early as 1938, Jacobson had argued that any effort to relax can lead to a failure to relax. For Wegner at al. (1997), these counter-productive efforts appear to comprise three elements. The first is self-focused attention, which sometimes (but not always) results in relaxation. The second is evaluating the object of attention negatively (e.g. thoughts, feelings, bodily sensations, etc.). The third is an effort to suppress these internal events once they have entered the realm of attention. According to Wegner et al., suppression plays a critical role in counter-productive relaxation outcomes and there is growing empirical evidence to support this view (Greco, Lambert, & Baer, 2008; Short, Kitchiner, & Curran, 2004).

Relaxation as Habituation

It makes intuitive sense to assume that human beings are capable of attaining emotional and physical states that are free of stress. However, some authors have argued that the very activity of living involves arousal and thus it is impossible to maintain any type of "zero arousal state" for any protracted period of time (Lehrer, Woolfolk, & Sime, 2007). This latter perspective assumes, therefore, that success in relaxation must, by definition, comprise some element of habituation in the context of naturally changing levels of arousal. In short, it is not that the arousal doesn't happen, rather it is one's reaction to the arousal that is critical.

Habituation is the progressive decrease in level of responding to a stimulus over time. When we first encounter an unfamiliar stimulus, our body responds in the three areas described above (autonomic, muscular and cognitive): our heart-rate increases; we become tense; and we may have anxious or novel thoughts. Even if we evaluate the stimulus as non-threatening, repeated exposures will reduce the physical responses (i.e. we habituate). In contrast, if the stimulus is evaluated as threatening, physical responses frequently

remain the same or may even be increased. In short, we do not habituate, do so to a lesser degree, or take longer to do so.

For simple organisms, the interpretation of a novel stimulus as appetitive or aversive seems to be largely an instinctual matter. Indeed, responding to novelty almost always occurs in a current and external context. In contrast, humans have the ability to generate complex verbal evaluations far beyond our current experience (both in the past and future) and these evaluations can be applied to internal, as well as external, events (Gerdes, 1979). As such, if one assumes that the natural equilibrium is a state of zero arousal, then any physiological activity (e.g. increased heart rate) may automatically be evaluated as negative (Maslach, 1979). This evaluation will likely increase the heart rate further and thus strengthen the negativity associated with the event (Ray, Molnar, Aikins, Yamasaki, Newman et al., 2009). If one then responds by attempting to suppress arousal and all of its associated features, then the arousing events recur more frequently (Wegner, 1994). Hence, almost by definition, suppression precludes habituation because events must be fully discriminated in order to be habituated to.

Passivity

Davidson and Schwartz (1976) distinguished between active and passive attention. *Passive* attention implies a detached attitude toward the outcome of the concentrated activity, whereas *active* attention is characterised by an effortful or goal-directed approach to the activity and to the results of these efforts. Suppression, therefore, might be interpreted as a form of active attention because one must actively attend to stimuli and actively make efforts to suppress them. It is important to note, however, that passive attention is not simply a description of *a lack of* attention, but instead implies an awareness of recurring stimuli. Interestingly, although passivity has been identified as a vital

component of the relaxation process, it is not always categorised as a form of attention. For example, Benson (1975) described a passive *attitude* as a pre-requisite for relaxation.

In an expansion of the active vs. passive distinction, Smith (1990) offered a three-stage model of the role of attention in relaxation. Specifically, he referred to the three sequential acts of focusing, passivity and receptivity. From this perspective, *focusing* relates to the object of one's attention during relaxation, but must not be concerned with the outcome of the relaxation process. For example, in the context of PMR, one should focus on the target muscles, but not on whether or not the technique is having an effect (i.e. whether the muscles are actually relaxing). *Passivity* refers to one's attitude towards any internal stimuli that present themselves, while one is engaging in a chosen technique. Finally, *receptivity* refers to openness to the possibility of stimuli recurring.

In his definition of passivity, Smith (1996) acknowledged difficulties in both defining and correctly engaging in passivity. Specifically, he accepted that it may not be clear what one is striving for in relaxation, if it is not the reduction of physiological activity or anxious thoughts. He also noted that passivity is not a widespread phenomenon "when success in the majority of areas of living results from goal-directed striving" (Smith, 1996, p. 87). In later writings, he suggested that passivity might be better understood as `a personal philosophy' that allows one not to focus on the efficacy of the relaxation technique, but on the goal that arousal or anxiety is obstructing. From this perspective, the locus of control is outside of the relaxation activity, but is still highly personalised to the individual because it connects directly to personal values. In essence, therefore, the aim of relaxation is to continue a valued activity *in spite of* the presence of unwanted stimulation, thereby allowing the individual to habituate and paradoxically eventually reducing arousal and subjective anxiety.

Psychological Acceptance

There is a clear overlap between the concepts of passivity and receptivity and the traditional definition of psychological acceptance. Acceptance may be described as openness to any type of physiological or psychological content and is often viewed as the antithesis of psychological avoidance (Hayes, Strosahl, & Wilson, 1999). The aim of psychological acceptance is to allow individuals to experience emotions and bodily sensations fully and without attempting to avoid, regulate, or modify them (Barnes-Holmes, Cochrane, Barnes-Holmes, Stewart, & McHugh, 2004). Clinical outcome data on acceptance is relatively new. However, positive results have been obtained regarding the utility of acceptance in the treatment of: Eating Disorders (Baer, Fischer, & Huss, 2005); Post-traumatic Stress Disorder (PTSD: Batten & Hayes, 2005); Social Anxiety (Block & Wulfert, 2000); Psychoticism (Hayes & Bach, 2002); Obsessive Compulsive Disorder (OCD: Twohig, 2008); and GAD (Roemer, Orsillo, & Salters-Pedneault, 2008).

In the context of relaxation, acceptance may be viewed as a more parsimonious account of passivity and receptivity. Furthermore, acceptance incorporates the activity of observing or attending because one must discriminate the stimuli if one is to be fully accepting of their presence. A modern approach to acceptance, known as Acceptance and Commitment Therapy (ACT), also incorporates valued action that is not unlike Smith's (1996) external locus of control and thus contextualises the aims of one's acceptance.

In spite of the apparent overlap between acceptance and relaxation, there is almost no empirical research on this relationship. Unexpectedly, however, the research by Wegner et al. (1997) may be the only study to address this issue. Specifically, closer examination of participant instructions indicates that the "no-relax" condition did in fact encourage participants to accept thoughts and feelings that showed up during the task. Interestingly, the increase in arousal was lower in this condition than when participants were explicitly

instructed to try to relax. As such, acceptance may have played some role in the differing outcomes observed between the two experimental conditions.

Studying Relaxation in Experimental Contexts

Experimental studies that have incorporated relaxation components with a view to determining their efficacy frequently use academic tasks as the primary method of stress induction. Amongst those most widely employed for this purpose are mental arithmetic, reverse digit recall and verbal analogies (Benham, Nash, & Baldwin, 2009; Hughes, 2001). While there is no standard format for the presentation of these tasks, there are commonalities in the literature. For example, level of task difficulty is often consistent across studies that use standardised academic test materials (Ring, Harrison, Winzer, Carroll, Drayson, & Kendall, 2000). Time pressure is frequently an important feature of the task and is critical to the stress associated with task completion (Wegner et al., 1997). And recent studies have begun to replace the traditional pen and paper format with tasks that require participants to respond verbally to questions that are read aloud or to engage with automated procedures (Sarang & Telles, 2007).

Electrodermal Activity as a Measure of Relaxation or Anxiety

Given the subjective nature of relaxation itself, numerous studies have employed measurement procedures from the physiological literature as a means of accurately determining whether or not arousal has increased (i.e. whether or not one is relaxed). Measurements of electrodermal activity (EDA) are commonly employed for this purpose and their merits in this regard are well established. According to Cacioppo, Tassinary and Berntson (2007): "The application of EDA measures to a wide variety of issues is due in large part to its relative ease of measurement and quantification combined with its sensitivity to psychological states and processes" (p. 149). Specifically, because of its relationship with sympathetic activity, EDA is highly sensitive to emotional significance

and is particularly useful for measuring arousal, nervousness, or anxiety (Lagopoulos, 2007). For this reason, it is also particularly suitable for measuring the efficacy of relaxation techniques.

Electrodermal activity is measured by passing a constant voltage between two points on the skin and measuring the current that flows between these. Variations in EDA are observed because eccrine sweat glands in the skin are innervated by activity in the sympathetic nervous system. This innervation of the sweat glands changes the rate at which current is allowed to flow (similar to how an electrical resistor works). The specific label applied to measures of EDA depends on the way in which the response is measured. Where a constant current is applied to the skin, the variation in response is referred to as skin *resistance* and is expressed in Ohms (Ω). However, if a constant voltage is applied the response variation is skin *conductance* and is expressed in microsiemens (μS). Today, most measurement systems use the voltage model and measure skin conductance in microsiemens (μS).

When measuring physiological arousal, different terminology is used to describe different possible levels of measurement. For example, the presentation of a novel discrete stimulus elicits a skin conductance *response* (SCR), prior to which a minimum change in amplitude is selected by the experimenter to determine whether a response to the stimulus has occurred. In addition, a short latency window that follows the stimulus presentation is selected (typically 1-5s). The highest amplitude response during this window is then assumed to have been elicited by the stimulus onset. *Skin Conductance Level (SCL),* on the other hand, refers to electrodermal activity over a period of time and has been shown to vary with changes in emotion or psychological state (Cacioppo et al., 2007). Skin conductance level can be measured by calculating the mean response amplitude over the period and typically decreases when participants are at rest, but increases when novel

stimulation is introduced. As expected, SCL begins to decrease over time when the same stimulus is repeated (i.e. habituation).

The Current Research

The current research extended the existing literature on relaxation, by focusing on the efficacy of various psychological strategies. The primary focus of the research was on acceptance vs. suppression strategies, although a number of additional strategies, including PMR, Mindfulness and Endurance, were included for comparison. The main aim of the research was to examine whether acceptance-based interventions would prove effective at reducing levels of physiological arousal and subjective anxiety during a stress-induction procedure. All aspects of the experimental procedure, including interventions, were automated, such that participants interacted directly with audio equipment and/or a computer program. The current research program consisted of four experimental studies, including a detailed analysis of arousal patterns associated with suppression and acceptance strategies.

Experiment 1 (Chapter 2) compared acceptance- and suppression-based interventions in conjunction with an abbreviated PMR treatment. The experimental design incorporated placebo elements for both aspects of the study (i.e. PMR+Acceptance; Placebo+Acceptance; PMR+Suppression; Placebo+Acceptance; Placebo+Suppression; Placebo+Placebo). Both aspects of the intervention were in audio format and the latter were metaphor-based. The experimental task exposed participants to an anxiety-inducing academic test. Measures of SCL were taken at Baseline (pre-intervention), Test (post-intervention) and Post-test. It was predicted that participants in the Acceptance Conditions would show smaller increases in anxiety than the Suppression Conditions. The results of Experiment 1 indicated that the Placebo+Acceptance resulted in the lowest increases in arousal from Baseline to Post-test.

Experiment 2 (Chapter 3) attempted to ascertain whether the findings from Experiment 1, in terms of increased anxiety, were in fact the result of suppression. In an attempt to create a more explicit task-based analogue of suppression, participants had the option to physically suppress a recurring stimulus, while engaging in a high-load cognitive task. Participants in the Suppression Condition were instructed to suppress the stimulus, while participants in the Control Condition were instructed to continue with the task. Experiment 2 employed SCRs in addition to SCL. The results of the study indicated that Suppression showed a significant increase in SCL, while Control Condition showed a marginal decrease. The findings also indicated that the suppression strategy produced markedly different patterns of arousal during the task than Control. Specifically, Suppression appeared to disrupt participants' habituation to the task, such that arousal levels stayed constant (or even increased), relative to Control.

In Experiment 3 (Chapter 4), we attempted to compare the effects of different psychological strategies on anxiety in the context of increased demand. Participants in the experimental conditions were presented with intervention videos of acceptance, suppression, mindfulness and endurance. The first aim of the study was to examine how acceptance- and suppression-based strategies compared to mindfulness and endurance. We hypothesised that mindfulness and acceptance might be associated with similar outcomes in terms of reductions in arousal. A secondary aim was to determine whether either strategy was simply synonymous with endurance. A supplementary aim of the study was to examine whether any of the interventions elicited avoidance from participants. In addition, we incorporated a measure of *anticipatory* arousal in order to determine whether the different strategies were linked with different arousal patterns in response to an impending event. The results of the study found Acceptance to have significantly lower increases in arousal compared to Suppression and Placebo. Mindfulness also differed

significantly from Placebo. Differences between anticipatory and event arousal between conditions suggested that different strategies may produce contrasting response patterns.

In Experiment 4 (Chapter 5), we attempted to examine whether introducing expectation into strategies would influence their utility by emphasising their proven efficacy and condensing the details of the interventions. We predicted that the efficacy of the Acceptance intervention would be reduced by the introduction of expectation, and that participants in the Acceptance Condition would show increased anxiety post-intervention. We also predicted that the introduction of expectation would enhance the Suppression effect resulting in larger increases in arousal post-intervention than all other conditions. We made no specific predictions in relation to the other strategies. While the efficacy of Acceptance was reduced, the results of the study showed no significant differences between conditions. In addition, the anticipatory and event arousal patterns were inconsistent with the previous study. As such, we were unable to confirm our predictions regarding the effect of expectation.

Chapter 2
Experiment 1

Comparing Acceptance, Suppression and PMR

Chapter 2

Experiment 1

Comparing Acceptance, Suppression and PMR

Aspects of the process of relaxation appear to involve the removal of anxiety-related internal stimuli (Hayes, Bissett, Zorn, Zettle, Rosenfarb et al., 1999). However, recent research on thought suppression and experiential avoidance suggests that deliberate attempts to remove internal content may be counter-productive (Wenzlaff & Wegner, 2000). In contrast, other authors have suggested a strategy that is functionally similar to psychological acceptance may be a pre-requisite for successful relaxation (Wegner et al., 1997). Indeed, a number of studies support the utility of acceptance in the treatment of anxiety, stress and other psychological conditions (e.g. Roemer et al., 2008). However, there remains very little empirical research on the relationship between relaxation and acceptance.

In one of the only published studies to investigate this issue, Wegner (1997) demonstrated that an acceptance-based instruction was more effective than simply asking participants to try to relax during a stress-induction procedure. However, it is important to note that it was not Wegner's explicit intention to encourage participants to engage in acceptance, nor was he explicit about the potential overlap between the instruction to relax and the possibility that participants would engage in suppression as a means of achieving a relaxed state. Hence, it is not clear what types of outcomes would be generated by the direct manipulation of either strategy in a relaxation or stress-induction context. Experiment 1 was designed to address this issue.

The current study employed abbreviated PMR training as an intervention component in conjunction with acceptance- vs. suppression-based instructions. It is

important to emphasise that the suppression-based instructions were presented as a form of relaxation instruction that highlighted the use of relaxation to push away (i.e. suppress) task-induced anxiety. The primary aim of the research was to compare the relative utility of acceptance and suppression as coping strategies for experimentally-induced anxiety and to determine the impact of coupling each with PMR-based relaxation training. Anxiety was measured as both physiological arousal (SCL) and subjective anxiety (self-report).

First, we predicted that the chosen academic task would increase anxiety, especially on the SCL measure, for all conditions prior to intervention. Second, although we assumed that anxiety would increase for all conditions from pre- to post-intervention as a result of the academic task, we predicted that an acceptance-based instruction would be associated with smaller increases in anxiety than either suppression or placebo. We also predicted that anxiety levels observed with the acceptance instruction would be comparable to PMR training. Finally, we were also interested in, but had no clear predictions about, whether a combination of suppression with PMR vs. acceptance with PMR would produce different outcomes than each component alone.

Method

Participants

A non-clinical sample of 60 adults, consisting of 24 males and 36 females, participated in Experiment 1. The mean age was 22 years and 4 months. All were undergraduate and postgraduate students from The National University of Ireland, Maynooth (NUIM) recruited through faculty announcements in the Department of Psychology. None received any form of incentive for participation. Each participant was randomly assigned to one of six experimental conditions (i.e. 10 per condition, see Table 1). All participation was on an individual basis.

Table 1

Experiment 1 Conditions

PMR Training +			Placebo Training +		
Relax/Suppression Instruction	Placebo Instruction	Acceptance Instruction	Relax/Suppression Instruction	Placebo Instruction	Acceptance Instruction

Experimental Setting

Experiment 1 was conducted in an experimental room in the Department of Psychology at NUIM. The room was quiet and free from distraction and contained a one-way mirror that allowed the experimenter to observe participants from an adjacent observation room. The experimental room contained a cushioned adjustable office chair with arm rests, a desk and a laptop. The skin conductance recording apparatus was located behind the laptop, out of view of participants. The cable containing the electrodes extended from the recording apparatus to the left or right hand of each participant. A paper-based

questionnaire and a pen were located on the desk beside the laptop. During completion of the questionnaire, the initial instructions and the attachment of electrodes, the experimenter remained in the room with participants. During all other times, he observed proceedings from the observation room.

Apparatus and Materials

All automated aspects of the experiment were conducted on a Hewlett Packard TX1000 Laptop with an AMD Dual Core 64bit Processor, 2GB RAM, a 12" display and a standard computer mouse. A standard pair of stereo headphones and a free-standing microphone were also used.

Physiological Measures of Anxiety. All skin conductance (SC) measurements were obtained via the skin conductance recording apparatus (i.e. Nexus 4). The apparatus consisted of a small device (11cm x 6cm x 5cm) with a single cable that contained two silver chloride (AgCl) electrodes. The electrodes were attached to participants' fingers with Velcro straps. All skin conductance data were recorded using the Biotrace 4 software program and measured in microsiemens (μS).

Self-Report Measures of Anxiety. All participants received two exposures to a self-report measure of anxiety in the form of a questionnaire that was adapted from the research by Wegner (1997, see Appendix A). For current purposes, these were referred to as Subjective Anxiety Questionnaires 1 and 2 (SAQ1 and SAQ2, respectively). Each contained 15 adjectives (e.g. "anxious") which participants rated in terms of how much they applied at the current time. Responses were recorded on a 5-point Likert scale that ranged from 1/Not at all to 5/Very much. Two sub-scales were contained within the questionnaire. The first 8-item sub-scale measured *relaxation*, while the second 7-item sub-scale measured *anxiety*. Tests of the internal consistency of the sub-scales indicated a Cronbach alpha coefficient of .656 for relaxation and .803 for anxiety.

Academic Test (anxiety-induction procedure). The core experimental task comprised nine verbal analogies and six reverse digit recall tasks. The verbal analogies were adapted from Levels C and D of the Cognitive Abilities Test (CAT: Lohman, Thorndike, & Hagen, 2001, see Appendix B). Each analogy appeared in the form of a traditional analogy stem. For example, participants were presented with: 'Hurt is to Cry as Tickle is to:' They responded by completing the analogy stem by stating aloud the correct response (e.g. Laugh).

The reverse digit recall tasks were adapted from Wegner et al. (1997, see Appendix C). These consisted of a series of multi-digit numbers, beginning from 4 digits (e.g. 3129) and sequentially increasing to 8 digits (e.g. 74598240). Participants were required to remember the stated sequence and reverse the series aloud.

Automated Procedure, PMR Training and Strategy Instructions. All automated aspects of the procedure were controlled by a custom built computer program, designed in Visual Basic (VB6). This program controlled the presentation of all instructions, academic tasks and the interventions. Please note that the term 'intervention' refers to the combination of PMR/Placebo Training plus Strategy Instruction (Acceptance, Relax/Suppression, or Placebo). The program also recorded participants' responses and matched the timing of stimulus presentations and responses to participants' current SCL.

Both the PMR training and the strategy instructions were presented to participants as individual audio clips. The PMR Training protocol was adapted from Wegner et al. (1997) and was approximately 3min long. The aim of the PMR Training was to offer participants a relaxation-based strategy for dealing with potential anxiety that resulted from the academic tasks. The voice on the clip was that of a female therapist and the same voice was used for the PMR Training, all interventions and placebo clips.

Experiment 1 also contained two audio strategy instructions, one relaxation/suppression-based, the other acceptance-based, each offered in conjunction with the PMR Training (see Table 1). Each type of instruction was designed to offer participants different strategies for dealing with potential anxiety that resulted from the academic tasks. Both clips were approx. 3min/30sec in length.

Two audio placebo passages contained unrelated information about wildlife. One clip was designed as an alternative to the PMR Training and was matched in duration, while the other was designed as an alternative to the acceptance- or relaxation/suppression-based instructions and was matched in duration to these clips.

Ethical Issues

The current study raised a number of ethical considerations due to potentially negative psychological consequences that might be induced by the academic tasks. In order to address this possibility, all aspects of the work were conducted according to current ethical guidelines for research as articulated by the British Psychological Society (BPS, 2006) and the Psychological Society of Ireland (PSI, 2008). These ethical considerations may be summarised as follows. 1. Each participant was briefed as to the nature of the study prior to agreement to participate and a standard written consent form was signed (see Appendix D). 2. Participants could withdraw from the study at any point and would not be contacted again. 3. All data would be retained for five years. Each participant could view his/her own data at any time, but not the data from others. 4. All aspects of participation were confidential and the data or its representation offered no identifying information. 5. All participants were debriefed on the nature and purpose of the study at the end and were informed that their test performance could not be interpreted as a measure of intelligence or academic ability. They were also informed, at the beginning and end of the study, that the SCL data offered no psychological, medical, or other inferences.

6. In the event that unexpected or negative consequences arose from participation, all individuals were advised that these issues could be discussed free of charge with a Chartered Psychologist. At no point during the experiment did any participant withdraw from the study or express dissatisfaction or distress of any kind.

General Experimental Sequence

Experiment 1 consisted of seven stages, presented in a fixed sequence (see Figure 1). In Stage 1, participants completed the pre-experimental Subjective Anxiety Questionnaire (SAQ1). In Stage 2, a 2min baseline SCL measurement was recorded for each participant as an index of physiological anxiety prior to the academic test. In Stage 3, participants were presented with either a relaxation training (PMR) audio exercise or a placebo audio clip as the first part of the intervention. In Stage 4, participants were presented with one of three strategy instructions (Acceptance, Relax/Suppression or Placebo) in the form of audio clips as the second part of the intervention. Stage 5 comprised the academic test in the form of the verbal analogy and reverse digit-recall tasks, employed here as a means of anxiety induction. Stage 6 involved the post-test and post-intervention SCL measurement. In Stage 7, participants completed SAQ2 as a measure of self-reported anxiety post-test and post-intervention.

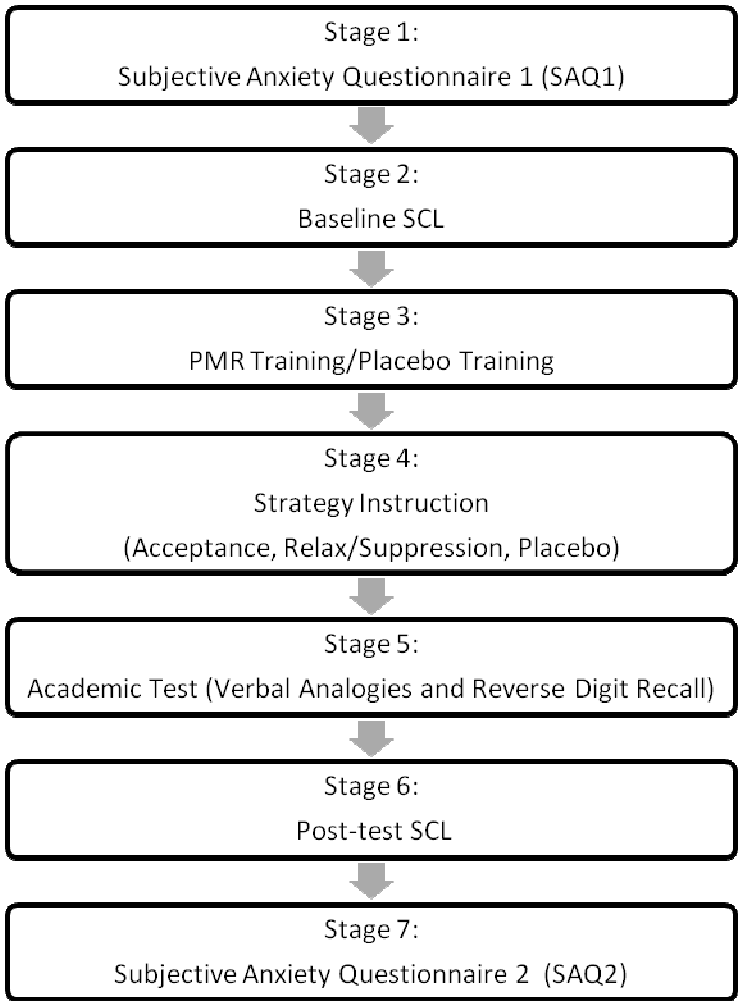


Figure 1. Experiment 1 sequence.

Procedure

Stage 1: Subjective Anxiety Questionnaire 1 (SAQ1). At the beginning of Stage 1, participants were randomly assigned to one of six experimental conditions, of which they were unaware (see Table 1). They completed the SAQ1 while the experimenter remained in the observation room.

Stage 2: Baseline SCL. At the beginning of Stage 2, the electrodes of the SC apparatus were connected to the distal phalanges of the index and middle fingers of each participant's non-dominant hand. Participants were encouraged to avoid movement by retaining the hand in a resting position. All experimental responses required the use of the

other (dominant) hand. During the SCL Baseline, participants simply remained still while the experimenter remained in the observation room.

Stage 3: PMR Training/Placebo Training. Stage 3 marked the beginning of the automated procedure and the intervention. The aim of this stage was to determine the potential use of brief PMR Training vs. Placebo in helping to minimise potential participant anxiety that would subsequently be induced during the academic test. As a result, this formed the first part of the intervention. Participants were presented with a short set of automated instructions prior to the experimenter leaving the room as follows:

> Thank you for agreeing to participate in this study. When you are ready, press the SPACE BAR to continue.
>
> For this experiment, instructions will be presented on the computer screen and through the headphones. Please read everything carefully and listen as you proceed.
>
> You will now be presented with an audio clip through your headphones. Please listen and follow it carefully. When you are ready, press the SPACE BAR to continue.

When the participant pressed the space bar, the audio clip for PMR or Placebo Training began to play immediately through the headphones as part of the automated procedure.

PMR Training. Half of the participants were assigned to PMR Training as the first part of the intervention. The instructions they received for this via the headphones were as follows:

> Okay, close your eyes, take a deep breath and hold it for three seconds. Then let it out slowly while counting to five in your head. Now take another deep breath. But this time as you exhale, slowly relax every muscle in your body. Inhale and feel any tension in your facial muscles disappear. Relax your jaw and your forehead. If your shoulders feel tensed up, then try to press them down away from your neck. Remember to keep breathing and try to focus on a breathing pattern that is both even and relaxing. Let's continue relaxing the body by concentrating on the arms and the torso. Let them feel heavy like they are weighted down and just sink into the comfort of the chair. Now try to make your hips and legs feel as heavy as the rest of your body by letting your feet rotate to their natural turnout, rather than trying to keep your inner ankle bones and big toes together. And now relax your toes and let them curl naturally, rather than pointing them or tensing them. Before we continue, I want you to take one more deep breath and exhale while simultaneously letting your body sink into the chair. Now just continue to relax.
>
> Please take two minutes to reflect on what you have just heard. After this time, the experiment will continue automatically. *(2min Pause)*

During the automated audio clip, the text of the PMR Training was read at a steady pace and in an even tone. The PMR Training clip lasted approx. 3min. After the 2min reflection period, a soft tone was played through the headphones to encourage participants to open their eyes (these had often remained closed during the PMR Training).

Placebo Training. The remaining half of the participants were exposed to Placebo Training instructions also delivered as an audio clip via headphones. These were matched for duration to the PMR Training and were delivered in the same manner. The Placebo Training information was as follows:

> Badgers mostly have rather stocky bodies, supported by short but strong legs. The forelegs are particularly well developed in most of the badger species and the fore paws of all the species are equipped with long, strong claws. The heads are rather wedge-shaped with relatively long, pointed muzzles. The eyes and the ears are small. The tails are variable in length. They are very short in the case of the stink badgers, while the tails of the ferret badgers are relatively long (around half the length of the body) and bushy. In their general appearance, the ferret badgers are in fact the least badger-like members of the sub-family. In general, badgers have poor eyesight, good hearing and an exceptionally well developed sense of smell. Honey badgers are similar in size and build to the European badger. They are heavily built and have a broad head, with small eyes, no external ears and a relatively blunt snout. Badgers live in setts, a network of underground tunnels which they dig using their strong claws. Each social group can number up to about 15 badgers and is headed by a dominant male and female. Setts are usually found on sloping ground where there is some cover, for example, in woods. Setts usually comprise a network of interconnected tunnels and chambers and are typically made in soil that is well drained and easy to dig. If you are interested in attracting wildlife into your garden and want to feed badgers, it is safe to give them dog food, fruit, root vegetables, peanuts and raisins. Peanuts are particularly nourishing for badgers, but please make sure to provide only small amounts of food so that the badgers do not become dependent on you. Badgers are creatures of habit and will tend to occupy the same sett for long periods of time. They also tend to use the same runs or pathways when they leave their setts and forage for food.
>
> Please take two minutes to reflect on what you have just heard. After this time, the experiment will continue automatically. *(2min Pause)*

Stage 4: Strategy Instruction (Acceptance, Relax/Suppression, Placebo). Stage 4 comprised the second part of the intervention and was designed to offer participants specific strategies that might minimise further the potential anxiety induced by the subsequent academic tasks. Similar to Stage 3, the strategy instructions were presented to participants via headphones. Those participants presented with the PMR Training were further sub-divided into three groups who were subsequently presented with an

Acceptance Instruction, a Relax/Suppression Instruction, or Placebo Information. Those participants who had not previously been exposed to PMR Training (i.e. those presented with Placebo Training) were sub-divided in the same way (see Table 1).

Relax/Suppression Instruction. All participants assigned to the Relax/Suppression Instruction received metaphor-based relaxation advice that encouraged them to use any means necessary to relax away their anxiety. That is, a key feature of these instructions explicitly directed participants to try to "remove all anxiety", hence implicitly directing them towards the use of suppression. These instructions were as follows:

> In the next part of the experiment, you will be asked to complete a series of tasks which are designed to measure intelligence.
>
> Suppose that you are now wired up to the best polygraph machine that's ever been built. This is the perfect machine, the most sensitive ever made. When you are wired up to it, there is no way you can be aroused or anxious without the machine knowing it. So I tell you that you have a very simple task here. All you have to do is stay relaxed. If you get the least bit anxious, however, I will know it. I know you want to try hard, but I also want to give you an extra incentive. So I also have a .44 Magnum which I'll hold to your head. If you just stay relaxed, I won't blow your brains out. But if you get nervous (and I'll know it because you're wired up to this perfect machine), I'm going to have to kill you. Your brains will be all over the walls. So just relax. All you have to do is relax yourself completely. If you get nervous I'll know it, because you're wired up to this perfect machine. So just relax. I need you to relax as much as you can. Using any technique, I want you to remove all anxiety, reduce all tension in your muscles and become completely and totally relaxed. It is very important that you feel thoroughly relaxed for this experiment. Please become relaxed as quickly as possible and I will give you two minutes to achieve deep relaxation.
>
> Please take two minutes to reflect on what you have just heard. After this time, the experiment will continue automatically. *(2min Pause)*

Acceptance Instruction. These participants were presented with a metaphor-based clip that encouraged psychological acceptance. The primary aim of this message was to encourage participants to completely accept their anxiety without trying to avoid or remove it. This advice was as follows:

> In the next part of the experiment, you will be asked to complete a series of tasks which are designed to measure intelligence.
>
> Suppose that you are now wired up to the best polygraph machine that's ever been built. This is the perfect machine, the most sensitive ever made. When you are wired up to it, there is no way you can be aroused or anxious without the machine knowing it. So I tell you that you have a very simple task here. All you have to do is stay relaxed. If you get

> the least bit anxious, however, I will know it. I know you want to try hard, but I also want to give you an extra incentive. So I also have a .44 Magnum which I'll hold to your head. If you just stay relaxed, I won't blow your brains out. But if you get nervous (and I'll know it because you're wired up to this perfect machine), I'm going to have to kill you. Your brains will be all over the walls. So just relax. Guess what you'd get? Bang! How could it be anything else? The tiniest bit of anxiety would be terrifying. You'd be going: "Öh my God! I'm getting anxious! Here it comes!" Bang! You're dead meat. How could it be any other way? So, even if you tried your very best to relax away the anxiety, chances are it wouldn't work. So perhaps, it would be better if you don't dry to relax and just go ahead and experience whatever feelings show up. We are not interested in your ability to relax and in fact if you try to relax, it may disturb our readings. Therefore, if you feel aroused or excited, please go ahead and experience those feelings. I will now give you two minutes to experience whatever feelings come up.
>
> Please take two minutes to reflect on what you have just heard. After this time, the experiment will continue automatically. *(2min Pause)*

Placebo Instruction. Participants assigned to Placebo Instruction were presented with an audio clip via headphones that was matched for duration with the two previous instructions, but contained completely unrelated information as follows:

> The Eurasian badger looks rather like a small bear and indeed when it was first described scientifically it was classified as a bear. However, the badger is not a small bear. It is, in fact, a big weasel. A male badger is called a boar and the female is called a sow. Young badgers are cubs. An old English name for the badger is brock. As the badger is widely distributed across Europe and Asia, it has many other names in different languages. I have already mentioned the badger's resemblance to a small bear. One feature that immediately distinguishes the badger is its colour, particularly its face. The badger's black and white striped head is well known and may be a form of warning colour. In Japan, however, the facial stripes are often very much reduced in size. The fur on the badger's upper parts appears grey or brownish, while the fur on the throat, legs and under-parts is black. The forelegs are well-developed and the forepaws bear long, strong claws. These are adaptations for a digging way of life. As mentioned above, badgers are widely distributed across Europe and Asia. Unlike other badgers, the Eurasian badger often lives in groups. These groups can be quite large where food supplies are good.
>
> Please take two minutes to reflect on what you have just heard. After this time, the experiment will continue automatically. *(2min Pause)*

Stage 5: Academic Test (verbal analogies and reverse digit recall). During Stage 5, participants were presented with a series of verbal analogy tasks, followed by reverse digit recall tasks with only a short break in-between. Both tasks were presented in quick succession to elicit as much participant anxiety as possible. Participants received no form of feedback on any question in either task. At the beginning of this stage, the following text appeared on-screen:

> You will now be presented with a series of short tasks. The questions will be read to you through the headphones and you will answer using the microphone in front of you. Please speak loudly and clearly into the microphone. The questions will be presented in quick succession, so please answer as quickly as you can and try your best. On the next screen you will see instructions and an example of the tasks. Press SPACE BAR when you are ready to continue.

Verbal Analogy Tasks. The nine verbal analogies were identical in format. All contained a traditional analogy stem (e.g. 'Hurt is to Cry as Tickle is to ____?', see Appendix B). All analogies were presented via headphones and participants responded by speaking the chosen response option aloud into the microphone. They were given 5sec to respond to each analogy, after which the next analogy was presented automatically. The instructions for completion of the analogies appeared on-screen as follows:

> In the first part of the task you will hear a related pair of words, followed by another word. Your task is to find a word that best expresses a relationship similar to the original pair. For example, if the question was as follows:
>
> ***Gloves are to Hands as Shoes are to*** _____. Your answer would be ***Feet.***
>
> Each question will be followed by a short pause for your answer. The questions will be presented one after the other in quick succession, so please answer as quickly as you can and try your best. Press SPACE BAR when you are ready.

Reverse Digit Recall Tasks. There were five reverse digit recall tasks. The first task contained 4 digits (e.g. 3129) which participants were required to repeat aloud in reverse order within 8sec (see Appendix C). The second task contained 5 digits (e.g. 96571). The third task contained 6 digits (e.g. 149683). The fourth task contained 7 digits (e.g. 2086395) and the final task contained 8 digits (e.g. 74598240). The instructions for the reverse digit recall tasks were as follows:

> In the next part of the task you will hear sequences of numbers. Your task is to repeat the numbers in reverse order.
>
> For example, if the sequence was ***5, 3, 2, 1,*** your response would be ***1, 2, 3, 5.***
>
> Each number sequence will be followed by a short pause for your answer. They will be presented one after the other in quick succession, so please answer as quickly as you can and try your best.
>
> Press SPACE BAR when you are ready.

The end of Stage 5 marked the end of the automated procedure.

Stage 6: Post-test SCL. Stage 6 was identical to Stage 2 and involved a 2min SCL measurement as an index of post-intervention and post-test physiological anxiety.

Stage 7: Subjective Anxiety Questionnaire 2 (SAQ2). Stage 7 was identical to Stage 1, but was designed as a self-report index of post-intervention and post-test anxiety. Completion of the questionnaire marked the end of the experiment. At this point, the experimenter entered the room and each participant was thanked and debriefed.

Results

Experiment 1 contained two primary types of data taken before, during and after the academic tasks and interventions. Specifically, the data from SAQ1 and 2 were recorded at the very beginning and end of the experiment. In contrast, the SCL data were recorded at all times between Stages 2 and 6, but the only segments of this used for analysis were from Baseline (Stage 2), the Academic Test (Stage 5) and the Post-test SCL measurement (Stage 6). In addition, the VB program automatically recorded participants' accuracy levels on the analogies and digit recall tasks. The majority of participants across all six conditions produced high accuracy on both aspects of the test, generating an overall mean accuracy of 12.3 (88%), SD 1.3.

The general analytic strategy adopted in the current study was as follows. To account for the potential natural variability of SCL across participants, mean Baseline SCL was analysed for significant differences among conditions. An initial 6x3 mixed repeated measures analysis of variance (ANOVA) was then conducted to examine effects for both condition and time point (Baseline, Test, Post-test). Three planned 6x2 mixed repeated measures ANOVAs were then conducted to test specific predictions about changes in mean SCL by condition across three critical time periods (Baseline-Test, Test-Post-test and Baseline-Post-test). Given the variable nature of SCL data, we also examined the percentage change in SCL across the three time periods (Baseline-Test, Test-Post-test and Baseline-Post-test). Finally, the percentage of individual participants in each condition who showed increases or decreases in mean SCL by condition were analysed to determine the consistency of responding within each group. The data from the various aspects of Experiment 1 are presented separately below.

SCL Analyses

The SCL data from the critical Stages 2, 5 and 6 are presented here in microsiemens per cm^2 ($\mu S/cm^2$). To convert the raw data to this unit (i.e. from μS to $\mu S/cm^2$), the raw data points were multiplied by 1.2732 because the area of the electrodes used was 0.785 cm^2. For inferential analyses, the data were also transformed to obtain a more normally distributed sample. The transformation method used was Ln(x)+1 (where Ln is the natural log of the data value X). This type of normalisation is considered preferable square root or other log value transformations and the addition of a constant value (i.e. 1) is necessary because the transformed value of any original data point less than 1 would be returned as undefined (Cleveland, 1984).

Mean SCL. The mean SCL data were collated by condition and the three critical time points (Baseline, Test, Post-test) and are presented in Figure 2. As expected, all conditions showed increased anxiety between Baseline and Test, indicating that the academic test was anxiety-inducing. The increases in SCL were comparable for four of the conditions: PMR+Relax/Suppress (4.33); Placebo+Relax/Suppress (4.56); Placebo+Acceptance (4.61); and Placebo+Placebo (4.84). Considerably larger increases in SCL were recorded for both Placebo+Placebo (7.06) and Placebo+Acceptance (7.59), although these were comparable to each other. All conditions showed comparable *decreases* in SCL from Test to Post-test/intervention.

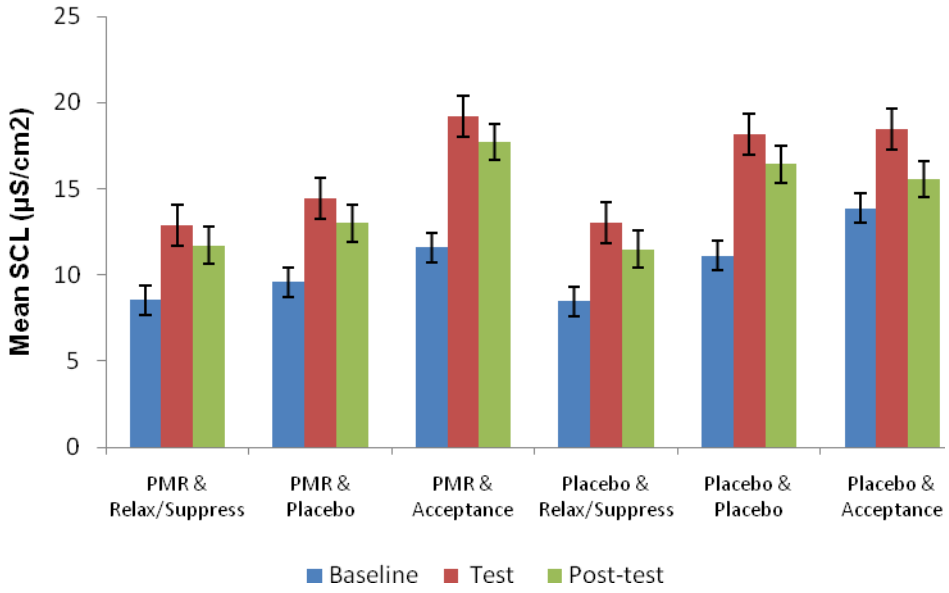


Figure 2. Mean SCL for each condition at the three critical time points in Experiment 1.

Following the log transformation, the SCL data at baseline was still not found to be sufficiently normally distributed. A Kurskall-Wallis Test was conducted (following transformation) to assess differences at Baseline across conditions, but no significant difference was found ($p = .651$). A 6x3 mixed repeated-measures ANOVA (with condition as the between-participant variable and time point as the within-participant variable) indicated no significant main nor interaction effects (all p's > .413). Three separate 6x2 planned comparison mixed repeated measures ANOVAs assessed differences across the three crucial time periods (one each for Baseline-Test, Test-Post-test and Baseline-Post-test), with time as the within-participant variable (two levels) and condition as the between-participant variable (six levels). Time was highly significant for both Baseline-Test, ($F= 59.66$ (1,54) $p= 0.00$) and Test-Post-test ($F= 41.26$ (1,54) $p= 0.00$), but not for Baseline-Post-test ($p = 0.576$). Neither condition nor the interaction effects were significant for any of these ANOVAs (all p's > 0.518).

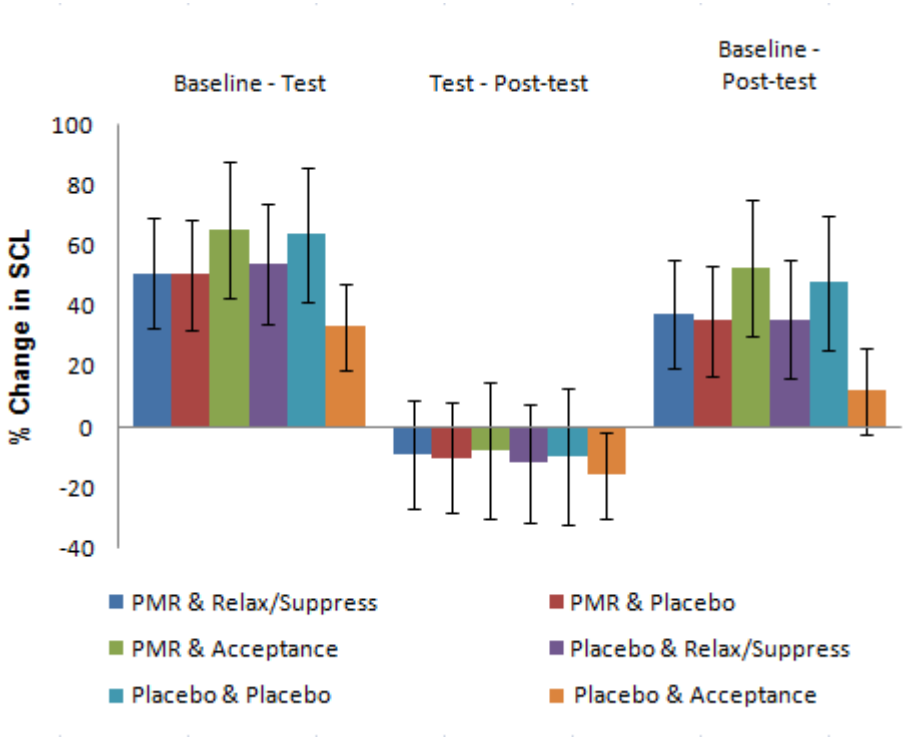


Figure 3. Percentage change in mean SCL by condition on the three critical time period comparisons in Experiment 1

Percentage Change. To compare the effect of the interventions, the data were also examined in terms of percentage change in mean SCL across the three target time periods (see Figure 3). Placebo Training+Acceptance showed the smallest increase (33%) from Baseline-Test, the largest decrease (15%) from Test-Post-test and the smallest increase (12%) from Baseline-Post-test. In contrast, PMR+Acceptance showed the largest increase (65%) from Baseline-Test, the smallest decrease (7%) from Test-Post-test and the largest increase (52%) from Baseline-Post-test.

Percentage of Participants. The individual participant mean SCL data was analysed to assess the consistency of response patterns in terms of the numbers of participants who showed increased or decreased anxiety across the three time periods (see Table 2). All participants increased anxiety from Baseline-Test. In five conditions, 90% of

participants decreased from Test-Post test (for PMR+Placebo this was 70%). At least 80% of participants in all conditions increased anxiety from Baseline-Post-test.

Table 2

Percentage of Participants by Condition Who Increased or Decreased in Mean SCL across the Three Critical Time Periods in Experiment 1

		PMR Training			**Placebo Training**		
	(%)	**Relax/Suppress**	**Placebo**	**Acceptance**	**Relax/Suppress**	**Placebo**	**Acceptance**
Baseline-Test	*Increased*	100	100	100	100	100	100
	Decreased	0	0	0	0	0	0
Test-Post-test	*Increased*	10	30	10	10	10	10
	Decreased	90	70	90	90	90	90
Baseline-Post-test	*Increased*	80	90	100	100	100	80
	Decreased	20	10	0	0	0	20

Subjective Anxiety Ratings

Subjective anxiety ratings were recorded at the beginning and end of the experiment using SAQ1 and SAQ2 and the means for both the relaxation and anxiety sub-scales are presented in Table 3. From pre- to post-experiment, all conditions showed decreased subjective relaxation and increased subjective anxiety. Two 6x2 mixed repeated measures ANOVAs (one per sub-scale) showed a significant effect for time on both relaxation ($F(1, 54) = 86.7$, $p = .00$) and anxiety ($F(1, 54) = 51.6$, $p = .00$). Condition nor interaction effects were significant at any point (all p's > .384).

Table 3

Mean Subjective Levels of Relaxation and Anxiety on SAQ 1 and 2 Pre- and Post-Experiment in Experiment 1

	PMR Training			**Placebo Training**		
	Relax/Suppress	**Placebo**	**Acceptance**	**Relax/Suppress**	**Placebo**	**Acceptance**
SAQ1 Relaxation	24.8	24.3	22.7	24.5	22.5	22.2
SAQ2 Relaxation	17.9	18.05	15.95	18.7	14.3	16.6
SAQ1 Anxiety	8.9	8.7	9.6	7.05	8.3	8.7
SAQ2 Anxiety	13.1	13.4	12.8	11.6	12.4	10.8

Results Summary

Mean SCL increased for all conditions from Baseline-Test, suggesting that the target academic test did increase physiological anxiety. The largest increases in anxiety were observed for Placebo+Placebo and Placebo+Acceptance. Mean SCL decreased in a small and similar way for all conditions from Test-Post-test/intervention, suggesting some small influence fir the interventions and/or for practice because Placebo also changed. However, none of these differences were significant. When the time points were systematically compared, mean SCL showed a significant increase from Baseline-Test and Test-Post-test, but the conditions did not differ significantly from each other. The analysis of the percentage change across the three time periods showed some differences among conditions. Specifically, Placebo+Acceptance showed the smallest increase in anxiety from Baseline-Test, the largest decrease from Test-Post-test and the smallest overall increase from Baseline-Post-test. In contrast, PMR+Acceptance showed the largest increase in anxiety from Baseline-Test, the smallest decrease from Test-Post-test and the largest increase overall from Baseline-Post-test. The individual participant data indicated

that the response patterns were largely consistent within conditions. Subjective anxiety significantly increased and subjective relaxation significantly decreased from pre- to post-experiment, as indicated by SAQ1 and 2. However, the conditions did not differ significantly in this regard.

The results from Experiment 1 confirmed some of our initial predictions. First, we predicted that the chosen academic task would increase anxiety, especially on the SCL, for all conditions prior to intervention. Both the SCL and SAQ data confirmed that the task did significantly increase anxiety for all conditions. Second, we predicted that the Acceptance Instruction would be associated with smaller increases in anxiety than both Suppression and Placebo. Overall, the data from Experiment 1 indicated no significant effect for condition, hence failing to confirm this hypothesis. However, the percentage change in mean SCL data indicated that Placebo+Acceptance showed the smallest decrease in physiological anxiety overall from Baseline-Test, including the largest decrease from Test-Post-test. Given that the first part of the intervention comprised Placebo Training, one might assume that this effect, albeit small, was a result of the acceptance-based instruction. However, it is important to note that this group had also shown the smallest increase from Baseline-Test. We had also predicted that anxiety levels observed with the acceptance instruction would be comparable to PMR Training, but the strong similarities across conditions made comparisons between the first and second parts of the interventions difficult to discriminate.

Discussion

The key finding that emerged from Experiment 1 was the lack of different outcomes across conditions. One factor that may have contributed to this concerned the nature of the academic test. Although the chosen tasks resulted in significant increases in anxiety, the level of cognitive demand required was constant that was not particularly high (i.e. the majority of participants made no errors). However, previous research has indicated that the effects of coping strategies on anxiety are enhanced by a context of increasing demand (Lang, Bradley & Cuthbert, 1990). Indeed, the constancy of the current academic test may have facilitated habituation in all participants, thus reducing any differences among them.

A second issue that may account, to some extent, for the lack of differences among conditions in Experiment 1 emerges from the possibility that the study did not contain a formal means of determining whether or not participants were engaging in suppression or acceptance. Indeed, McRae, Bodenhausen, Milne and Jetten (1994) argued that the effects of suppression are most apparent with *behavioural* suppression tasks. This makes intuitive sense and likely facilitates greater differences in anxiety with other types of instructions because a number of behavioural suppression tasks contain warning cues that participants are advised to attend to in order to then gain opportunities to explicitly avoid or suppress what is coming next in the task. There was no facility within the current procedure to build up this type of alertness or anxiety in any group. Both of these issues were addressed in Experiment 2 with the construction of a new type of anxiety-inducing academic test.

Chapter 3
Experiment 2

Examining the Impact of Suppression on Anxiety

Chapter 3

Experiment 2

Examining the Impact of Suppression on Anxiety

One factor that may have contributed to the lack of difference among conditions in Experiment 1 concerned the nature of the academic test. That is, the test contained therein was not particularly high in cognitive demand (although it did induce anxiety); all tasks contained a similar level of demand; and there was no critical measure to assess whether participants had tried to suppress. Experiment 2 attempted to address this issue with the development of a new experimental procedure that involved an on-going stressor and the repeated introduction of a visual stimulus, which the Suppression group only were instructed to suppress. In short, participants in Suppression would be given explicit instructions to suppress a stimulus during the task. In theory, the process of constantly monitoring for the "to be suppressed" stimulus should serve to increase arousal in participants. In contrast, participants who are not instructed to suppress should simply habituate to the stimulus.

The primary aim of Experiment 2 was to examine whether the instruction to avoid a visual stimulus would be associated with increased anxiety. In short, we predicted that participants in Suppression would avoid the stimulus more and would show more anxiety than those assigned to Control (i.e. no instruction to suppress). A secondary aim of the study was to examine whether the instruction to suppress the stimulus affected participants' habituation to its appearance. Habituation was measured by recording participants' SCR to each presentation of the stimulus. In short, we predicted that habituation would be disrupted in Suppression, but not in Control.

Method

Participants

A non-clinical sample of 20 adults (10 males and 10 females) participated in Experiment 2. Their mean age was 20 years and 6 months. Participants were recruited in the same manner as Experiment 1. Each was randomly assigned to one of two experimental conditions (i.e. Suppression or Control). Two participants were excluded from data analysis as a result of disturbances in baseline SCL from excessive hand movements. This left 10 participants in the Suppression Condition and 8 in Control.

Experimental Setting, Ethical Issues, Apparatus and Materials

The setting and ethical issues in Experiment 2 were identical to the previous study. The apparatus and materials were in part the same, with the exception of the removal of SAQ1 and 2 and changes to the test. Overall, the sequence of the current study was shortened considerably relative to Experiment 1. The test in Experiment 2 consisted of 30 verbal analogies taken from Levels C to F of the CAT (Appendix E: Lohman et al., 2001). Digit-recall tasks were not included, as the questions were now delivered on-screen as opposed to the oral question-answer format that was used in Experiment 1. The presentation of the test was also modified in order to facilitate an explicit measure of suppression. This modification involved the presentation of a moving image (i.e. a black rabbit) on-screen at random intervals during the test. The image itself was non-threatening and non-aversive. However, the Suppression group were instructed to watch out for and remove (suppress) the image while completing the analogies, while the Control group were simply instructed to continue with the task.

General Experimental Sequence

Experiment 2 comprised of two stages, presented in a fixed sequence. Stage 1 contained a 2min Baseline SCL measurement. Stage 2 comprised the verbal analogies test and the moving suppression image.

Procedure

Stage 1: Baseline SCL. Stage 1 was identical to the SCL Baseline in Experiment 1.

Stage 2: Academic Test (verbal analogies). Stage 2 marked the beginning of the automated part of the procedure and participants were presented with the following instructions:

> Thank you for agreeing to participate in this study. When you are ready, click "Next" to continue.
>
> For this experiment, instructions will be presented on the computer screen. Please read everything carefully and listen as you proceed.
>
> Each exercise in this test starts with a pair of words that are related to each other in some way. Following the first two words, you are given a third word which starts the second pair.
> For example: **Big is to Large as Little is to _____**. Your answer would be **Small.**
>
> From the five choices below, find the word that matches the third word, in the same way the second word matches the first. That is, your job is to find a word to complete the second pair. In this example, the answer would be Small. That is, Big is to Large as Little is to Small. Try to score as many points as you can.
>
> Click NEXT when you are ready to continue.

An additional instruction was then presented to participants in both conditions. The purpose of this was to inform them that an image would appear on-screen, preceded by a warning, at random intervals while they were completing the analogy test. The instructions also indicated how the participants in each condition should respond to the presence of the image.

Suppression Condition. Participants in the Suppression Condition were instructed to watch out for and remove the image as soon as possible when it appeared. The purpose of this instruction was to examine whether the suppression process (i.e. watching for and removing an upcoming stimulus) was associated with increased anxiety. These instructions were as follows:

> While you are doing the test, the following image will appear on the screen at random intervals.
>
> 
>
> Before the image appears, you will see a warning. First the screen will flash orange, then it will flash red, then the image will appear.
>
> **It is very important that you remove the image from the screen as quickly as possible.**
>
> To remove the image, simply click on it with the mouse.
>
> As much as you can, try to keep the image off the screen as much as possible. To do this, simply click on it with the mouse as soon as you see it. It is important that you continue to do this throughout the test.

Control Condition. Participants in the Control Condition were instructed to continue with the task, even when the image appeared on-screen:

> While you are doing the test, the following image will appear in the screen at random intervals.
>
> 
>
> Before the image appears, you will see a warning. First the screen will flash orange, then it will flash red, then the image will appear.
>
> **Try to not let the image distract you from the task.**
>
> As much as possible, try to continue with the task even when the image appears on the screen. It is important that you continue to do this throughout the test.

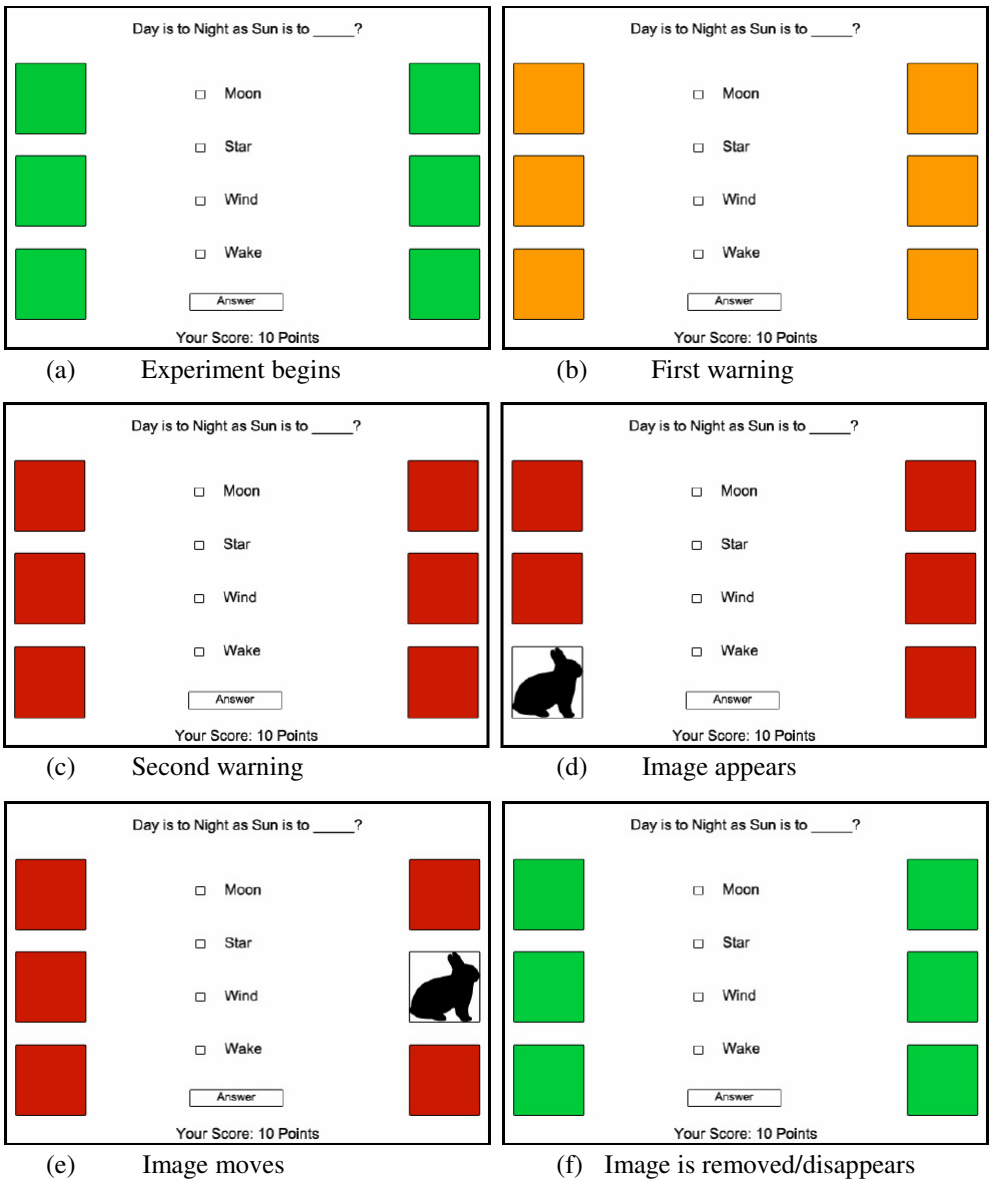


Figure 4. The colour sequence presented across trials in the test in Experiment 2.

For each verbal analogy (i.e. each trial), the analogy stem appeared at the top of the screen, with the four response options directly below, one above the other (see Figure 4). The text "Your Score" was displayed at the bottom of the screen with a tally of the participant's current score in the test. Participants simply responded by selecting the chosen response option with the mouse and clicking an "Answer" button. If the answer was correct, the word “Correct” appeared on-screen and score increased by 10 points. If the response was incorrect, the word “Incorrect” was displayed and the score did not

increase. The next question then appeared immediately. Participants were given 20secs to respond to each analogy and the time left to respond was displayed on-screen below the response options. If a participant failed to emit a response on any trial, the phrase "No response. Incorrect" appeared on-screen, followed immediately by the next analogy.

During all analogy trials, the screen contained three boxes on either side of the analogy stem, three on the left and three on the right (see Figure 4). At the beginning of each trial, all six boxes were green in colour (see Figure 4a, top left). At random intervals of between 10 and 20 seconds, *while the trials progressed*, the boxes changed colour to orange for 5sec (see Figure 4b, top right) and then to red for 5sec (see Figure 4c, middle left). The colour change was designed to warn participants that the target stimulus was about to appear. An image of a black rabbit then appeared on-screen in one of the six boxes (see Figure 4d, middle right) and moved to a different box every 1000ms. in a random sequence (see Figure 4e, bottom left). During this time, the six boxes remained red.

Participants in the Suppression Condition were required to click on the image as soon as it appeared. If they did so, the image disappeared immediately and all six boxes returned to green (see Figure 4f, bottom right). For participants in the Control Condition, the image remained on-screen for 10 sec, after which it disappeared and the six boxes returned to green. This was also the case for participants in the Suppression Condition who failed to click the image on time. The full colour change and image sequence began again after a random interval of 10-20 sec. Because this sequence occurred independently of the analogy trials, the number of exposures to the sequence varied somewhat across participants. The test ended when each participant had been exposed to all 30 analogies. At this point, the experimenter entered the room and the participant was thanked and debriefed.

Results

The current study employed both *SCL* (recorded during Baseline and Test) and *SCR* data only recorded during the Test. The SCL measurement refers to the general level of physiological anxiety throughout the Baseline and the Test stages. The SCR data refer to participants' anxiety in response to each presentation of the moving image stimulus. All participants in the Suppression Condition suppressed the image on every occasion it was presented, compared to no participants in the Control condition. The majority of participants in both conditions produced high accuracy on both aspects of the test, generating an overall mean accuracy of 26.8 (89%), SD 2.74.

The general analytic strategy for analyses of the SCL data was largely identical (as appropriate) to Experiment 1. The SCR data was examined and grouped according to the typical habituation patterns recorded in each condition. The data from the various aspects of Experiment 2 are presented separately below.

SCL Analyses

Mean SCL. A one-way ANOVA was conducted to assess differences between baseline levels between experimental conditions. No significant difference in baseline levels was found between conditions ($F(1, 16) = 0.126$, $p = .727$).

The mean SCL data ($\mu S/cm^2$) were collated by condition and time point (Baseline and Test) and are provided in Figure 5. The Suppression Condition showed increased anxiety from Baseline-Test, whereas Control showed a marginal decrease. A 2x2 mixed repeated measures ANOVA (with condition as between-participant variable and time as within-participant variable) yielded a significant effect for time ($F(1,16) = 10.43$, $p = .005$), but not for condition ($p = .246$). However, the interaction effect was highly significant ($F(1,16) = 16.43$, $p = .001$).

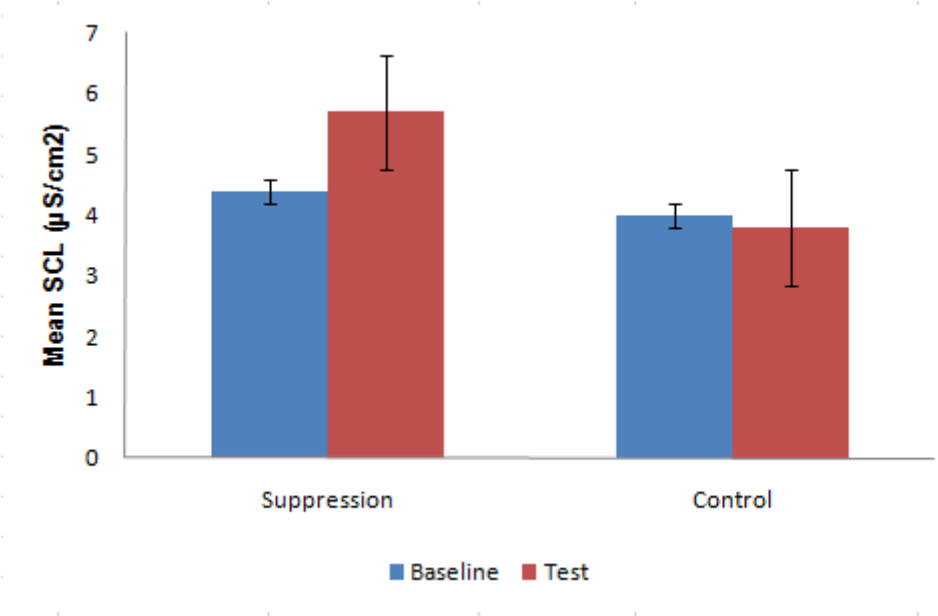


Figure 5. Mean SCL for each condition in each stage of Experiment 2.

Given the 2x2 design of the current study, this suggests that the effect for time depended on which condition participants were placed in. Indeed, after splitting the data by condition and examining the effect of time separately for each condition, a significant effect was found for time in Suppression ($F(1,9) = 34.14$, $p = .000$), but not in Control ($p = .624$).

Percentage Change. Analysis of the SCL mean percentage change data indicated that the Suppression group showed a sizeable increase (34%) from Baseline-Test, whereas Control showed a small decrease (2%, see Figure 6).

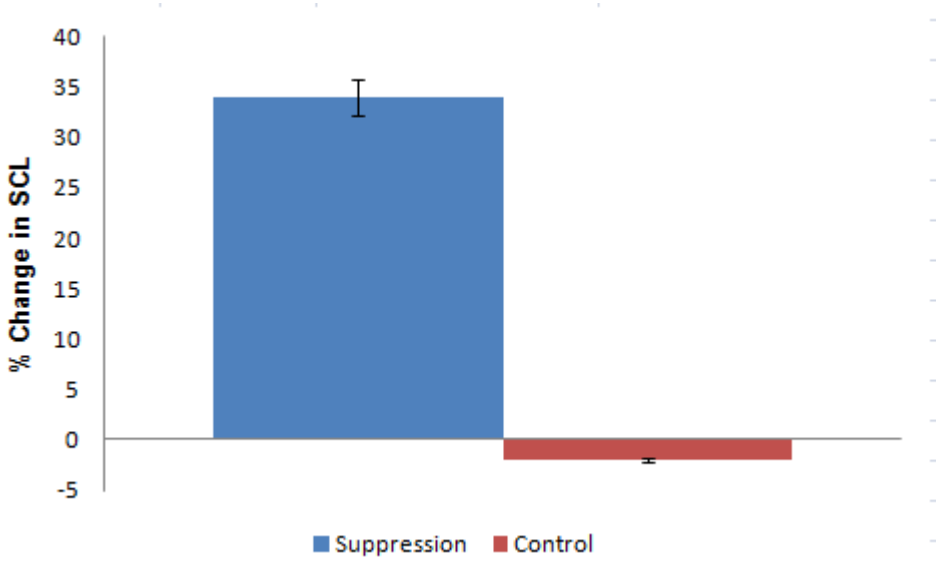


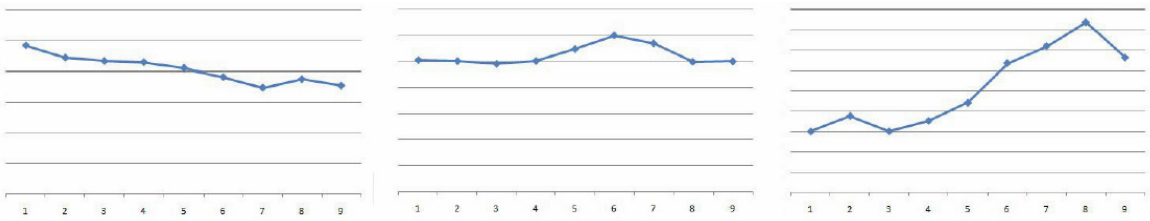
Figure 6. Percentage change in Mean SCL by condition on the critical time comparison in Experiment 2

Percentage of Participants. The percentage of participants whose mean SCL increased or decreased from Baseline-Test is presented in Table 4. All participants in Suppression showed increased anxiety, compared to 66% in Control.

Table 4

Percentage of Participants by Condition who Increased or Decreased Mean SCL across the Critical Time Period in Experiment 2

(%) Change Baseline-Test	**Suppression**	**Control**
Decreased	0	33
Increased	100	66



(a) Habituation (b) Inconsistent (c) Increasing arousal

Figure 7. Characteristic SCR patterns observed in Experiment 2.

SCR Analyses

Habituation was defined as a progressive decrease in participants' SCRs to the stimulus presentations across the test. To examine habituation, measurements of SC amplitude were taken at the highest point within 5sec of the stimulus presentation. Figure 7 presents three examples of typical habituation patterns recorded with participants across conditions. The dominant pattern of responding in the Control Condition can be referred to as Habituation (Figure 7a, left) and is characterised by a gradual decrease in SCL amplitude across the task. In contrast, two alternative patterns dominated the Suppression Condition. Specifically, Figure 7b (middle) shows an Inconsistent pattern that neither increases nor decreases steadily and Figure 7c (right) shows gradual Increasing Arousal.

Results Summary

Mean SCL between Baseline and Test increased significantly for participants in the Suppression Condition, but not in Control. The percentage change data indicated that the increase for Suppression was 34%, compared with a 2% decrease for Control. The percentage of participants data indicated that the response patterns were entirely consistent within Control, but more mixed for Suppression. Nonetheless, 66% of Suppression participants showed increased physiological anxiety. The current study also included analyses of SCR as a means of measuring participant habituation to the presence of the

visual stimulus. The dominant pattern of responding in Control was Habituation. In contrast, response patterns in Suppression were either Inconsistent or indicative of Increasing Arousal.

The results from Experiment 2 confirmed our predictions. The primary aim of the study was to examine whether the instruction to avoid a visual stimulus would be associated with increased anxiety and the strong difference between Suppression (who received the instruction) and Control (who did not) confirmed that this was the case. A secondary aim of the study was to examine whether the instruction to suppress the stimulus affected participants' habituation to its appearance and this effect was confirmed by the SCR outcomes in Suppression.

Discussion

The results of Experiment 2 were consistent with predictions and demonstrated that suppression resulted in significantly increased arousal and lack of habituation. These outcomes accord with previous research on the paradoxical effects of suppression (Wenzlaff & Wegner, 2000) and support Wegner's (1994) definition of relaxation as the ability to habituate to events causing arousal. The enhanced outcomes recorded here for Suppression, relative to Experiment 1, also supported Wegner's (1997) claims that increased task demand is an important context for observing the paradoxical effects of suppression.

One issue that arose from Experiment 2 concerned the possibility that participants in the Suppression condition were required to attend more carefully to areas of the screen that presented the visual stimulus than participants in Control, given that the former and not the latter were instructed to remove the image once it appeared. As a result, this spurious source of control may have contributed, at least in part, to the differential outcomes observed across the two groups. This issue was addressed in Experiment 3.

Chapter 4
Experiment 3

Examining the Effects of Interventions on Anxiety

Chapter 4
Experiment 3

Examining the Effects of Interventions on Anxiety

A potential concern raised in Experiment 2 related to the possibility that participants in Suppression showed greater anxiety because of increased task demand, created by the need to attend to a *visual* stimulus that other group did not need to attend to. In order to address this issue, the task developed for Experiment 3 involved a recurring *event*, which signalled a forthcoming increase in the level of task difficulty, which participants could avoid.

Empirical evidence has also indicated that the evaluation of forthcoming stimuli or events is a crucial component in the processes of anxiety and relaxation (Ray, 2009). However, there appear to be no studies that have specifically examined the effects of evaluation on anxiety in a relaxation context. In order to address this issue, Experiment 3 also examined participants' anxiety response to the warning that occurs prior to the increased difficulty event (i.e. when the evaluation occurs).

In spite of the strong contrast between the Suppression and Control outcomes in Experiment 2, it remains the case that the acceptance-based instructions employed in Experiment 1 had only a relatively limited impact on anxiety. One possible explanation concerns the use of an instruction in this context, rather than a more extensive intervention. Indeed, several researchers have highlighted the importance of various components of interventions that contextualise instructions and thus likely make even small interventions more effective than instructions alone (Rasmussen, 1995). In order to examine this possibility, Experiment 3 investigated the effects of a range of brief strategy-based interventions on physiological and self-report anxiety.

Clinical researchers have noted strong conceptual and technical overlap between acceptance and mindfulness (Orsillo et al., 2005) and Experiment 3 created interventions based on each. The purpose of this is to examine whether these strategies are indeed functionally similar. In order to attend to the possibility that participants in an anxiety-induction context were not interpreting either acceptance or mindfulness as standard 'endurance', the current study also employed an Endurance Condition (e.g. Hasenbring, 1993). Mindfulness, for example, involves attending to stimuli without evaluation (Orsillo et al., 2005) and endurance involves simply allowing events to occur. In contrast, acceptance involves a combination of both of these components (Hayes, Strosahl, & Wilson, 1999).

The principal aim of Experiment 3 was to compare the relative effects of psychological strategies on physiological and self-report anxiety in a high-demand context. To obtain a better indication of the efficacy of the target interventions, the experimental procedure was modified to include pre- and post-intervention tests, as well as an initial baseline measurement. As such, we returned to the more lengthy experimental sequence from Experiment 1, rather than the brief procedure in Experiment 2.

First, we predicted that Suppression and Placebo would be less effective at diminishing anxiety than Mindfulness and Acceptance. We also predicted that similarity across outcomes for Mindfulness or Acceptance vs. Endurance might indicate that participants in either of the former were actually interpreting the strategy incorrectly as simple endurance. We had no clear predictions about differences across conditions in terms of the level of anxiety associated with the event warning, or the events themselves, although it seemed likely that Suppression, at least, would show greater anxiety here than Acceptance.

Method

Participants

A non-clinical sample of 80 adults (32 males and 48 females) participated in the current study. The mean age was 27 years and 2 months. Participants were recruited in the same manner as previous studies. Each participant was randomly assigned to one of five experimental conditions (i.e. 16 per condition: Acceptance, Suppression, Mindfulness, Endurance and Placebo).

Experimental Setting, Ethical Issues, Apparatus and Materials

The setting of Experiment 3 was identical to previous studies. There were no additional ethical concerns related to this study. The apparatus and materials were largely identical to Experiment 1, except that interventions here were delivered as video clips (rather than audio) contained within the automated procedure. However, the anxiety-inducing task comprised a modified version of the procedure employed in Experiment 2. As such, the current study involved a combination of aspects of Experiments 1 and 2.

Interventions. Experiment 3 contained four intervention video clips (one for each of the four active conditions). All interventions were designed to offer participants various strategies for dealing with potential anxiety that resulted from the academic test. The clips used a metaphorical style that is commonplace in many psychotherapies (Moreira, Beutler, & Goncalves, 2008; Rasmussen, 1995). A video clip that contained unrelated information about wildlife was also employed as a Placebo and was matched in duration to the intervention clips. All clips were approx. 2min/35sec in length. The presenter of all videos was the same female therapist who had delivered the audio and automated strategy instructions in the previous experiments (see snapshot in Figure 8).

Figure 8. A screen-shot from the video intervention employed in Experiment 3.

Academic Test. The test employed in Experiment 3 contained some modifications to the program from Experiment 2. The test consisted of 25 verbal analogies (Appendices F & G) and a "to be suppressed" event that occurred at random intervals during the test. Experiment 3, however, did not involve a visual stimulus, but rather increases in level of task difficulty that could be avoided. Similar to Experiment 2, a sequence of colour changes was used to warn participants that the event was about to occur.

General Experimental Sequence

Experiment 3 consisted of six stages presented in a fixed sequence (see Figure 9). In Stage 1, participants completed SAQ1 as a measure of subjective pre-experimental anxiety. Stage 2 comprised a 2min SCL Baseline. Stage 3 contained the first academic test, followed by the video Interventions or Placebo in Stage 4. Stage 5 presented a second academic test as a means of post-intervention anxiety-induction. In Stage 6 participants completed SAQ2.

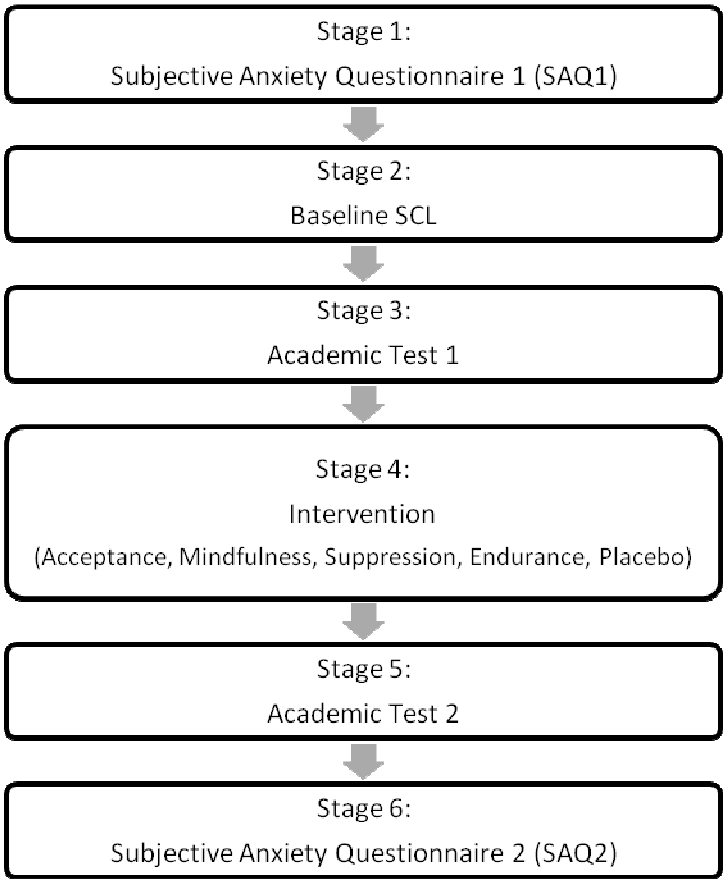


Figure 9. Experiment 3 sequence.

Procedure

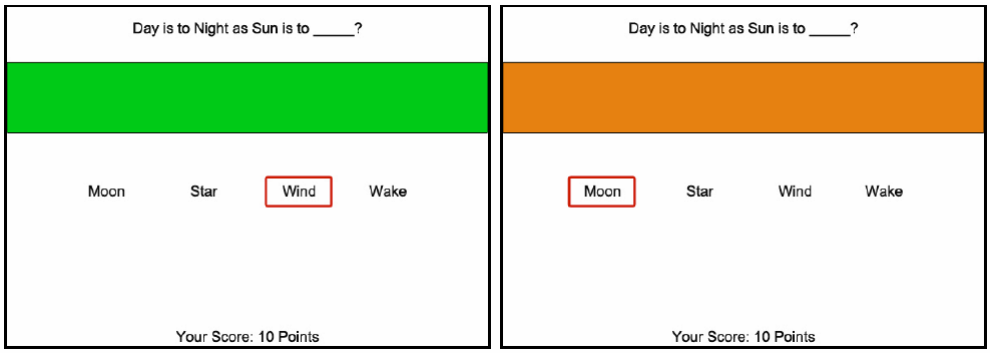
Stage 1: Subjective Anxiety Questionnaire 1 (SAQ1). At the beginning of Stage 1, participants were randomly assigned to one of six experimental conditions, of which they were unaware. Participants completed SAQ1 at the outset of the study while the experimenter remained in the observation room.

Stage 2: Baseline SCL. Stage 2 contained a 2min baseline SCL recording while the experimenter remained in the observation room.

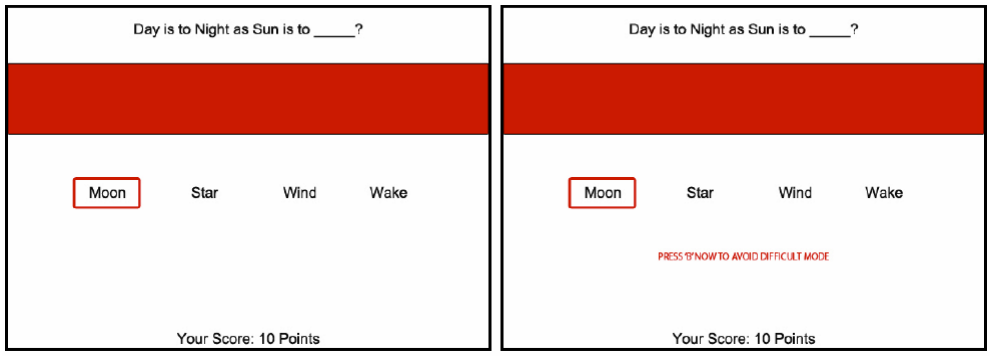
Stage 3: Academic Test 1. Stage 3 marked the beginning of the automated procedure and participants were presented with a short set of automated instructions:

> Thank you for agreeing to participate in this study.
>
> When you are ready, press the SPACE BAR to continue.
>
> For this experiment, instructions will be presented on the computer screen and through the headphones. Please read everything carefully and listen as you proceed.
>
> Each exercise in this test starts with a pair of words that are related to each other in some way. Following the first two words, you are given a third word which starts the second pair. For example:
>
> ***Big is to Large as Little is to*** _____. Your answer would be ***Small.***
>
> From the five choices in the line below, find the word that matches the third word, in the same way the second word matches the first. That is, your job is to find a word to complete the second pair. In this example, the answer would be Small. That is, Big is to Large as Little is to Small. As a college student, you should be able to score close to 250 points.
>
> You will now be presented with some automated instructions. Please pay attention and read the instructions carefully.
>
> Press SPACE BAR when you are ready to continue.

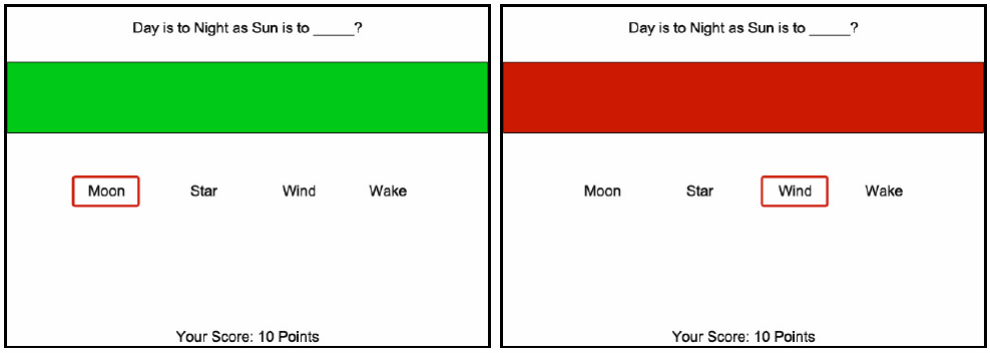
The first verbal analogy appeared on-screen automatically and all trials were identical in format. When the test began, the coloured bar across the top of the screen was green (see Figure 10a, top left) and the moving red box rotated through the four response options at a rate of one per 1000ms. Participants selected their chosen response by pressing the space bar when that response was highlighted by the red box. At this point in the test sequence, all *correct* responses increased the participant score by 10 points (displayed at bottom of screen). *Incorrect* responses resulted in the allocation of 0 points, but none were deducted.



(a) Answers rotate every 100ms (b) First warning



(c) Second warning (d) Option to suppress



(e) Suppression: Returns to normal (f) No suppression: Answers rotate every 500ms

Figure 10. The colour change sequence during the test in Experiment 3.

At random intervals of 10-20 sec across analogy trials, the warning bar changed colour from green to orange (Figure 10b, top right) and remained orange for 5sec as trials continued. After this interval, the bar then automatically changed from orange to red (Figure 10c, centre left) and after 5sec a brief automated instruction “PRESS 'B' NOW TO AVOID DIFFICULT MODE” appeared in the centre of the screen (Figure 10d, centre right). Difficult Mode referred to a forthcoming increase in the speed of highlighting the

response options from 1 per 1,000ms to 1 per 500ms (i.e. twice as fast). All participants could suppress Difficult Mode by pressing the space bar within 5sec of the instruction. As a result, the warning bar returned immediately to green and the speed of highlighting the response options continued at 1 per 1000ms (see Figure 10e, bottom left). Suppressing Difficult Mode reduced the value of correct responses to 5 points for the next three consecutive analogy trials. If participants chose not to suppress Difficult Mode, the speed of highlighting the response options was increased to 500ms (Figure 10f, bottom right) across the next three consecutive analogy trials. After the third analogy presented in Difficult Mode, the warning bar returned to green. After a random interval of 10-20sec, the colour change sequence began again. This sequence continued through the entire test.

Stage 4: Interventions. Stage 4 comprised the video interventions or Placebo.

Acceptance Intervention. Participants in the Acceptance Condition were presented with a metaphor-based intervention that centred on psychological acceptance. The primary aim of this message was to encourage participants to accept their anxiety without trying to avoid or remove it:

> I would like you to imagine that the next test you will do is a bit like trying to cross a muddy swamp. Imagine that the swamp is full of dirt, rubbish and leftovers that smell really bad and really stink. What kind of thoughts do you think are going to occur in such a situation? It's likely that thoughts such as "This is too hard. I'm not good at this. I can't do anything this unpleasant or disgusting. It's not worth the effort. It's nonsense" will all show up even if you don't want them to. The best way you could possibly cross the swamp would be to notice all those thoughts and the distress they carry with them and let them be, to notice them and make room for them while you keep crossing the swamp. It's about being open to all the thoughts that may show up and the distress associated with them, about carrying them with you while you keep doing what you were trying to do in the first place- that is crossing the swamp and reaching the shore. Notice all the thoughts that show up while you perform the test and carry them with you because you can have whatever thoughts and act differently to what you think or feel.
>
> For the next part of the study, it is important that you imagine that doing the test is a bit like trying to cross the swamp, in that there is some kind of emotional or physical discomfort that seems to be standing in the way of something you want. You should think of the thoughts that show up during the test as being like the discomfort that stands in your way.

Mindfulness Intervention. Participants in the Mindfulness Condition were presented with a metaphor-based clip that centred on mindfulness. The primary aim of this message was to encourage participants to be aware of their anxiety and focus on the current task. This advice was as follows (only text different from other conditions is included):

> The best way you could possibly cross the swamp would be to notice all those thoughts without judging them and let them pass by, before bringing your attention back to crossing the swamp. It's about observing all the thoughts that may show up. Notice that you can observe these thoughts without getting caught up in them. You can let them go and bring your attention back to what you were trying to do in the first place- that is crossing the swamp and reaching the shore. Notice all the thoughts that show up while you perform the test and be aware of them. These thoughts are separate from you and from your actions. Your actions are taking place in the present moment, while your thoughts are just thoughts.

Suppression Intervention. Participants in the Suppression Condition were presented with a metaphor-based clip that centred on suppression. The primary aim of this message was to encourage participants to watch for, and remove, any anxiety that occurred during the task (only text different from other conditions is included):

> The best way you could possibly cross the swamp would be to watch for all those thoughts and the distress they carry with them and try to stop them coming into your mind, so that you can keep crossing the swamp. It's about not letting these thoughts come up and not letting them interfere if they do come up, so that you can keep doing what you were trying to do in the first place- that is crossing the swamp and reaching the shore (in other words watch for these thoughts so that they can be avoided or removed if need be). Watch for all the thoughts that show up while you perform the test. Try to avoid or remove them, to keep them from coming back, so that these thoughts don't have an effect on your actions
> .

Endurance Intervention. Participants in the Endurance Condition were presented with a metaphor-based clip that centred on endurance. The primary aim here was to encourage participants to simply tolerate with any anxiety that occurred during the task and to continue:

> The best way you could possibly cross the swamp would be to just keep going no matter what comes up. It's about taking all the thoughts that may show up and the distress that may come with them and just putting up with them, while you keep doing what you were trying to do in the first place- that is crossing the swamp and reaching the shore (in other words trying your best, even when the test gets difficult). Notice all the thoughts

> that show up while you perform the test and try to endure them as best that you can, even when it gets difficult. You can have any thoughts about the task and endure them, because they don't have to have any effect the task.

Placebo. Participants in the Placebo Condition were presented a video clip that was matched for duration (temporal duration as opposed to exact word count) with the four previous interventions, but contained completely unrelated information as follows:

> The Eurasian badger looks rather like a small bear, and indeed when it was first described scientifically it was classified as a bear. However, the badger is not a small bear - it is in fact a big weasel! A male badger is called a boar and the female is called a sow. Young badgers are cubs. An old English name for the badger is Brock. As the badger is widely distributed across Europe and Asia, it has many other names in different languages. I have already mentioned the badger's resemblance to a small bear. One feature that immediately distinguishes the badger is its colour, particularly its face! The badger's black and white striped head is well known, and may be a form of warning colour. In Japan however, the facial stripes are often very much reduced in size. The fur on the badger's upperparts appears grey or brownish, while the fur on the throat, legs and underparts is black. The forelegs are well-developed, and the forepaws bear long, strong claws. These are adaptations for a digging way of life. As mentioned above, badgers are widely distributed across Europe and Asia. Unlike other badgers, the Eurasian badger often lives in groups. These groups can be quite large where food supplies are good.
>
> The badgers mostly have rather stocky bodies, supported by short but strong legs. The forelegs are particularly well developed in most of the badger species. The heads are rather wedge-shaped with relatively long, pointed muzzles; the eyes and the ears are small. The tails are variable in length; they are very short in the case of the stink badgers, while the tails of the ferret badgers are relatively long (around half the length of the body) and bushy.

Stage 5: Academic Test 2. Stage 5 was identical to Stage 3, but comprised a novel set of 25 verbal analogies.

Stage 6: Subjective Anxiety Questionnaire 2 (SAQ2). Stage 7 was identical to Stage 1, but was designed as a self-report index of post-intervention and post-test anxiety. Completion of the questionnaire marked the end of the experiment. At this point, the Experimenter entered the room and the participant was thanked and debriefed.

Results

Experiment 3 contained SCL and SCR data taken before, and during, the tests. Mean SCL were recorded during Baseline, Test 1 and Test 2, while the SCR data were recorded only during the tests. The current study recorded two types of SCR data. *Anticipatory arousal* was recorded during the warning sequence that preceded the increase in task difficulty. *Event arousal* was recorded during the increased difficulty events.

The general analytic strategy adopted in the current study was largely similar to that employed previously. Specifically, this involved conducting an initial one-way repeated measures ANOVA to assess differences in Baseline mean SCL among conditions. A 5x2 mixed repeated measures ANOVA was then used to check that differences between Baseline and Test 1 were similar for all conditions. A 5x2 mixed repeated measures ANCOVA, with the Baseline used as a covariate, then tested specific predictions about changes in mean SCL by condition between Test 1 and 2. Again, we examined the percentage change in SCL between the two tests and the percentage of participants in each condition who showed increases or decreases in anxiety. Unlike Experiment 2 however, the SCR data were examined here for changes in anticipatory and event arousal, rather than assessing habituation patterns. Again, the data from SAQ 1 and 2 were also analysed. The data from the various aspects of Experiment 3 are presented separately below.

It is important to note a difference between Experiment 3 and previous studies. Experiments 1 and 2 both contained a Baseline and a single Test Phase, with interventions occurring in-between. In contrast, Experiment 3 contains a Baseline and two Test Phases: one pre-intervention (Test 1) and one post-intervention (Test 2). Therefore, while the difference between Baseline and Test was a focus of Experiments 1 and 2, it is measured

in Experiment 3 only to ensure that all conditions were similarly affected by the test. The primary focus of Experiment 3 is the difference in arousal between Test 1 and Test 2.

SCL Analyses

Mean SCL. A one-way ANOVA indicated no significant differences among the conditions at Baseline ($p = .997$). The SCL data were collated by condition and the three critical time points (Baseline, Test 1 and Test 2) and the means are provided in Figure 11. All conditions showed increased anxiety from Baseline-Test 1. The increases for Acceptance and Mindfulness were relatively small (0.92 and 0.94 $\mu S/cm^2$, respectively) and were slightly larger for Suppression and Endurance (1.5 and 1.3 $\mu S/cm^2$, respectively).

The largest increase was recorded for Placebo (1.7 μS), although the differences across conditions were indeed minor. A 5x2 mixed repeated measures ANOVA, with condition as the between-participant variable and time point (Baseline and Test 1) as the within-participant variable indicated a highly significant effect for time ($F (1, 78) = 165$, $p = .000$), but not for condition, with no interaction effect ($p = .999$). Hence, the first academic test was associated with significantly increased anxiety, but the conditions did not differ in this regard.

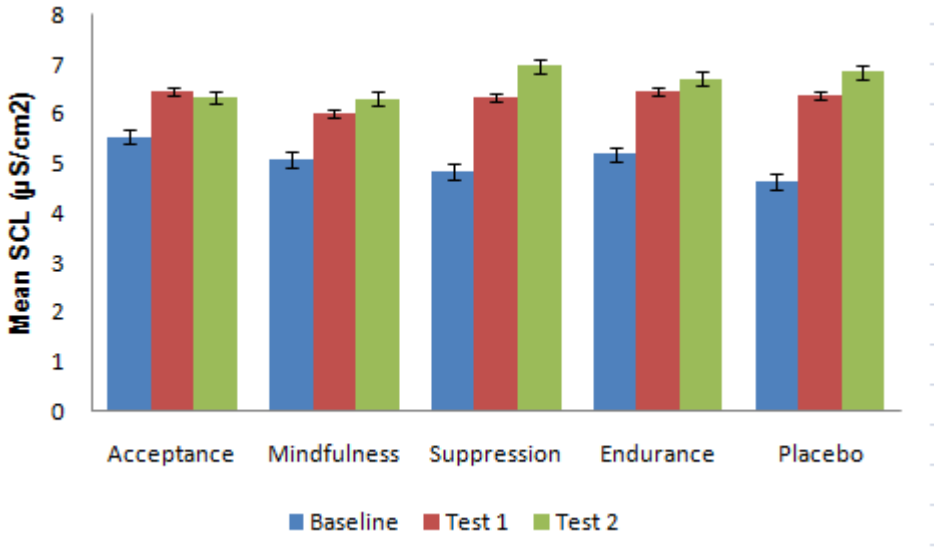


Figure 11. Mean SCL by condition at the three critical time points in Experiment 3.

Four of the conditions showed minor increases in anxiety between Tests 1 and 2 (i.e. pre- to post-intervention, range of 0.258 to 0.618 µS/cm^2.). Acceptance decreased anxiety only noticeably by 0.125 µS/cm^2. A 5x2 mixed repeated measures ANCOVA, with baseline as a covariate, condition as the between-participant variable and time point (Test 1 and Test 2) as the within-participant variable indicated a significant main effect for condition ($F(4, 78) = 3.04$, $p = .02$). Pairwise comparisons revealed significant differences for: Acceptance vs. Placebo ($p = .003$); Mindfulness vs. Placebo ($p = .03$); and Acceptance vs. Suppression ($p = .016$).

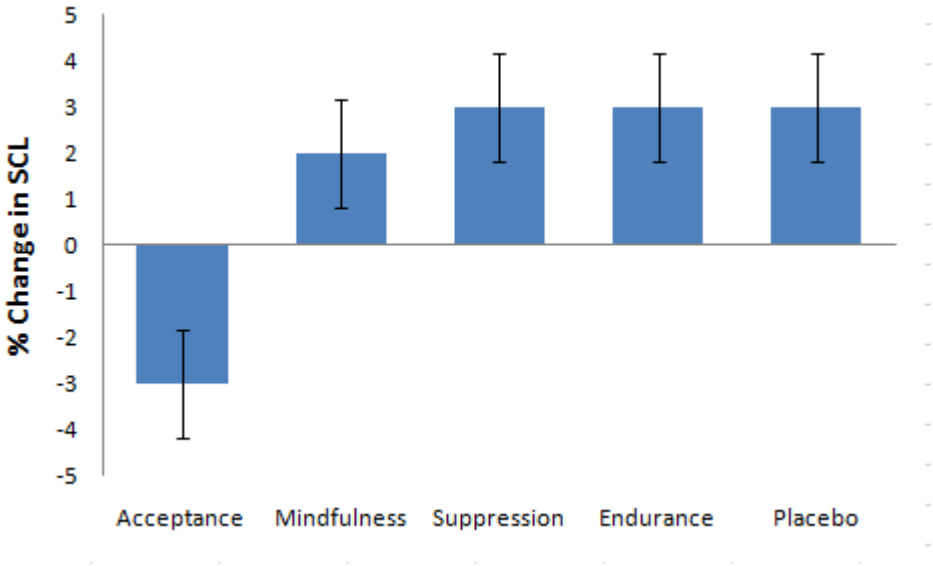


Figure 12: Percentage change in mean SCL by condition between tests 1 and 2 in Experiment 3.

Percentage Change. Analysis of the percentage change in mean SCL from Tests 1-2 indicated that four of the conditions showed increased anxiety (see Figure 12). Suppression, Endurance and Placebo increased by around 3%, while Mindfulness increased by 2%. In contrast, Acceptance showed decreased anxiety of around 3%.

Percentage of Participants. Individual participant mean SCL was analysed to assess the consistency of response patterns in terms of the numbers of participants who showed increased or decreased anxiety across Tests 1 and 2 (see Table 5). The majority of participants in four of the conditions showed increased anxiety: Suppression (94%), Mindfulness (80%), Endurance (77%) and Placebo (65%). In contrast, the majority of participants in Acceptance (59%) showed decreased anxiety.

Table 5

Percentage of Participants by Condition Who Increased or Decreased in Mean SCL across Tests 1 and 2 in Experiment 3

	Acceptance	**Mindfulness**	**Suppression**	**Endurance**	**Placebo**
Decreased (%)	59	20	6	23	35
Increased (%)	41	80	94	77	65

SCR Analyses

Anticipatory Arousal: *Mean SCR.* The mean SCR data for anticipatory arousal were collated by condition and time (Test 1-2, see Figure 13). Mindfulness, Suppression and Placebo showed similarly decreased anticipatory arousal between Test 1 and 2 (0.03, 0.08 and 0.08 μS/cm^2, respectively). In contrast, both Acceptance and Endurance showed increased anticipatory arousal (0.15 and 0.25 μS/cm^2, respectively).

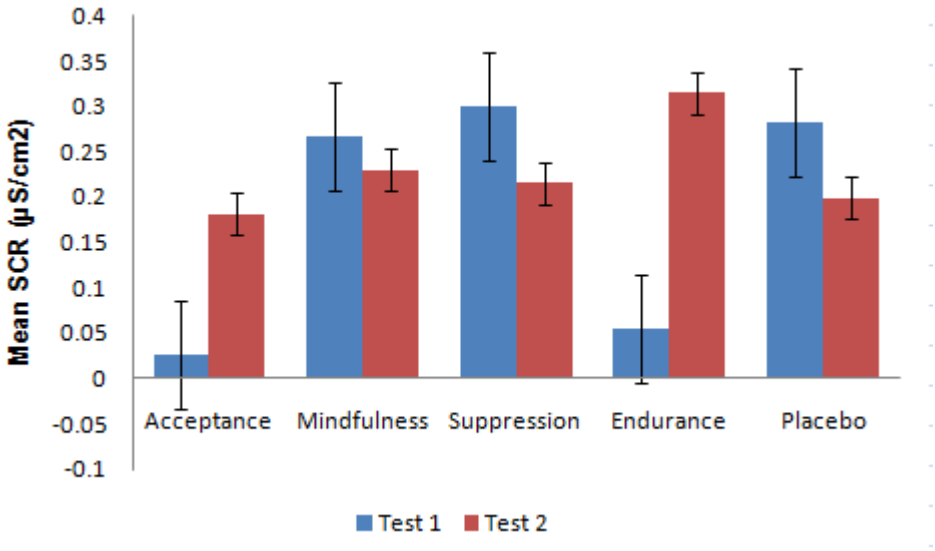


Figure 13. Mean anticipatory arousal across tests 1 and 2 by condition in Experiment 3.

Anticipatory Arousal: ***Percentage of Participants.*** These data showed some mixed patterns of responding (see Table 6). In Acceptance (53%) and Endurance (54%), just over half of participants showed increased anticipatory arousal. In Placebo, 53% showed decreased arousal. In both Mindfulness (74%) and Suppression (65%), the majority of participants showed decreased arousal.

Table 6

Percentage of Participants by Condition Who Increased or Decreased in Mean Anticipatory Arousal across Tests 1 and 2 in Experiment 3

	Acceptance	**Mindfulness**	**Suppression**	**Endurance**	**Placebo**
Decreased (%)	47	74	65	46	53
Increased (%)	53	26	35	54	45

Event Arousal: ***Mean SCR.*** Participants in all conditions displayed increased mean event arousal between Tests 1 and 2 (see Figure 14). For Acceptance and Placebo, these increases were very small (.008 $\mu S/cm^2$ for both). However, the increases for the three remaining conditions were sizeable: (Mindfulness (.14 $\mu S/cm^2$), Suppression (.18 $\mu S/cm^2$) and Endurance (.17 $\mu S/cm^2$).

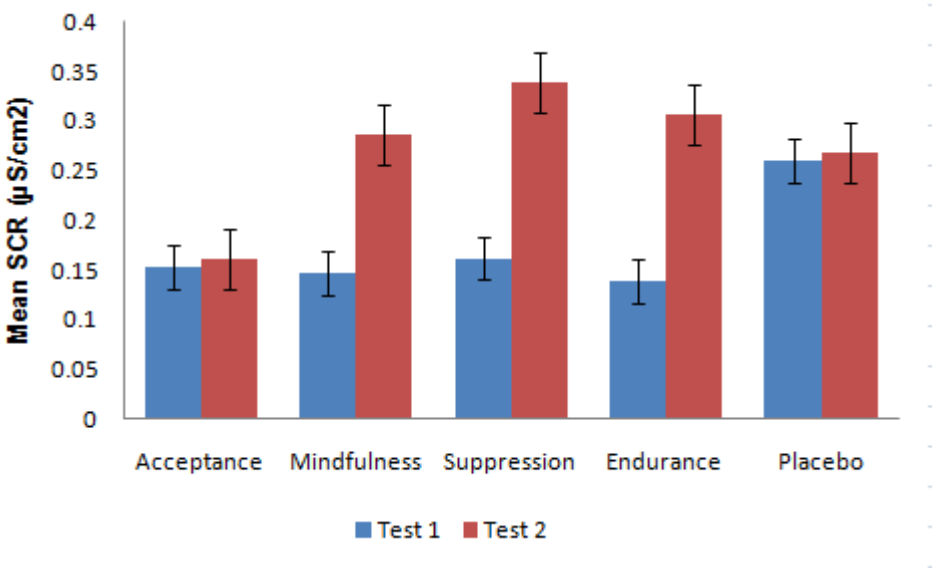


Figure 14. Mean event arousal across tests 1 and 2 by condition in Experiment 3.

Event Arousal: ***Percentage of Participants.*** In Suppression and Endurance over 60% of participants showed increased event arousal (65% and 62%, respectively, see Table 7). In contrast, 59% of participants in Acceptance showed decreased arousal, as did 53% of Mindfulness and 53% of Placebo.

Table 7

Percentage of Participants by Condition who Increased or Decreased Mean Event Arousal across Tests 1 and 2 in Experiment 3

	Acceptance	**Mindfulness**	**Suppression**	**Endurance**	**Placebo**
Decreased (%)	59	53	35	38	53
Increased (%)	41	47	65	62	47

Subjective Anxiety Ratings

The subjective ratings showed a decrease in subjective relaxation and an increase in subjective anxiety for all conditions (see Table 8). Two 5x2 mixed repeated-measures ANOVAs (one per sub-scale) showed a significant effect for time on both relaxation ($F(1, 78) = 22.7$, $p = .00$) and anxiety ($F(1, 78) = 40.565$, $p = .00$). Neither condition nor interaction effects were significant (all p's > .261).

Table 8

Mean Subjective Levels of Relaxation and Anxiety on SAQ 1 and 2 Pre- and Post-Experiment in Experiment 3

	Acceptance	**Mindfulness**	**Suppression**	**Endurance**	**Placebo**
SAQ1 Relaxation	25.17	26.38	27	26	24.76
SAQ2 Relaxation	22.52	22.88	25.94	24.30	23
SAQ1 Anxiety	14.82	11.94	12.22	12.38	12.17
SAQ2 Anxiety	17.35	16	15.61	14.76	15.41

Results Summary

Mean SCL increased for all conditions from Baseline-Test 1. In short, the test once again significantly increased physiological anxiety, but the conditions did not differ significantly in this regard. Mean SCL increased further between Tests 1 and 2 (i.e. pre- to post-intervention) for four conditions, excluding Acceptance, for whom it decreased marginally. When Tests 1 and 2 were analysed statistically using an ANCOVA, condition proved to be significant and Acceptance differed significantly from both Placebo and Suppression. Mindfulness also differed significantly from Placebo. The analysis of the

percentage change in mean SCL from Tests 1-2 confirmed that all conditions, except Acceptance, showed increased anxiety, although the percentage changes were small. The individual participant data from Tests 1-2 confirmed that the majority of participants in the same four conditions showed increased anxiety, while the majority of participants in Acceptance decreased. Analyses of the anticipatory arousal data for Tests 1-2 indicated that Mindfulness, Suppression and Placebo decreased, while Acceptance and Endurance increased. The percentage of participants data confirmed that these arousal patterns were consistent within conditions. On event arousal, all participants increased, with the largest recorded on Mindfulness, Suppression and Endurance. Interestingly, the majority of participants in both Endurance and Suppression increased, while just over half of Acceptance, Mindfulness and Placebo decreased. On the SAQs, relaxation decreased significantly while anxiety increased significantly, but the conditions did not differ in either regard.

The results from Experiment 3 confirmed some of our predictions. First, we predicted that Suppression and Placebo would be less effective at reducing anxiety than Mindfulness and Acceptance and indeed Acceptance showed decreased physiological anxiety from Test 1 to Test 2 and Mindfulness showed significantly smaller increases than Placebo. We also predicted that similarity across outcomes for Mindfulness or Acceptance vs. Endurance might indicate that participants in either of the former were actually interpreting the strategy incorrectly as simple endurance. The results indicate some similarity between Mindfulness and Acceptance, given that both were significantly more effective than Placebo; however, Endurance did not have similar outcomes.

We had no clear predictions about differences across conditions in terms *Anticipatory Arousal* responses during the test, since no measurement was taken in response to the warnings in Experiment 2. In the current study, Acceptance and Endurance

were associated with increases from pre- to post-intervention, while the other conditions decreased.

Event Arousal, however, was the same type of response that was measured at the time of the image presentations in Experiment 2 (i.e. response to the presentation of a stimulus). Given the results of Experiment 2, it seemed likely that Suppression, at least, would show greater increases from pre- to post-intervention here than Acceptance and indeed, this was the case. Acceptance and Placebo showed small pre- to post-intervention increases, with Suppression showing the largest increase, followed by Endurance and Mindfulness.

Discussion

The results of Experiment 3 were the first evidence of significant anxiety decreases for Acceptance, suggesting that the intervention was more effective than the previously-used instructions. It was counter to our initial predictions that the Acceptance Intervention was associated with *increased* anticipatory arousal, while arousal in response to the events themselves decreased, especially when anticipatory arousal in Suppression decreased. However, in hindsight, these outcomes may be regarded as consistent with the rationale behind acceptance. Specifically, participants using an acceptance strategy need to make psychological contact with events that are about to occur. In contrast, for suppression the expectation is that all arousal that occurs will simply be removed. As a consequence, participants in Acceptance may have experienced some form of habituation to the event when it did occur, whereas in Suppression, arousal in response to an event is not only surprising, but then requires continuous effort to try to suppress it. In Experiment 4, we attempted to examine this issue of expectation further. In order to do so, we altered features of the interventions, in particular, in order to convince participants that the designated strategies had proven efficacy.

Chapter 5
Experiment 4

Examining the Effects of Expectation on Anxiety

Chapter 5
Experiment 4

Examining the Effects of Expectation on Anxiety

One of the contributing factors to paradoxical relaxation effects is the expectation that relaxation techniques should work (Wenzlaff and Wegner, 2000). In other words, the very use of relaxation techniques may create the expectation that any form of arousal (e.g. anxiety) should decrease or cease entirely. According to Wenzlaff and Wegner (2000) "the most important meta-cognition underlying thought suppression, of course, is the belief that suppression could succeed" (p. 68). Indeed, Wegner (1994) argued that if a stimulus is not expected to reappear, then the physiological response to it will remain at a high level. Expectation, therefore, is an important part of habituation (Sharpless & Herbert, 1956). The results of Experiments 2 and 3 in the current thesis provide some evidence in support of this view.

From this perspective, expectation may be a core feature of suppression and may also be conceptualised as the antithesis of passivity. In short, individuals employing a suppression strategy may not expect to feel anxious, while individuals employing acceptance would expect to feel anxious. As a result, the level of efficacy of either technique may be influenced indirectly by the level of participant expectation (Lehrer et al, 2007). The primary aim of Experiment 4 was to examine the effects of expectation on the efficacy of the previously employed interventions.

In spite of the positive outcomes associated with the Acceptance Intervention employed in Experiment 3, the current study comprised some modifications to the strategies. In short, we presently condensed the interventions in order to highlight more explicitly the putative role of expectation. In other words, rather than receiving lengthy interventions, the strategies were re-formulated as strategy-based rules. Several previous

studies have compared the efficacy of strategies when presented as interventions vs. rules and frequently reported that the former are more effective (McMullen, Barnes-Holmes. Barnes-Holmes, Stewart, Luciano et al., 2007). However, the latter were employed here specifically for the purposes of highlighting the possible influence of expectation.

Method

Participants

A non-clinical sample of 95 adults, consisting of 40 males and 55 females (mean age of 23 years and 3 months), participated in Experiment 4. Participants were recruited in the same manner as previous experiments. Each participant was randomly assigned to one of five experimental conditions (i.e. 19 per condition, Acceptance, Mindfulness, Suppression, Endurance and Placebo).

Experimental Setting, Ethical Issues, Apparatus, Materials and Procedure

The setting of Experiment 4 was identical to previous experiments. There were no additional ethical concerns specific to the current study. The apparatus and materials were largely identical to Experiment 3, with the exception of changes to the content of the interventions. The procedure was identical to Experiment 3.

Interventions. Experiment 4 contained four intervention video clips (Acceptance, Mindfulness, Suppression and Endurance), all designed to offer participants strategies for dealing with potential anxiety that resulted from the academic test. The primary difference between the current and previous interventions in that those employed currently all stated explicitly that the target strategy had proven efficacy. As such, the clips were explicitly designed to create participant expectations that the strategy presented in them would help them deal with their task-induced anxiety. Once again, a matched placebo video about wildlife was also employed. All clips were approx. 55sec in length and contained the same presenter as before.

Acceptance Intervention. Participants in the Acceptance Condition were presented with a message that encouraged them to accept their anxiety without trying to avoid or remove it.

> Research has shown that the best way to do well in this task is simply to accept that the task will get harder no matter what you do. In other words, simply accept that the task is going to get harder at times. If you have any thoughts or feelings about this, carry them with you while you continue with the task, scoring as many points as possible.

Mindfulness Intervention. Participants in the Mindfulness Condition were presented with a message that encouraged them to be aware of their anxiety and focus on the current task:

> Research has shown that the best way to do well in this task is simply to be aware that the task will get harder no matter what you do. In other words, simply observe that the task is going to get harder at times. If you have any thoughts or feelings about this, notice them while you continue to focus your attention on the task, scoring as many points as possible.

Suppression Intervention. Participants in the Suppression Condition were presented with a message that encouraged them to suppress their anxiety during the task:

> Research has shown that the best way to do well in the task is to watch out for thoughts and feelings that might make it even more difficult. In other words, the task is going to get harder at times, so you will have thoughts and feelings about this. Try to avoid these thoughts from happening and remove them if they do, while you to continue with the tasks and score as many points as possible.

Endurance Intervention. Participants in the Endurance Condition were presented with a message that encouraged them to endure any anxiety that occurred during the task:

> Research has shown that the best way to do well in this task, even when it gets harder, is to simply to endure the task no matter what. In other words, simply endure the task, even when it gets harder. If you have any thoughts or feelings about the task, simply put up with them while you continue the task, scoring as many points as possible.

Placebo Clip. Participants in the Placebo Condition were presented with a video that was matched for duration with the previous interventions, but contained completely unrelated information as follows:

The Eurasian badger looks rather like a small bear, and indeed when it was first described scientifically it was classified as a bear. However, the badger is not a small bear - it is in fact a big weasel! A male badger is called a boar and the female is called a sow. Young badgers are cubs. An old English name for the badger is Brock.

Results

The data collection and general analytic strategy used in Experiment 4 were identical to Experiment 3. The data from the various aspects of Experiment 4 are presented separately below.

SCL Analyses

Mean SCL. The SCL data were collated by condition and time and the means are provided in Figure 15. All conditions showed small increases in anxiety between Baseline and Test 1 (range 0.8 to 1.3 µS/cm2). A one-way ANOVA found no significant difference in baseline levels between conditions ($F(4, 91) = 0.977$, $p = .424$). A 5x2 mixed repeated measures ANOVA assessed differences between Baseline and Test 1 and found a highly significant effect for time ($F(1, 91) = 160$, $p = .000$), but not for condition and the interaction effect was non-significant (both p's > .486). Hence, the test was associated with significantly increased anxiety, but the conditions did not differ in this regard.

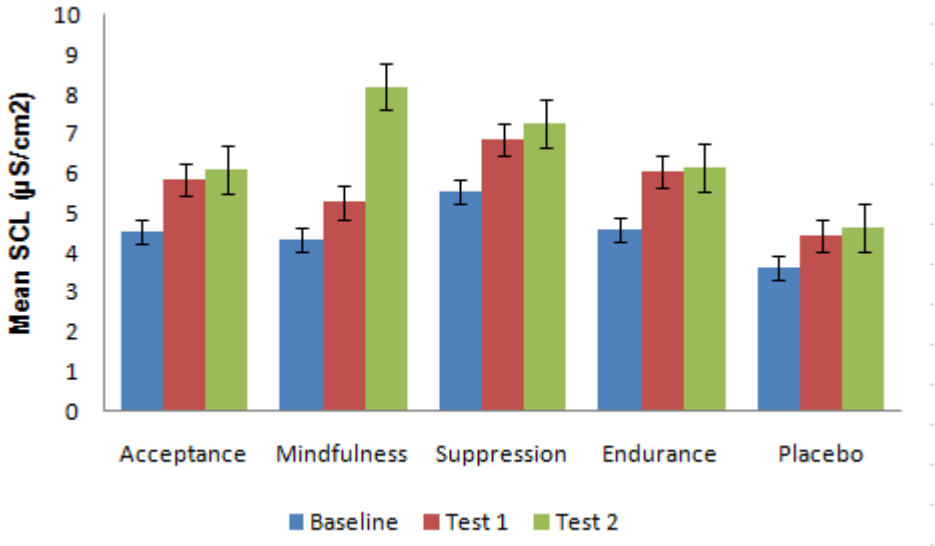


Figure 15. Mean SCL by condition at the three critical time points in Experiment 4.

All conditions displayed increased SCL between Tests 1 and 2. This increase was small for four conditions (range 0.07 to 0.2 μS/cm^2), but was considerably larger for Mindfulness (2.9μS/cm^2). A 5x2 mixed repeated measures ANCOVA, with baseline as a covariate, condition as the between-participant variable and time point (Test 1 and Test 2) as the within-participant variable indicated a significant effect for time ($F(1, 90) = 4.823$, $p = .031$), but not condition with no interaction effect (both p's > .906). It should be noted that there was a violation of Box's Test of Equality of Covariance Matrices. However, the F test is considered to be robust even when there are departures from this assumption and as a result, the violation was ignored. In short, anxiety also increased significantly pre- to post-intervention, but the conditions did not differ significantly in this regard.

Percentage Change. The percentage change in mean SCL data were compared for Test 1 to Test 2 (see Figure 16). Four conditions showed increased anxiety ranging from 1% (Endurance) to 7% (Mindfulness), while Placebo Condition showed a slight decrease (-0.2%).

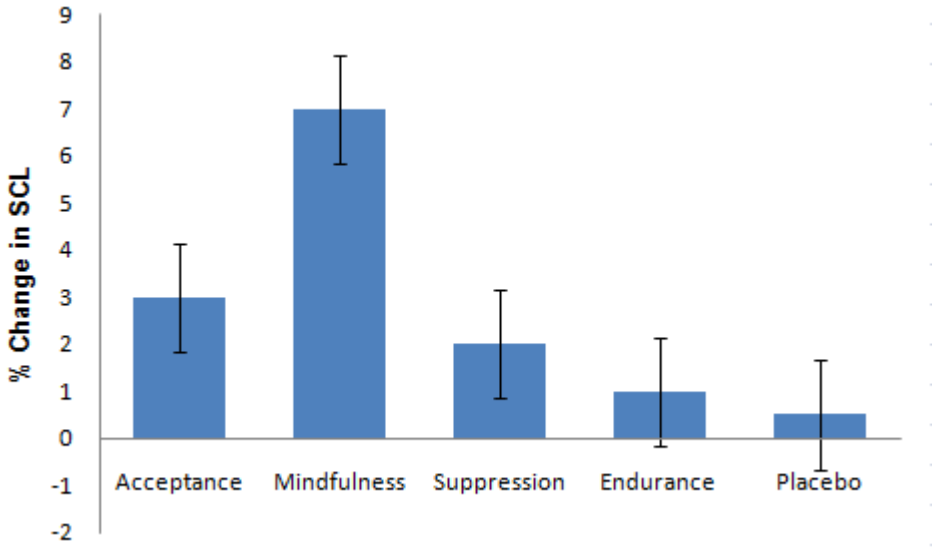


Figure 16. Percentage change in mean SCL by condition from pre- to post-intervention in Experiment 4.

Percentage of Participants. The majority of participants in all conditions showed increased anxiety in mean SCL from Test 1 to Test 2 (see Table 9). This level of consistency ranged from 56% in Endurance to 85% in Acceptance.

Table 9

Percentage of Participants in Each condition Who Increased or Decreased Mean SCL Across Tests 1 and 2 in Experiment 4

	Acceptance	**Mindfulness**	**Suppression**	**Endurance**	**Placebo**
Decreased (%)	15	35	17	44	38
Increased (%)	85	65	83	56	62

SCR Analyses

Anticipatory Arousal: *Mean SCR.* Acceptance, Mindfulness and Endurance displayed increased mean anticipatory SCR from Test 1 to Test 2 (0.06, 0.04 and 0.16 μS/cm^2, see Figure 17), while Suppression and Placebo decreased (0.03 and 0.14 μS/cm^2).

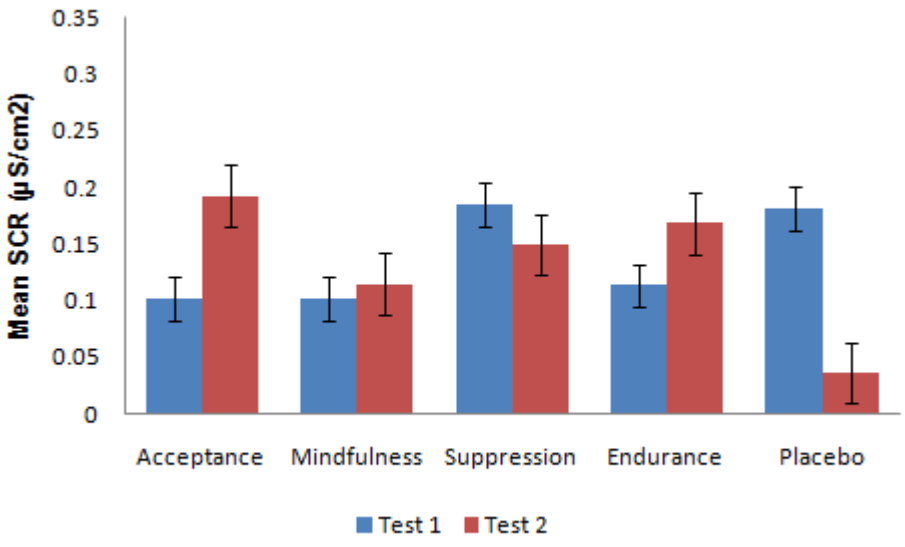


Figure 17. Mean anticipatory arousal across tests 1 and 2 by condition in Experiment 4.

Anticipatory Arousal: ***Percentage of Participants***. These data showed some mixed patterns of responding (see Table 10). In Suppression, the majority (65%) of participants increased. For Acceptance, Mindfulness and Endurance, responding was almost split in half. In contrast, the large majority of participants in Placebo (78%) decreased.

Table 10

Percentage of Participants by Condition who Increased or Decreased in Mean Anticipatory Arousal across Tests 1 and 2 in Experiment 4

	Acceptance	**Mindfulness**	**Suppression**	**Endurance**	**Placebo**
Decreased (%)	48	50	35	50	78
Increased (%)	52	50	65	50	22

Event Arousal: ***Mean SCR.*** Participants in four conditions displayed increased mean event arousal from pre- to post-intervention (see Figure 18). This increase ranged from 0.01 µS/cm^2 for Placebo to 0.1 µS/cm^2 for Endurance. Suppression decreased by an average of 0.05 µS/cm^2.

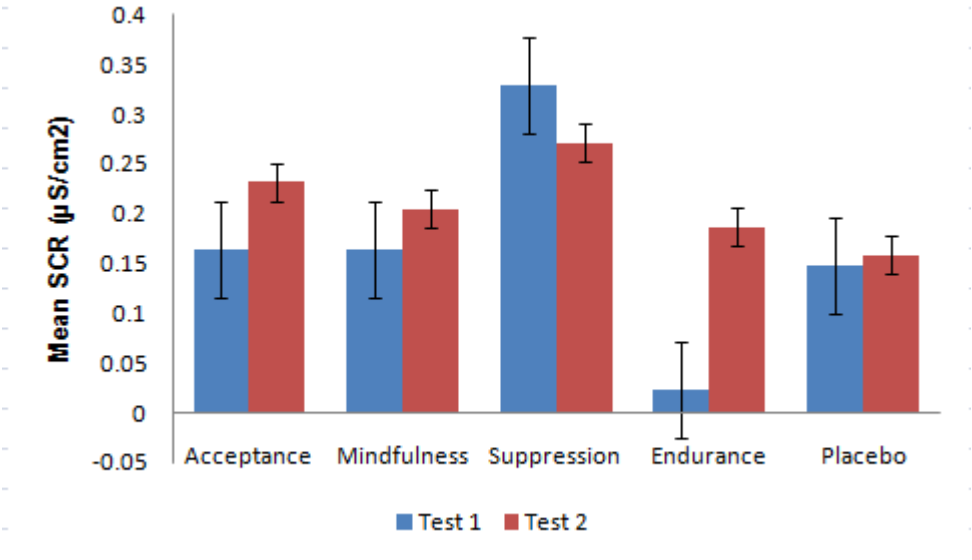


Figure 18. Mean event arousal across tests 1 and 2 by condition in Experiment 4.

Event Arousal: ***Percentage of Participants***. These data showed mixed patterns of responding (see Table 11). Just over half of participants in Acceptance (59%) and Placebo (56%) showed increased event arousal, while similar numbers showed decreases in Suppression (59%) and Endurance (56%). Mindfulness was the most consistent with 67% of participants showing decreased arousal.

Table 11

Percentage of Participants by Condition who Increased or Decreased in Mean Event Arousal across Tests 1 and 2 in Experiment 4

	Acceptance	**Mindfulness**	**Suppression**	**Endurance**	**Placebo**
Decreased (%)	41	67	59	56	44
Increased (%)	59	33	41	44	56

Subjective Anxiety Ratings

The SAQ data showed a decrease in subjective relaxation and an increase in subjective anxiety pre- and post-experiment for all conditions (see Table 12). Two 5x2 mixed repeated-measures ANOVAs (one per sub-scale) showed a significant effect for time on both relaxation ($F(1, 91) = 8.24$, $p = .005$) and anxiety ($F(1, 91) = 24.41$, $p = .00$). Interestingly, condition was not significant on relaxation ($p = .462$), but was on anxiety ($F(4, 91) = 2.5$, $p = .044$). All interaction effects were non-significant (P's > .417). Post-hoc comparisons indicated a significant difference between Placebo and Endurance ($p = .039$).

Table 12

Mean Subjective Levels of Relaxation and Anxiety on SAQ 1 and 2 Pre- and Post-Experiment in Experiment 4

	Acceptance	**Mindfulness**	**Suppression**	**Endurance**	**Placebo**
SAQ1 Relaxation	25.30	26.23	25.94	24.83	27.22
SAQ2 Relaxation	24.61	25.41	22.82	24.55	26.27
SAQ1 Anxiety	13.26	11.88	12.11	14.27	10.05
SAQ2 Anxiety	15.07	14.29	15.94	15.44	11.77

Results Summary

Mean SCL increased significantly from Baseline-Test 1, but the conditions did not differ from one another. Mean SCL also increased significantly between Tests 1 and 2 (i.e. post-intervention). Although Mindfulness showed the largest increase, the conditions did not differ significantly. The analysis of the percentage change in mean SCL from Tests 1-2 confirmed that all conditions, except Placebo, showed increased anxiety, although the percentage changes were small. The percentage of participant data confirmed that the majority of participants in all conditions showed increased anxiety. Analyses of the anticipatory arousal data for Tests 1-2 indicated that Mindfulness, Acceptance and Endurance increased, while Placebo and Suppression decreased. The percentage of participants data were mixed, with Acceptance, Mindfulness and Endurance almost split in half, while the majority of participants in Suppression increased and the majority in Placebo decreased. On event arousal, all conditions, except Suppression, increased. Once again, the response patterns were mixed. Just over half of Acceptance and Placebo increased, while just over half of Suppression and Endurance decreased. The majority of Mindfulness decreased. On the SAQs, relaxation decreased significantly while anxiety

increased significantly. Condition was significant on the anxiety sub-scale, with a significant difference recorded for Placebo vs. Endurance.

The results from Experiment 4 confirmed some of our predictions. First, we predicted that the procedural emphasis on expectation would alter the effects of the interventions. Indeed, the previously positive outcomes associated with Acceptance were reduced. However, we predicted that Suppression would show the largest increase in arousal, when in fact Mindfulness did. Differences between anticipatory and event arousal were observed; however, patterns were different from those recorded in the previous study. Given that no significant differences were observed between conditions, we failed to confirm our hypotheses regarding the effects of expectation.

Discussion

The results of Experiment 4 showed that previously established outcomes associated with Suppression and Acceptance were altered by the introduction of expectation. Although there were no significant differences among conditions on any of the physiological measures, there are some notable findings. The largest increases in mean SCL were observed for Mindfulness and Acceptance, both believed to be functionally incompatible with the expectation of decreased arousal in relaxation. In contrast, Suppression showed a comparatively lower increase in SCL. This difference also occurred in anticipatory and event arousal. Both Acceptance and Mindfulness showed increased SCRs from pre- to post-intervention, while Suppression decreased. This outcome is not consistent with previous research on suppression, which suggests that expectations should add to the overall ironic effect.

Chapter 6
Experimental Comparisons

Chapter 6
Experimental Comparisons
(Experiments 1-4)

The four preceding experiments collected a great deal of information from participants (n=255) including, physiological, self-report and avoidance measures. Although a wide range of analyses were conducted on these measures for each experiment, it is only through systematic comparison of the data that one can begin to form a complete picture of how the aims of the research were addressed. The primary aim of the current chapter is to compare the outcomes associated with the various experimental manipulations across studies. The dependent measures on which these outcomes were assessed include: skin conductance level; skin conductance response/habituation; subjective anxiety ratings and avoidance responses.

Skin Conductance Level (SCL)

The primary dependent variable across all four studies was physiological anxiety, defined as the change in participants' mean SCL. The key time points incorporated in these analyses were between the Baseline, Test and Post-Test (Experiment 1); Baseline-Test (Experiment 2) or Pre- to Post-intervention (i.e. Tests 1-2, Experiments 3 and 4). In each of the four studies, there were no significant differences in Baseline levels of mean SCL across conditions. As a result, pre-experimental individual or between-group differences could not account for any differential outcomes observed subsequently.

The Impact of *Acceptance.* In Experiment 1, the Placebo Training+Acceptance condition was the most effective at minimising levels of physiological anxiety induced by the academic tasks. Specifically, this condition showed the smallest percentage increase in mean SCL from Baseline-Test, the largest decrease from Test-Post-test and the smallest increase overall from Baseline-Post-test. This finding was supported by the result that 90%

of participants in Acceptance decreased from Test-Post-test, although indeed, 80% of these participants increased overall from Baseline-Post-test. Interestingly, PMR Training+Acceptance showed the largest percentage increase from Baseline-Test, the smallest decrease from Test-Post-test and the largest overall increase from Baseline-Post-test. Although the study recorded no significant differences for condition, these two findings suggest that the impact of the acceptance-based component was modified in some way by the training component that preceded it. In short, the PMR Training appeared to undermine the potential benefits of the acceptance instruction in a manner that did not occur with the Placebo Training. As a result, one might argue that the PMR Training contained potentially avoidant or suppressing connotations that were the opposite of the acceptance-based message. This possible view of PMR as a form of relaxation is consistent with arguments articulated in Chapter 1 and other researchers have emphasised the importance of internal consistency among clinical components within an intervention (Kehoe, 2008).

More positive anxiety outcomes were recorded with the stand-alone Acceptance Intervention employed in Experiment 3. In this study, Acceptance was the only condition associated with a decrease in mean SCL from Pre- to Post-intervention. Indeed, this outcome differed significantly from both Suppression and Placebo. In short, the Acceptance Intervention here reduced anxiety significantly more than both Suppression and Placebo.

Perhaps the worst outcome for acceptance was recorded in Experiment 4, where expectation was emphasised and the intervention was condensed to a brief rule-based instruction. In these data, all conditions, including Acceptance, were associated with increased mean SCL from Test 1 to 2 and the percentage change data for the same period showed a 3% increase for Acceptance. Again, just over half of participants in Acceptance

showed increased mean SCL. Relative to the previous studies, especially Experiment 3, these findings suggest that the positive benefits associated previously with acceptance were reduced by the condensing of the intervention and/or the procedural emphasis on expectation.

The Impact of *Suppression*. In Experiment 1, the outcomes recorded for the Suppression Instruction did not differ greatly from the other conditions, including Acceptance. That is, Suppression was associated with increased mean SCL from Baseline-Test, decreases from Test-Post-test and increases overall from Baseline-Post-test. At all three time period comparisons for both mean SCL and percentage change SCL, the combination of Suppression with PMR or Placebo Training appeared to have little impact as the two conditions were largely indecipherable at all times. Once again, these outcomes were supported by the percentage of participants data.

Experiment 2 offered perhaps the most critical analysis of the impact of suppression and in this study Suppression differed considerably from Control. Specifically, in mean SCL from Baseline-Test, Suppression showed increased anxiety, Control decreased. The analyses indicated that this change was significant. This outcome was supported by the percentage change data which indicated that the increase in mean SCL for Suppression was in the region of 30%. Furthermore, two thirds of these participants responded in this way. In Experiment 3, the Suppression Intervention group showed an increase in mean SCL from Test 1-2. Indeed, this group showed significantly more anxiety than Acceptance with 94% of participants displaying increased arousal. In Experiment 4, the addition of expectation along with the condensing of the interventions all but eliminated potential differences among conditions. Taken together, these findings at the least suggest that suppression is not an effective means of reducing physiological anxiety in an experimental academic task environment.

The Impact of the *Other Interventions.* All experiments contained some element of control or placebo and Experiments 1, 3 and 4 included a number of additional strategy-based groups. Specifically, Experiment 1 incorporated PMR Training and Experiments 3 and 4 included Mindfulness and Endurance Conditions.

In all cases, the Placebo Conditions, controlled for time, served in the experiment matched against the other active conditions. Experiment 1 contained two placebo components, one balanced against PMR Training and other against the strategy instructions. The results indicated that Placebo+Placebo showed the largest increase in mean SCL from Baseline-Test. The remaining PMR Training+Placebo, Placebo+Suppression and Placebo+Acceptance performed in a largely similar manner on the mean SCL data. On the percentage change in mean SCL, Placebo+Acceptance was notably different. This condition was associated with the smallest increase from Baseline-Test, the largest decrease from Test-Post-Test and the smallest increase overall from Baseline-Post-test, but again none of these differences were significant. However, as noted previously, this outcome may reflect a greater influence of the Acceptance than placebo component. The only other noteworthy placebo result indicated that while 90% of participants in other conditions showed decreased mean SCL from Test-Post-test, this figure was 70% in PMR+Placebo.

In Experiment 2, the Control condition differed from Suppression only in that participants were not explicitly instructed to suppress the visual stimulus. As a result, it was not designed to function in a manner that was similar to the placebos elsewhere, which were *inactive* conditions. Placebo conditions were also incorporated into Experiments 3 and 4; outcomes for Experiment 3 were largely consistent with Experiment 1. Specifically, both Acceptance and Mindfulness were both significantly better at minimising increases in mean SCL than Placebo. Placebo increased mean SCL by an average of 3% and 65% of

this group performed in this way. In contrast, although the Placebo group in Experiment 4 performed overall in a manner similar to the other conditions, this was the only group whose percentage change in mean SCL showed a decrease (although it was very small). Taken together therefore, the Placebo outcomes across studies suggest that the target content functioned well as a Placebo and that this had little role in minimising task-induced SCL anxiety.

Experiments 3 and 4 both included Mindfulness conditions to try to distinguish between the topographically similar acceptance and mindfulness components. In Experiment 3, the Mindfulness Intervention showed the second lowest increase in anxiety and differed significantly from Placebo. However, on the percentage change data Mindfulness was associated with a 2% increase in mean SCL between Tests 1 and 2 and 80% of the group responded in this way. The Mindfulness outcomes in Experiment 4 were even poorer. That is, Mindfulness showed the largest increase in mean SCL between Tests 1 and 2, as well as the largest percentage increase (7%) and 65% of participants responded in this way. As a result, Mindfulness outcomes differed considerably from Acceptance, particularly in Experiment 3.

Given the likelihood that our participants would not be proficient users of acceptance, there remained the possibility that in either Mindfulness or Acceptance Conditions, participants were simply *tolerating* their anxiety, rather than actually accepting it. Endurance interventions were included in Experiments 3 and 4. In Experiment 3, the Endurance condition performed comparably to the other conditions, except Acceptance, showing increased arousal. A similar pattern was recorded in Experiment 4. Taken together, the concordance of the Endurance outcomes with other conditions, except Acceptance in Experiment 3, suggested the possibility that many participants were in fact employing a tolerance-based strategy. In our experimental aims, we were particularly

concerned with distinguishing Endurance from both Acceptance and Mindfulness given the possibility that participants may have misinterpreted acceptance for tolerance. The Endurance outcomes suggested that this was less likely to be the case for Acceptance than Mindfulness, but remained a possibility that also affected other conditions (e.g. Suppression).

Skin Conductance Responses (SCR)

The secondary physiological measure employed in the current thesis was skin conductance responding to discrete stimulus or event presentations that occurred during the anxiety-inducing tasks in Experiments 2, 3 and 4. Specifically, Experiment 2 examined SCR in terms of habituation patterns, while Experiments 3 and 4 examined anticipatory and event SCR.

The Impact of *Acceptance*. Unlike Experiment 2, the SCR analyses in Experiment 3 were not conducted to determine habituation patterns. Specifically, they were conducted in the latter study as a means of determining which conditions showed greatest anxiety during to a warning stimulus (anticipatory arousal) and during the increased difficulty trials (event arousal). Participants in the Acceptance Condition in Experiment 3 showed increased anticipatory arousal between Tests 1 and 2 and just over half of the group responded in this way. On event arousal, Acceptance was associated with the smallest increases from Tests 1 and 2, although 59% of participants actually decreased. The *increase* in anticipatory arousal for Acceptance was not what we had predicted. However, as noted previously, this outcome may in fact be consistent with acceptance when one considers that acceptance requires one to make psychological contact with events that are about to occur. Indeed, this explanation would also assume that event arousal would then decrease in Acceptance, as indeed it did. However, both anticipatory and event arousal increased in Experiment 4. Nonetheless, this latter outcome may have been influenced by

the condensing of the interventions, which appears to have affected all conditions and certainly reduced previously noted benefits for Acceptance.

The Impact of *Suppression*. The SCR data were analysed in Experiment 2 as a means of deciphering characteristic patterns of participant habituation that may have distinguished the two target conditions. In short, this was done to determine whether the suppression instruction interfered with the normal pattern of habituation to the recurring visual stimulus. The data clearly indicated that participants in Control showed habituation, while Suppression did not. Indeed, the SCR analyses were particularly useful in this study in highlighting the types of interference to habituation that emerged. Specifically, participants in Suppression showed two SCR patterns characteristic of suppression and lack of habituation, namely Inconsistent responding and Increasing Arousal.

In Experiment 3, Suppression participants showed decreased anticipatory arousal but increased event arousal – an opposite pattern to Acceptance in the same study. That is, their anxiety response to the warning decreased but then increased when the trials became more difficult. An alternative pattern of SCR was recorded for Suppression in Experiment 4, where participants showed decreased anticipatory arousal and decreased event arousal. The former findings would appear to be more consistent with Suppression if one assumes that when the warning occurs, participants will not expect anxiety, but suppressing anxiety in response to the increased difficulty has a paradoxical effect, similar to Experiment 2. However, the SCR data from Experiment 4 are not consistent with this possibility.

The Impact of the *Other Interventions*. The Mindfulness Condition in Experiment 3 showed decreased anticipatory arousal and increased event arousal, similar to Suppression. In contrast, in Experiment 4 both anticipatory and event arousal were increased. However, it is worth noting that the majority of participants in fact demonstrated decreased event arousal in the latter study. The Endurance Condition in

Experiment 3 showed increased anticipatory and event arousal and this pattern was repeated in Experiment 4.

Taken together, there was perhaps greater variability in the SCR outcomes than those recorded for SCL. Some predictions were confirmed in one study, but then disconfirmed in another. Overall, the use of SCR in deciphering habituation patterns between the two target conditions was perhaps the best use of the measure in the current thesis. The variability of findings thereafter, along with the poor outcomes overall in Experiment 4, suggest that much more work needs to be done to correctly articulate predictions about acceptance and suppression in terms of expectation and event arousal.

Subjective Anxiety Ratings

Subjective anxiety and relaxation ratings were recorded in Experiments 1, 3 and 4. The data were remarkably concordant across studies. All experiments found a significant increase in subjective anxiety and a significant decrease in subjective relaxation. The only observed difference between conditions was recorded in Experiment 4, in which Endurance condition had significantly higher levels of subjective anxiety than Placebo. Taken together, these findings concord with the other outcomes in confirming that the target tests did in fact increase participant anxiety, and to the extent that they clearly discriminated this on a self-report measure.

Avoidance Responding

In Experiments 3 and 4, avoidance/suppression responding was optional, such that participants could opt to avoid the more difficult trials. It was to our surprise that almost no participants in any condition chose to do so. Perhaps this indicated that the level of task difficulty could have been increased further, a modification that might also have enhanced potential differences among conditions, particularly in Experiment 4. Indeed, previous researchers have noted the failure of behavioural choice tasks to differentiate among

groups, in a demand situation that is not perceived to be particularly high (Cochrane, Barnes-Holmes & Barnes-Holmes, 2008).

Chapter 7
General Discussion

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General Discussion

The current thesis examined the influence of acceptance, suppression and other coping strategies on levels of physiological and self-reported anxiety, induced experimentally by academic tasks. The research program comprised four automated experimental studies, across which, the relative impact of the target strategies on levels of task-induced anxiety was compared. Additional aims of the work sought to examine the relationship between suppression and habituation and between expectation and arousal. In the following sections, the findings from the four experimental studies are reviewed. Relevant theoretical issues spanning the research program are thereafter discussed.

Chapter 2: Summary of Findings

Experiment 1 (Chapter 2) compared acceptance- and suppression-based interventions in conjunction with abbreviated PMR Training. The experimental design incorporated placebo elements for both aspects of the study (i.e. PMR+Acceptance; Placebo+Acceptance; PMR+Suppression; Placebo+Acceptance; Placebo+Suppression; Placebo+Placebo). Both parts of the intervention were presented in audio format and the strategy instructions were metaphor-based. The experimental task exposed participants to an anxiety-inducing academic test involving verbal analogies and reverse digit recall tasks. Measures of SCL were taken at Baseline (pre-intervention), Test (post-intervention) and Post-test.

Mean SCL increased for all conditions from Baseline-Test, suggesting that the target academic test did increase physiological anxiety. The largest increases in anxiety were observed for Placebo+Placebo and Placebo+Acceptance. Mean SCL decreased in a small and similar way for all conditions from Test-Post-test, suggesting some small influence for the interventions and/or for practice because Placebo also changed. However,

none of these differences were significant. When the time points were systematically compared, mean SCL showed a significant increase from Baseline-Test and Test-Post-test, but the conditions did not differ significantly from each other. The analysis of the percentage change across the three time periods showed some differences among conditions. Specifically, Placebo+Acceptance showed the smallest percentage increase in anxiety from Baseline-Test, the largest decrease from Test-Post-test and the smallest overall increase from Baseline-Post-test. In contrast, PMR+Acceptance showed the largest increase in anxiety from Baseline-Test, the smallest decrease from Test-Post-test and the largest increase overall from Baseline-Post-test. The individual participant data indicated that the response patterns were largely consistent within conditions. Subjective anxiety significantly increased and subjective relaxation significantly decreased from pre- to post-experiment, as indicated by SAQ1 and 2. However, the conditions did not differ significantly in this regard.

The results from Experiment 1 confirmed some of our initial predictions. First, we predicted that the chosen academic task would increase anxiety, especially on the SCL, for all conditions prior to intervention. Both the SCL and SAQ data confirmed that the task did significantly increase anxiety for all conditions. Second, we predicted that the Acceptance Instruction would be associated with smaller increases in anxiety than both Suppression and Placebo. Overall, the data from Experiment 1 indicated no significant effect for condition, hence failing to confirm this hypothesis. However, the percentage change in mean SCL data indicated that Placebo+Acceptance showed the smallest increase in physiological anxiety overall from Baseline-Test, including the largest decrease from Test-Post-test. Given that the first part of the intervention comprised Placebo Training, one might assume that this effect, albeit small, was a result of the acceptance-based instruction. However, it is important to note that this group had also shown the smallest increase from

Baseline-Test. We had also predicted that anxiety levels observed with the Acceptance Instruction would be comparable to PMR Training, but the strong similarities across conditions made meaningful comparisons between the interventions difficult. It also worth noting that the small number of participants (n=10) in each group may have reduced the power of statistical comparisons between conditions.

Chapter 3: Summary of Findings

Experiment 2 (Chapter 3) attempted to ascertain whether the findings from Experiment 1, in terms of increased anxiety, were in fact the result of suppression. In an attempt to create a more explicit task-based analogue of suppression, participants had the option to physically suppress a recurring stimulus, while engaging in a high-load cognitive task. Participants in the Suppression Condition were instructed to suppress the stimulus, while participants in the Control Condition were instructed to continue with the task. Experiment 2 employed SCRs in addition to SCL.

Mean SCL between Baseline and Test increased significantly for participants in the Suppression Condition, but not in Control. The percentage change data indicated that the increase for Suppression was 34%, compared with a 2% decrease for Control. The percentage of participants data indicated that the response patterns were entirely consistent within Suppression and more mixed for Control. 100% of Suppression participants showed increased physiological anxiety, compared to 66% of Control. The study included analyses of SCR as a means of measuring participant habituation to the presence of the visual stimulus. The dominant pattern of responding in Control was Habituation. In contrast, response patterns in Suppression were either Inconsistent or indicative of Increasing Arousal.

The results from Experiment 2 confirmed our predictions. The primary aim of the study was to examine whether the instruction to avoid a visual stimulus would be

associated with increased anxiety and the strong difference between Suppression (who received the instruction) and Control (who did not) confirmed that this was the case. A secondary aim of the study was to examine whether the instruction to suppress the stimulus affected participants' habituation to its appearance and this effect was confirmed by the SCR outcomes in Suppression.

Chapter 4: Summary of Findings

In Experiment 3 (Chapter 4), we attempted to compare the effects of different psychological strategies on anxiety in the context of increased demand. Participants in the experimental conditions were presented with intervention videos of acceptance, suppression, mindfulness and endurance. The first aim of the study was to examine how acceptance- and suppression-based strategies compared to mindfulness and endurance. We hypothesised that mindfulness and acceptance might be associated with similar outcomes in terms of reductions in arousal. A secondary aim was to determine whether either strategy was simply synonymous with endurance. A supplementary aim of the study was to examine whether any of the interventions elicited avoidance from participants. In addition, we incorporated a measure of *anticipatory* arousal in order to determine whether the different strategies were linked with different arousal patterns in response to an impending event. We had no clear predictions about differences across conditions in terms of anticipatory arousal responses during the test, since no measurement was taken in response to the warnings in Experiment 2. Event Arousal, however, was a similar type of response that was measured at the time of the image presentations in Experiment 2 (i.e. response to the presentation of a stimulus). Given the results of Experiment 2, it seemed likely that Suppression, at least, would show greater increases from pre- to post-intervention.

Mean SCL increased for all conditions from Baseline-Test 1. In short, the test once again significantly increased physiological anxiety, but the conditions did not differ significantly in this regard. Mean SCL increased further between Tests 1 and 2 (i.e. pre- to post-intervention) for four conditions, excluding Acceptance, for whom it decreased marginally. When Tests 1 and 2 were analysed statistically using an ANCOVA, condition proved to be significant and Acceptance differed significantly from both Placebo and Suppression. Mindfulness also differed significantly from Placebo. The analysis of the percentage change in mean SCL from Tests 1-2 confirmed that all conditions, except Acceptance, showed increased anxiety, although the percentage changes were small. The individual participant data from Tests 1-2 confirmed that the majority of participants in the same four conditions showed increased anxiety, while the majority of participants in Acceptance decreased. Analyses of the anticipatory arousal data for Tests 1-2 indicated that Mindfulness, Suppression and Placebo decreased, while Acceptance and Endurance increased. The percentage of participants data confirmed that these arousal patterns were consistent within conditions. On event arousal, all participants increased, with the largest recorded on Mindfulness, Suppression and Endurance. Interestingly, the majority of participants in both Endurance and Suppression increased, while just over half of Acceptance, Mindfulness and Placebo decreased. On the SAQs, relaxation decreased significantly while anxiety increased significantly, but the conditions did not differ in either regard.

The results from Experiment 3 confirmed some of our predictions. First, we predicted that Suppression and Placebo would be less effective at diminishing anxiety than Mindfulness and Acceptance and indeed Acceptance was the only condition that showed decreased physiological anxiety and differed significantly from the other two conditions from Test 1 to Test 2. We also predicted that similarity across outcomes for Mindfulness

or Acceptance vs. Endurance might indicate that participants in either of the former were actually interpreting the strategy incorrectly as simple endurance. The results indicate some similarity between Mindfulness and Acceptance, given that both were significantly more effective than Placebo; however, Endurance did not have similar outcomes. We had no clear predictions about differences across conditions in terms of the level of anticipatory anxiety associated with the warning; however, Acceptance and Endurance were associated with increases from pre- to post-intervention, while the other conditions decreased. Given the results for Experiment 2, we expected that Suppression would show greater increases in anxiety responses to the increased difficulty events than Acceptance. Indeed, this was the case. Acceptance and Placebo showed small pre- to post-intervention increases, with Suppression showing the largest increase, followed by Endurance and Mindfulness.

Chapter 5: Summary of Findings

In Experiment 4 (Chapter 5), we attempted to examine whether introducing expectation into strategies would influence their utility by emphasising their proven efficacy and condensing the details of the interventions. We predicted that the efficacy of the Acceptance intervention would be reduced by the introduction of expectation, and that participants in the Acceptance Condition would show increased anxiety post-intervention. We also predicted that the introduction of expectation would enhance the Suppression effect resulting in larger increases in arousal post-intervention than all other conditions. We made no specific predictions in relation to the other strategies.

Mean SCL increased significantly from Baseline-Test 1, but the conditions did not differ from one another. Mean SCL also increased significantly between Tests 1 and 2 (i.e. post-intervention). Although Mindfulness showed the largest increase, the conditions did not differ significantly. The analysis of the percentage change in mean SCL from Tests 1-2

confirmed that all conditions, except Placebo, showed increased anxiety, although the percentage changes were small. The percentage of participant data confirmed that the majority of participants in all conditions showed increased anxiety. Analyses of the anticipatory arousal data for Tests 1-2 indicated that Mindfulness, Acceptance and Endurance increased, while Placebo and Suppression decreased. The percentage of participants data were mixed, with Acceptance, Mindfulness and Endurance almost split in half, while the majority of participants in Suppression increased and the majority in Placebo decreased. On event arousal, all conditions, except Suppression, increased. Once again, the response patterns were mixed. Just over half of Acceptance and Placebo increased, while just over half of Suppression and Endurance decreased. The majority of Mindfulness decreased. On the SAQs, relaxation decreased significantly while anxiety increased significantly. Condition was significant on the anxiety sub-scale, with a significant difference recorded for Placebo vs. Endurance.

The results from Experiment 4 confirmed some of our predictions. First, we predicted that the procedural emphasis on expectation would alter the effects of the interventions. Indeed, the previously positive outcomes associated with Acceptance were reduced. We predicted that Suppression would show the largest increases from pre- to post-intervention. This was not the case, with Mindfulness showing the largest increase. The results for anticipatory and event arousal were inconsistent with the previous study, which makes it difficult to ascertain the extent to which these measures were influenced by the interventions. Overall, we were unable to gain any clear indication of the effects of expectation, due to the similarity between conditions and the fact that no significant difference was found between them.

Chapter 6: Summary of Experimental Comparisons

Chapter 6 offered a systematic comparison of findings across the four studies. A number of key themes that addressed the core research aims emerged from these comparisons. First, the outcomes for Acceptance were generally favourable, relative to the other coping strategies, in terms of minimising task-induced anxiety. Indeed, Acceptance was on the whole more beneficial than Suppression, which was most often associated with increased anxiety. Furthermore, findings from Experiment 2 indicated that suppression does appear to interfere with habituation. All experiments contained some element of control or placebo and several included Mindfulness and Endurance Conditions as additional coping strategies. Placebo was generally associated with increases in anxiety. Overall Mindfulness outcomes were variable and differed considerably from Acceptance, thereby suggesting some level of functional distinction between these two components, in spite of topographical overlap. Overall, Endurance was dissimilar to Acceptance, suggesting that participants in the latter were not misinterpreting the acceptance-based instructions as simple tolerance or endurance. Patterns of SCR responding were, on the whole, variable, with the exception of Experiment 2. In this case, the data recorded significant differences between Suppression and Control, which suggested that the former was associated with increased arousal by interfering with habituation. The findings on the subjective anxiety/relaxation measure (SAQs) were always consistent. Specifically, subjective anxiety always increased significantly from pre- to post-experiment, while subjective relaxation significantly decreased. Although we had no reason to assume that accuracy on the target academic tasks would differentiate participants, we predicted that the Suppression groups, at least, would explicitly avoid the more difficult tasks, but they did not. In hindsight, the academic tasks were not perhaps difficult enough for this to

function as a suitable dependent variable and thus practically all participants completed all trials.

Theoretical Issues

A number of theoretical issues emerged from the experimental work conducted in the current thesis. These issues are discussed below under several headings: acceptance; suppression; experimentally-induced anxiety procedures; using physiological measures; and using explicit measures.

In clinical settings, relaxation training is primarily used as an appendage to a primary treatment regime (Poppen, 1998) and different relaxation components are generally considered interchangeable in this context (Smith, 1996). Many such techniques focus on bottom-up features including muscular tension and processes believed to account for relaxation outcomes are often based at this level. For example, Jacobson's (e.g. 1925) theory of relaxation was almost entirely focused on changes in muscular tension. Top-down accounts have also been considered and several have focused on attention (Bond et al., 2009), but there remains little empirical evidence that accounts, at the level of process, for the role of attention in relaxation. In the latter accounts, a number of researchers have also emphasised the role of habituation, with the general view that relaxation involves some level of habituation to novel stimuli and thereby maintains a low level of arousal. The primary aim of the current research was to address this issue by examining the relationships among acceptance, suppression and habituation and the role of each in changes in task-induced anxiety.

Acceptance. Traditional accounts of relaxation placed a stronger emphasis than contemporary accounts on the importance of acceptance. Indeed, in the former acceptance was considered to be a core psychological pre-requisite to effective relaxation. Although there are numerous synonyms for acceptance in this context (e.g. passivity), it is easy to

equate this pre-requisite involving: a focus on non-internal content; openness to the possibility of psychological events; and receptivity to these events as they occur with acceptance involving: personal values; acceptance that internal events are normal; willingness to engage with these events. To date, however, there has been very little experimental research that explicitly examines the role of acceptance in relaxation.

There is strong evidence in the clinical outcome literature of the efficacy of psychological acceptance in the treatment of anxiety (Hofmann, Heering, Sawyer, & Asnaani, 2009; Roemer et al., 2008), as well as observed benefits on anxiety and fear in experimental contexts (Cochrane et al., 2008; Kehoe, 2008). The results of the current research are, in part, consistent with these findings in suggesting the utility of acceptance in diminishing anxiety. It is a common paradox in acceptance work, that an explicit starting point involves being completely open to increases in arousal at any point and yet the strategy is effective at actually minimising any such increases. Indeed, unanticipated decreases in anxiety and discomfort are now commonplace in the experimental literature on acceptance (e.g. Vowles, McNeil, Gross, McDaniel, Mouse et al., 2007). In contrast, when one *explicitly attempts to* minimise arousal via suppression, arousal increases. It was largely based on this type of thinking that our initial predictions in Experiment 3 were that anticipatory arousal should decrease with acceptance, whereas it did in fact increase. However, as noted previously, this outcome is not inconsistent with an acceptance rationale because one must make full contact with events if one is to remain open to them. Taken together, the current work contributes to the now rapidly growing research base on acceptance in highlighting positive outcomes in anxiety reduction in experimental contexts. However, the work also clearly warns of the compromise to these outcomes when one's intention (implicitly or explicitly) is to remove arousal or unwanted psychological content.

The current work also attempted to examine the potential role of expectation on acceptance outcomes. Confounding reductions in the size of the intervention with the addition of the expectation manipulation, combined with the overall reductions in the effects and differences among conditions, made it difficult to draw any firm conclusions about expectation. It was our starting assumption that expectation might undermine the effects of acceptance and similarly exacerbate the effects of suppression. However, we were not able to answer this. As a result, one direction for future research would be to replicate Experiment 4 with the larger interventions in Experiment 3 and manipulate expectation in this context.

According to Smith (1990; 1996), willingness to experience forthcoming anxiety-provoking content is a critical component of relaxation. Indeed, this view is entirely consistent with the conceptualisation of acceptance adopted in the current thesis and elsewhere (Hayes et al., 1999). Within this framework, it is very difficult to functionally distinguish between acceptance and willingness because in a sense one has to be willing before one can be accepting, while at another level willingness and acceptance may be synonymous (because being accepting is being willing). Although the current work was not designed to address this issue directly, the use of the Endurance condition may go some way in this direction. Specifically, one might debate the extent to which participants in an Endurance Condition are accepting, but they are very likely willing. If this is the case, the results here indicated that willingness in the absence of acceptance is not sufficient to reduce anxiety, because participants in the Endurance Condition were amongst the highest in terms of their anxiety levels.

Suppression. A number of studies have examined the psychological and physiological effects associated with suppression strategies (e.g. Wenzlaff & Wegner, 2000). The general consensus from these links suppression with increased physiological

arousal (e.g. Wegner at al., 1997) and thus highlights the now characteristic paradoxical effects of suppression (Gross & Levenson, 1993). That is, 'if you don't want it you have it'. Wegner's "White Bear" research is the most notable example of this effect. In spite of this view, much of the language used, particularly in popular and contemporary descriptions of relaxation techniques, continue to describe a successful relaxation outcome as a state of no arousal, thereby creating the possible illusion that the removal of same is the object of the relaxation technique. Indeed, several researchers have already argued that explicit efforts to make yourself relax are the most counter-prodcutive (e.g. Benson, 1975; Smith, 1990). The current research contributes to the body of existing work on suppression in adding further evidence that such a strategy does not facilitate decreases in anxiety.

According to Wegner (1994), one possible account for the paradoxical effects of suppression results from the fact that the need to attend to novel and to-be-suppressed stimuli interferes with natural processes of habituation. The results of Experiment 2 strongly support this view and provide clear evidence of the distinction in outcomes between instructing participants to suppress and simply not instructing them to. In short, left to their own devices, participants in Control habituated to the recurring visual stimulus, but this process was interfered with by the instruction to suppress. It was indeed also as a likely result of this, that anxiety increased. The current research appears to offer the first empirical evidence of suppression as the interruption of habituation.

Wenzlaff and Wegner (2000) argued that expectations perpetuate attempts at mental control and ultimately lead participants to become alarmed by unsuccessful attempts at control, thereby culminating in increased anxiety. The aim of Experiment 4 in the current series was to determine whether expectation exacerbated the effects of suppression and whether it had a similar effect on other strategies. The considerably weaker outcomes for all strategies in Experiment 4 relative to the previous study may be

taken to suggest that this was in fact the case. However, it is important to reiterate that these outcomes may equally have been influenced by the shortening of the interventions themselves. Indeed, an important direction for future research would be to explore more systematically the extent to which expectation plays a role in the paradoxical effects of suppression.

In the current research there was some ambiguity regarding suppression as an emotional avoidance and the physical act of avoiding an upcoming event or stimulus. Specifically, in Experiment 2, participants in the suppression were explicitly instructed to suppress the stimulus, and did so. The results of the study showed a marked difference between Suppression and Control. In Experiments 3 and 4 however, the avoidance response was optional, although we predicted that participants in Suppression would avoid the more difficult trials; however, they did not do this. While the lack of avoidant responding is easily accounted for by the fact that the academic tasks were not too difficult, this arguably leaves some question of the extent to which participants in Experiments 3 and 4 actually engaged in suppression. On the other hand, while the aim of using a behavioural suppression task is to measure that the strategy is being implemented, we also need to consider that experiential avoidance may not always lead to a physical response.

Experimentally-induced Anxiety Procedures. Many previous studies have used academic tasks as a critical means of experimental stress or anxiety induction and a range of methodologies have also incorporated coping strategies. These include: the Cold Pressor Task (Hayes et al., 1999); the Carbon Dioxide (CO^2) Challenge (Levitt, Brown, Orsillo, & Barlow, 2004); and Brief Electric Shock (Gutierrez, Luciano, Rodriguez, & Fink, 2004). In practically all reported studies, the stress generated by stress-induction procedures has demonstrated sensitivity to acceptance. For example, with the Cold Pressor Task, Hayes et

al. (1999) compared an Acceptance rationale specifically aimed at disconnecting thoughts and feelings from behaviour to Cognitive Control, comprised of stress inoculation (Turk, 1978), and an Attention Placebo rationale. The results demonstrated that Placebo participants spent the least time with their hands immersed in the iced water, while Acceptance participants spent the longest time. Importantly, the subjective measures indicated that the latter group *did not experience less pain.* Equally positive effects have been reported for acceptance when employed as a strategy for coping with Brief Electric Shock (Gutierrez et al., 2004).

In spite of the number of studies that have effectively employed stress-induction methodologies, including those that lend themselves well to the manipulation of interventions, numerous procedures have well-established limitations (Mitchell, Mac Donald & Brodie, 2004). For example, research evidence involving the Cold Pressor Task may require caution because of a lack of standardised equipment, and variations in the number of immersions, immersion time, maximum tolerance time and water temperature. The choice of academic task in the current research was based on knowledge of these limitations elsewhere and also driven by the need to create a task that would permit on-going physiological measurement. Indeed, although we selected the most complex types of analogy from the Cognitive Abilities Test and assumed that all participants would respond with a high level of accuracy, we remained surprised at how anxiety-provoking the tasks were. The digit recall tasks were also effective at inducing anxiety but were more cumbersome than the analogies because they were not as easily automated. As a result, they were removed from the latter studies. All of the evidence across studies in the current thesis provided clear evidence that the target academic tasks did induce physiological anxiety and the subjective outcomes indicated significant increases in subjective anxiety also.

A core feature of the experimental work conducted in the current thesis involved the design and modification of the automated procedures. Experiments 2, 3 and 4 all involved extensive computer programs that could present the anxiety-induction procedure while being synchronised with the physiological measures. The use of automated procedures has become increasingly widespread, especially in acceptance research (Gutierrez et al., 2004; Johnson, Stewart, Barnes-Holmes, Barnes-Holmes, Luciano et al., 2004) and there are many benefits, including: lack of experimenter error; reduced experimenter influence; compatibility with interventions; consistency of video-based presentations; and consistency of response intervals, etc. The current research also highlights the potential benefits of marrying automated procedures with physiological measures.

The methodologies employed currently also permitted sophisticated manipulations of stimulus and event presentations and warnings. According to models of suppression (Wegner, 1994) and anxiety (Lang et al., 1990) the arousal created by the test creates a context in which physiological responses to subsequently presented stimuli are enhanced. However, according to these authors, the physiological response is dependent upon whether the event is evaluated as aversive or appetitive. The warning employed in some of the current studies attempted to address this issue and the SCR data were employed to this end. The protocols developed for the current research are among the first to attempt to tease apart these complex processes.

Using Physiological Measures. Skin Conductance is one of the most commonly used methods of measuring anxiety and in the current research programme, proved to be an effective measure of anxiety. Tonal SCL, as used in the current study, is particularly sensitive to changes in psychological and emotional states (Lagopoulos, 2007). In addition, computer-based measurement and standardised practices in the application of SCL have

removed much of the subjective "interpretation" that was historically associated with the analysis of the outcome data (Cacioppo et al., 2007). It was an important aim of the current research to analyse differences at group level, while accounting for individual variability of physiological arousal. Thus, the current research employed a number of additional measures, in addition to mean SCL, to gain a more complete picture in the interpretation of skin conductance responses.

The use of percentage change and ANCOVA data, accounts for the fact that increases in SCL occur relative to an original baseline level and should also be viewed in this context. Calculating the percentage of participants who increased or decreased in each group demonstrated that differences, when they were observed, were applicable to the majority of participants in a given condition. This is an important indicator of difference between groups, when the value of the mean or percentage change that occurs may seem small.

Using Explicit Measures. In the current studies, the findings consistently indicated that decreases in physiological anxiety were not reflected in the subjective measures. Similar findings have been reported recently by Hofmann et al. (2009), who found that acceptance was superior to suppression in decreasing physiological responses to an anxiety-provoking task, while there were no differences in the subjective experience of anxiety between the two groups. Indeed, it is not unusual for self-reports to be discordant with skin conductance measures, even when the skin conductance response closely matches the type of stimulus being presented (Meadows & Kaplan, 1994). Interestingly, Hofmann et al. also reported that instructing participants in how to reappraise their subjective experience, self-reports become increasingly consistent with physiological measures. One might conclude, therefore, that the dissociation between subjective and physiological measures simply reflects an individual's lack of awareness or discrimination

of his/her own physiological changes. This and many other features are commonly discussed in attempts to criticise explicit methodologies and indeed they have many established short-comings (Liska, 1975). Nonetheless, the current study demonstrated such strong consistency in the subjective outcomes that one might reasonably argue that a combination of both explicit and physiological measures is a wise direction for future research. It is difficult to make clear predictions about whether or not different types of measure should correlate because the measures are in fact extremely different and one is often aware of one type but not the other. For example, the subjective measures used currently only indicated, as expected, that subjective anxiety increased across the course of the study, but could not reflect on-going changes at any point in time, as was the case with the physiological measure. Perhaps most conservatively, one might conclude from the current research that the use of the physiological measures was a very useful contribution that ensures that one does not rely entirely on self-reports.

Conclusions

Based on the current research program and its findings, we can piece together a picture of relaxation as the ability to habituate to events and stimuli as they occur, in the absence of efforts to suppress or control these events, a strategy which will ultimately prove counter-productive. Psychological acceptance, it seems, is one way to articulate the nature of the relaxation process.

References

References

Adler, C.M., Craske, M.G., & Barlow, D.H. (1987). Relaxation induced panic (RIP): When resting isn't peaceful. *Journal of Integrative Psychiatry, 5*, 94-112.

Barton, M.J. (2005). The effects of meditation on relaxation and spirituality on recovering alcoholics. *Dissertation Abstracts International. 65(9-B)*, 4811. US: ProQuest Information & Learning.

Baer, R.A., Fischer, S., & Huss, D. (2005). Mindfulness and acceptance in the treatment of disordered eating. *Journal of Rational-Emotive & Cognitive-Behavior Therapy , 23*, 281-299.

Barnes-Holmes, D., Cochrane, A., Barnes-Holmes, Y., Stewart, I., & McHugh, L. (2004). Psychological acceptance: Experimental analysis and theoretical implications. *International Journal of Psychology & Psychological Therapy, 4*, 517-530.

Batten, S.V., & Hayes, S.C. (2005). Acceptance and Commitment Therapy in the treatment of comorbid substance abuse and post-traumatic stress disorder: A case study. *Clinical Case Studies, 4*, 246-262.

Benham, G., Nash, M.R., & Baldwin, D.R. (2009). A comparison of changes in secretory immunoglobulin A following a stress-inducing and stress-reducing task. *Stress and Health: Journal of the International Society for the Investigation of Stress, 25*, 81-90.

Benson, H. (1975). *The relaxation response.* HarperCollins: New York.

Bernstein, D.A., Carlson, C.R., & Schmidt, J.E. (2007). Progressive relaxation: Abbreviated methods. In P. M . Lehrer, R. L. Woolfolk & W. E. Sime (Eds.) *Principles and practice of stress management (3rd ed.)* (pp. 88-122) New York: Guilford Press.

Block, J.A., & Wulfert, E. (2000). Acceptance or change: Treating socially anxious college students with ACT or CBGT. *The Behavior Analyst Today, 1*, 1-55.

Boals, G.F. (1978). Toward a cognitive reconceptualization of meditation. *Journal of Transpersonal Psychology, 10*, 143-182.

Bond, K., Ospina, M.B., Hooton, N., Bialy, L., Dryden, D.M., Buscemi, N., et al. (2009). Defining a complex intervention: The development of demarcation criteria for ``meditation''. *Psychology of Religion and Spirituality, 1*, 129-137.

Borden, J.W., Lowenbraun, P.B., Wolff, P.L., & Jones, A. (1993). Self-focused attention in panic disorder. *Cognitive Therapy and Research, 17*, 413-425.

British Psychological Society (2006) *Code of Ethics and Conduct.* Leicester: British Psychological Society.

Cacioppo, J.T., Tassinary, L.G., & Berntson, G.G. (2007). *Handbook of psychophysiology.* Cambridge: Cambridge University Press.

Cleveland, W. S. (1984). Graphical methods for data presentation: Full scale breaks, dot charts, and multibased logging. *The American Statistician, 38,* 270-280.

Cochrane, A., Barnes-Holmes, D., & Barnes-Holmes, Y. (2008). The Perceived-Threat Behavioral Approach Test (PT-BAT): Measuring avoidance in high-, mid-, and low-spider-fearful participants. *The Psychological Record*, *58*, 585-596.

Conrad, A., & Roth, W.T. (2007). Muscle relaxation therapy for anxiety disorders: It works but how? *Journal of Anxiety Disorders, 21*, 243-264.

Davidson, R.J., & Schwartz, G.E. (1976). Matching relaxation therapies to types of anxiety: A patterning approach. In D.H. Shapiro & R.N. Walsh (Eds.) *Meditation, Classic and Contemporary Perspectives,* 622-631. New Jersey: Aldine Transaction.

Feuerstein, G. (1975). *Textbook of yoga.* London: Rider.

Gerdes, E.P. (1979). Autonomic arousal as a cognitive cue in stressful situations. *Journal of Personality, 47*, 677-711.

Ghafari, S., Ahmadi, F., Nabavi, M., Anoshirvan, K., Memarian, R., & Rafatbakhsh, M. (2009). Effectiveness of applying progressive muscle relaxation technique on quality of life of patients with multiple sclerosis. *Journal of Clinical Nursing, 18*, 2171-2179.

Goldfried, M., & Davidson, G. (1994). *Clinical behavior therapy.* New York: Wiley.

Greco, L.A., Lambert, W. & Baer, R.A. (2008). Psychological inflexibility in childhood and adolescence: Development and evaluation of the Avoidance and Fusion Questionnaire for Youth. *Psychological Assessment, 20*, 93-102.

Gross, J.J., & Levenson, R.W. (1993). Emotional suppression: Physiology, self-report, and expressive behavior. *Journal of Personality and Social Psychology, 64*, 970-986.

Gutiérrez, O., Luciano, C., Rodríguez, M., & Fink, B.C. (2004). Comparison between an acceptance-based and a cognitive control-based protocol for coping with pain. *Behaviour Therapy, 35*, 767-783.

Hasenbring, M. (1993). Endurance strategies - a neglected phenomenon in the research and therapy of chronic pain? *Der Schmerz*, *7*, 304-13.

Harding, S. (1996). Relaxation: With or without imagery? *International Journal of Nursing Practice, 2*, 160-162.

Hayes, S.C. & Bach, P. (2002). The use of Acceptance and Commitment Therapy to prevent the rehospitalization of psychotic patients: A randomized controlled trial. *Journal of Consulting and Clinical Psychology, 70*, 1129-1139.

Hayes, S.C., Bissett, R., Korn, Z., Zettle, R. D., Rosenfarb, I., Cooper, L., & Grundt, A. (1999). The impact of acceptance versus control rationales on pain tolerance. *The Psychological Record*, *49*, 33-47.

Hayes, S.C., Strosahl, K., & Wilson, K. (1999). *Acceptance and Commitment Therapy.* New York: Guilford Press.

Heide, F.J. & Borkovec, T.D. (1984). Relaxation-induced anxiety: mechanisms and theoretical implications. *Behaviour Research and Therapy, 22*, 1–12.

Hofmann, S.G., Heering, S., Sawyer, A.T., & Asnaani, A. (2009). How to handle anxiety: The effects of reappraisal, acceptance, and suppression strategies on anxious arousal. *Behaviour Research and Therapy, 47*, 389-394.

Hoyer, J., Beesdo, K., Gloster, A.T., Runge, J., Höfler, M., & Becker, E.S. (2009). Worry exposure versus applied relaxation in the treatment of generalized anxiety disorder. *Psychotherapy and Psychosomatics, 78*, 106-115.

Jacobson, E. (1925). Progressive relaxation. *The American Journal of Psychology, 36*, 73-87.

Jacobson, E. (1938). *Progessive relaxation.* Chicago: University of Chicago Press.

Johnson, B., Stewart, I., Barnes-Holmes, D., Barnes-Holmes, Y., Luciano, C., & Wilson, K. (2004, November). *Doing what you do not want to do to achieve valued outcomes: Acceptance and valuing in the face of aversive stimulation.* Paper presented at the annual conference of the Psychological Society of Ireland, Cork, Ireland.

Kehoe, A. (2008). *Experimental analyses of pain: Understanding processes and developing interventions.* Unpublished PhD thesis, NUI Maynooth, Co. Kildare, Ireland.

Lagopoulos, J. (2007). Electrodermal activity. *Acta Neuropsychiatrica, 19*, 316-317.

Lang, P.J., Bradley, M.M., & Cuthbert, B.N. (1990). Emotion, attention, and the startle reflex. *Psychological Review, 97*, 377-395.

Liska, A. E. (1975). *The consistency controversy.* New York: Wiley.

Lohman, D., Thorndike, R., & Hagen, E. (2001). *Cognitive Abilities Test.* UK: G.L. Assessment.

Lehrer, P. M . Woolfolk, R. L. & Sime, W. E. (2007). *Principles and practice of stress management.* (3rd ed.) New York: Guilford Press.

Levitt, J.T., Brown, T.A., Orsillo, S.M., & Barlow, D.H. (2004). The effects of acceptance versus suppression of emotion on subjective and psychophysiological response to carbon dioxide challenge in patients with panic disorder. *Behavior Therapy, 35*, 747-766.

Lichstein, K. (1998). *Clinical relaxation strategies.* New York: Wiley.

Luthe, W. & Schuktz, J. (1965). *Autogenic training.* New York: Grune and Straton.

Malhotra, J. (1963). Yoga and mental hygiene. *American Journal of Psychotherapy, 4*, 375-385.

Manzoni, G.M., Pagnini, F., Castelnuovo, G., & Molinari, E. (2008). Relaxation training for anxiety: A ten-years systematic review with meta-analysis. *BMC Psychiatry, 8,* 1-12.

Maslach, C. (1979). Negative emotional biasing of unexplained arousal. *Journal of Personality and Social Psychology, 37*, 953-969.

Matsumoto, M. & Smith, J.C. (2001). Progressive muscle relaxation, breathing exercises, and ABC relaxation theory. *Journal of Clinical Psychology, 57*, 1551-1557.

Macrae, C.N., Bodenhausen, G.V., Milne, A.B., Jetten, J. (1994). Out of mind but back in sight: Stereotypes on the rebound. *Journal of Personality and Social Psychology, 67*, 808–17.

McMullen, J., Barnes-Holmes, D., Barnes-Holmes, Y., Stewart, I., Luciano, C., Cochrane, A. (2008). Acceptance versus distraction: Brief instructions, metaphors and exercises

in increasing tolerance for self-delivered electric shocks. *Behaviour Research and Therapy, 46,* 122-129.

Meadows, M.E. & Kaplan, R.F. (1994). Dissociation of autonomic and subjective responses to emotional slides in right hemisphere damaged patients. *Neuropsychologia, 32,* 847-856.

Mitchell, L.A., Mac Donald, R.A.R., & Brodie, E.E. (2004). Temperature and the cold pressor test. *The Journal of Pain, 5,* 233-238.

Moreira, P., Beutler, L., & Goncalves, O. (2008). Narrative change in psychotherapy: differences between good and bad outcome cases in cognitive, narrative, and prescriptive therapies. *Journal of Clinical Psychology, 64*, 1181-1194.

Nassiri, M. (2005). The effects of regular relaxation on perceived stress in a group of London primary education teachers. *European Journal of Clinical Hypnosis, 6*, 21-29.

Orsillo, S. M., & Roemer, L. (2005). *Acceptance and mindfulness-based approaches to anxiety: Conceptualization and treatment.* New York: Springer Science + Business Media.

Paran, E., Amir, M., & Yaniv, N. (1996). Evaluating the response of mild hypertensives to biofeedback-assisted relaxation using a mental stress test. *Journal of Behaviour Therapy and Experimental Psychiatry, 27*, 157-163.

Poppen, R. (1998). R*elaxation training and assessment* (2nd ed.). California: Sage Publications.

Psychological Society of Ireland (2008). *Code of Professional Ethics.* Dublin: Psychological Society of Ireland.

Rama, S. (1979). *The royal path: Practical lessons on yoga.* Pennsylvania: Himalayan Institute Press.

Rasmussen, B. (1995). The differential use of metaphor in psychotherapy. *Clinical Social Work Journal, 23*, 139-149.

Ray, W.J., Molnar, C., Aikins, D., Yamasaki, A., Newman, M.G., Castonguay, L., et al. (2009). Startle response in Generalized Anxiety Disorder. *Depression & Anxiety, 26*, 147-154.

Ring, C., Harrison, L., Winzer, A., Carroll, D., Drayson, M., & Kendall, M. (2000). Secretory immunoglobulin A and cardiovascular reactions to mental arithmetic, cold pressor, and exercise: Effects of alpha-adrenergic blockade. *Psychophysiology, 37*, 634-643.

Roemer, L., Orsillo, S.M., & Salters-Pedneault, K. (2008). Efficacy of an acceptance-based behavior therapy for generalized anxiety disorder: Evaluation in a randomized controlled trial. *Journal of Consulting and Clinical Psychology, 76*, 1083-1089.

Sarang, S.P. & Telles, S. (2007). Immediate effect of two yoga-based relaxation techniques on performance in a letter-cancellation task. *Perceptual and Motor Skills, 105*, 379-385.

Sharpless, S. & Herbert, J. (1956). Habituation of the arousal reaction. *Brain, 79,* 655-680.

Short, N.P., Kitchiner, N.J., & Curran, J. (2004). Unreliable evidence. *Journal of Psychiatric and Mental Health Nursing, 11*, 106-111.

Smith, J. C. (1990). *Cognitive behavioural relaxation training: A new system of strategies for treatment and assessment.* New York: Springer.

Smith, J.C. (1996). Relaxation: Mapping an uncharted world. *Applied Psychophysiology and Biofeedback, 21*, 63-90.

Smith, J.C. (1999). *ABC relaxation theory: An evidence-based approach.* New York: Springer.

Smith, J. C. (2001). *Advances in ABC relaxation: Applications and inventories.* New York: Springer.

Thomson, R. H. S., Garry, M. I. & Summers, J. J. (2008). Attentional influences on short-interval intracortical inhibition. *Clinical Neurophysiology, 119*, 52-62.

Turk, D.C. (1978). A coping skills-training approach for the control of experimentally produced pain. *Dissertation Abstracts-International,* 39, 4-B, 1972.

Twohig, M.P. (2008). A randomized clinical trial of acceptance and commitment therapy versus progressive relaxation training in the treatment of obsessive compulsive disorder. *Dissertation Abstracts International. 68(7-B)*, 4850. ProQuest Information & Learning.

Vickers, A. & Zollman, C. (1999). ABC of complementary medicine: Hypnosis and relaxation therapies. *British Medical Journal, 319*, 1346-1349.

Vowles, K., McNeil, D., Gross, R., McDaniel, M., Mouse, A., Bates, M., et al. (2007). Effects of pain acceptance and pain control strategies on physical impairment in individuals with chronic low back pain. *Behavior Therapy*, *38*(4), 412-425.

Walsh, R. & Shapiro, S.L. (2006). The meeting of meditative disciplines and western psychology: A mutually enriching dialogue. *American Psychologist, 61*, 227-239.

Wegner, D.M. (1994). *White bears and other unwanted thoughts: Suppression, obsession, and the psychology of mental control.* New York: Guilford Press.

Wegner, D.M., Broome, A., & Blumberg, S. (1997). Ironic effects of trying to relax under stress. *Behavior Research and Therapy, 35*, 11-21.

Wells, A. (1990). Panic disorder in association with relaxation induced anxiety: An attentional training approach to treatment. *Behavior Therapy, 21*, 273-280.

Wenzlaff, R.M. & Wegner, D.M. (2000). Thought suppression. *Annual Review of Psychology, 51*, 59-91.

Appendices

Appendix A:

Subjective Anxiety Questionnaire (SAQ: Adapted from Wegner et al., 1997)

Please rate below, how much each of the following words applies to how you are feeling right now.

1/Not At All 3=/Somewhat 5/Very Much

Relaxed	1	2	3	4	5
Calm	1	2	3	4	5
Sleepy	1	2	3	4	5
Restless	1	2	3	4	5
Bored	1	2	3	4	5
Agitated	1	2	3	4	5
Tranquil	1	2	3	4	5
Happy	1	2	3	4	5
Placid	1	2	3	4	5
Composed	1	2	3	4	5
Anxious	1	2	3	4	5
Tired	1	2	3	4	5
Tense	1	2	3	4	5
Fidgety	1	2	3	4	5
Upset	1	2	3	4	5

Appendix B:

Verbal Analogy Tasks Employed in Experiment 1

Hurt is to Cry as Tickle is to _____?

Night is to Sleep as Day is to _____?

Red is to Green as Stop is to _____?

Line is to Ruler as Circle is to _____?

Tell is to Listen as Give is to _____?

Aim is to Gun as Fly is to _____?

Bee is to Sting as Snake is to _____?

New is to Old as Fresh is to _____?

Appear is to Arrive as Vanish is to _____?

Appendix C:

Reverse Digit Recall Tasks Employed in Experiment 1

3129

96571

149683

2086395

74598240

Appendix D:

Participant Consent Form

PARTICIPANT:

I …… consent to participate in an experimental psychology study being run by Chris Wilson in the Department of Psychology, National University of Ireland, Maynooth. I understand and consent to the following:

- ❑ The experiment will last approximately 60 minutes.
- ❑ I will be required to fill in various questionnaires and perform a computer task.
- ❑ My verbal responses will be recorded using a microphone for the duration of the experiment
- ❑ I am free to terminate my participation in the study at any time and may withdraw the data obtained from my participation, if I so wish.
- ❑ I understand that I participate under my own volition and that my participation will not have any effect on my subsequent academic results. I also understand that no monetary remuneration will result from participation.

I have received this information in an understandable way. All my questions have been answered.

Please print and sign your name below if you are willing to abide fully by the conditions stated above.

Name: _____(Please print in block capitals)

Signature: _____

Date: _____

EXPERIMENTER:

I, Chris Wilson, as primary experimenter, accept full responsibility for the care of all experimental participants and I confirm that all the necessary safety precautions have been taken and that additional experimental conditions followed in other studies have also been introduced.

Signature of experimenter: _____

Date: _____

Appendix E:

Verbal Analogy Tasks Employed in Experiment 2

Shuffle is to Walk : Mumble is to -Run-Stutter-Walk-Shout-

Calculator is to Accountant : Hammer is to -Saw-Pilot-Tool-Carpenter-

Smoulder is to Blaze : Simmer is to -Cook-Stew-Flame-Boil-

Blue is to Colour : Socks is to -Clothing-Feet-Shoes-Paper-

Hinge is to Door : Binding is to -Open-Book-Tape-Stuck-

Complain is to Grumble : Tempt is to -Invite-Lure-Propose-Ask-

Foundation is to House : Skeleton is to -Bones-Closet-Body-Ship-

Rain is to Snow : Dew is to -Wet-Cloud-Flower-Frost-

Temporary is to Permanent : Lodge is to -Halt-Landlord-Fleeting-Settle-

Breakfast is to Supper : Morning is to -Evening-Dawn-Afternoon-Dinner-

Smooth is to Silk : Sour is to -Taste-Lemon-Sweet-Bitter-

Deep is to Expert : Shallow is to -Critic-Master-Novice-Child-

Shoe is to Sock : Waistcoat is to -Trousers-Jacket-Shirt-Buttons-

Small is to Large : Lake is to -Ocean-River-Stream-Pond-

Catch is to Hitch : Raise is to -Flatten-Elevate-Throw-Lower-

Fawn is to Doe : Sapling is to -Syrup-Adult-Pitch-Tree-

Fantasy is to Reality : Fiction is to -Mystery-Drama-Novel-Documentary-

All is to Some : Whole is to -Part-Entire-Whole-More-

Rigid is to Flexible : Constant is to -Contentious-Variable-Critical-Dependable-

Hostel is to Hike : Motel is to -Travel-Holiday-Road-Drive-

Past is to Remembrance : Future is to -Progress-Opportunity-Anticipation-

North is to West : Forward is to -Ahead -Up-Sideways-Diagonal-

Leaf is to Wilt : Photograph is to -Develop-Picture-Fade-Film-

Celebrity is to Fame : Dictator is to -Infamy-Power-Leader-Audience-

Chef is to Shepherd : Kitchen is to -Garden-Lamb-Farm-Farmer-

Seed is to Sow : Rumour is to -Disperse-Select-Deny-Spread-

Country is to Prime Minister : City is to -Council-County-Mayor-Capital-

Grapefruit is to Orange : Lemon is to -Sour-Apple-Peach-Lime-

Object is to Shadow : Sound is to -Echo-Voice-Ear-Music-

When is to Now : Where is to -Here-Place-There-

Appendix F:

Verbal Analogy Tasks Employed in Experiments 3 & 4: Test 1

Shuffle is to Walk : Mumble is to -Run-Stutter-Walk-Shout-

Calculator is to Accountant : Hammer is to -Saw-Pilot-Tool-Carpenter-

Smoulder is to Blaze : Simmer is to -Cook-Stew-Flame-Boil-

Blue is to Colour : Socks is to -Clothing-Feet-Shoes-Paper-

Hinge is to Door : Binding is to -Open-Book-Tape-Stuck-

Complain is to Grumble : Tempt is to -Invite-Lure-Propose-Ask-

Foundation is to House : Skeleton is to -Bones-Closet-Body-Ship-

Rain is to Snow : Dew is to -Wet-Cloud-Flower-Frost-

Temporary is to Permanent : Lodge is to -Halt-Landlord-Fleeting-Settle-

Breakfast is to Supper : Morning is to -Evening-Dawn-Afternoon-Dinner-

Smooth is to Silk : Sour is to -Taste-Lemon-Sweet-Bitter-

Deep is to Expert : Shallow is to -Critic-Master-Novice-Child-

Shoe is to Sock : Waistcoat is to -Trousers-Jacket-Shirt-Buttons-

Small is to Large : Lake is to -Ocean-River-Stream-Pond-

Catch is to Hitch : Raise is to -Flatten-Elevate-Throw-Lower-

Fawn is to Doe : Sapling is to -Syrup-Adult-Pitch-Tree-

Fantasy is to Reality : Fiction is to -Mystery-Drama-Novel-Documentary-

All is to Some : Whole is to -Part-Entire-Whole-More-

Rigid is to Flexible : Constant is to -Contentious-Variable-Critical-Dependable-

Hostel is to Hike : Motel is to -Travel-Holiday-Road-Drive-

Past is to Remembrance : Future is to -Progress-Opportunity-Anticipation-

North is to West : Forward is to -Ahead -Up-Sideways-Diagonal-

Leaf is to Wilt : Photograph is to -Develop-Picture-Fade-Film-

Celebrity is to Fame : Dictator is to -Infamy-Power-Leader-Audience-

Chef is to Shepherd : Kitchen is to -Garden-Lamb-Farm-Farmer-

Appendix G:

Verbal Analogy Tasks Employed in Experiments 3 & 4: Test 2

Seed is to Sow : Rumour is to -Disperse-Select-Deny-Spread-

Country is to Prime Minister : City is to -Council-County-Mayor-Capital-

Grapefruit is to Orange : Lemon is to -Sour-Apple-Peach-Lime-

Object is to Shadow : Sound is to -Echo-Voice-Ear-Music-

When is to Now : Where is to -Here-Place-There-

Album is to Stamp : Garage is to -Car-Park-Full-Store-

Accordian is to Squeeze : Trumpet is to -Instrument-Play-Blow-Finger-

Get is to Buy : Give is to -Sell-Away-Present-Free-

Consume is to Eat : Produce is to -Drink-Food-Make-Sell-

Deuce is to Ace: Duet is to -Chorus-Solo-Song-Quartet-

Cattle is to Herd : Bees is to -Swarm-Flock-Honey-Drone-

Either is to Both : Neither is to -Nor-None-Which-Some-

Rain is to Snow : Dew is to -Fog-Frost-Ice-Grass-

Distance is to Kilometre : Direction is to -Guide-Up-Map-North-

Luxuriant is to Lush : Sparse is to -Cheap-Thick-Barren-Invaluable-

Actor is to Cast : Singer is to -Orchestra-Choir-Music-Radio-

Dirty is to Grimy : Pretty is to -Cute-Happy-Ugly-Beautiful-

Annecdote is to Narrator : Portrait is to -Actor-Camera-Novelist-Artist-

Time is to Age : Space is to -Spacious-Empty-Large-Distance-

Ice is to Water : Water is to -Dew-Drink-Steam-Tap-

Clear is to Transparent : Hazy is to -Sky-Rainy-Weather-Translucent-

Cottage is to Castle : Peasant is to -serf-Farm-Soldier-King-

See is to Imagine : Fact is to -Fiction-Observation-Know-Truth-

Cause is to Effect : If is to -Perhaps-But-Only-Then-

Acute is to Severe : Weak is to -Pale-Tired-Sharp-Mild-