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The Roles of Learning Ability and Stress Reactivity in Coping Behaviour Change: a CBT-based Brief Stress-Management Intervention

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Overall Abstract

CBT is well established as an effective treatment for a range of mental health problems and its use as a treatment for stress-related problems in occupational settings is also well evidenced; however, not every recipient of CBT necessarily shows improvement. Despite decades of research into the comparative effectiveness of psychological therapies like CBT, little is known still regarding how and why such therapies work. Mechanisms of change research in the field of therapeutic effectiveness has thus far focussed on therapy-specific variables or common factors such as therapist variables or the therapeutic alliance. Little attention has been paid to the role of individual client characteristics in processes of therapeutic change, and less still on psychobiological variables such as stress reactivity. High levels of stress reactivity have been found to constitute a risk factor for psychopathology, and further to impact upon cognitive processes of learning. The literature review herein explores this gap in knowledge and the research study that follows investigated the relationship of stress reactivity and learning ability to coping behaviour change. This was explored with a longitudinal control group design involving application of a brief CBT based stress management intervention to a university student population. Results found no positive intervention effect on coping behaviour change and no relationships with the variables of learning ability and stress reactivity; however, a negative relationship between these two variables was reported. Results and limitations of the study, along with implications for clinical practice are discussed.

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Literature Review

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Abstract

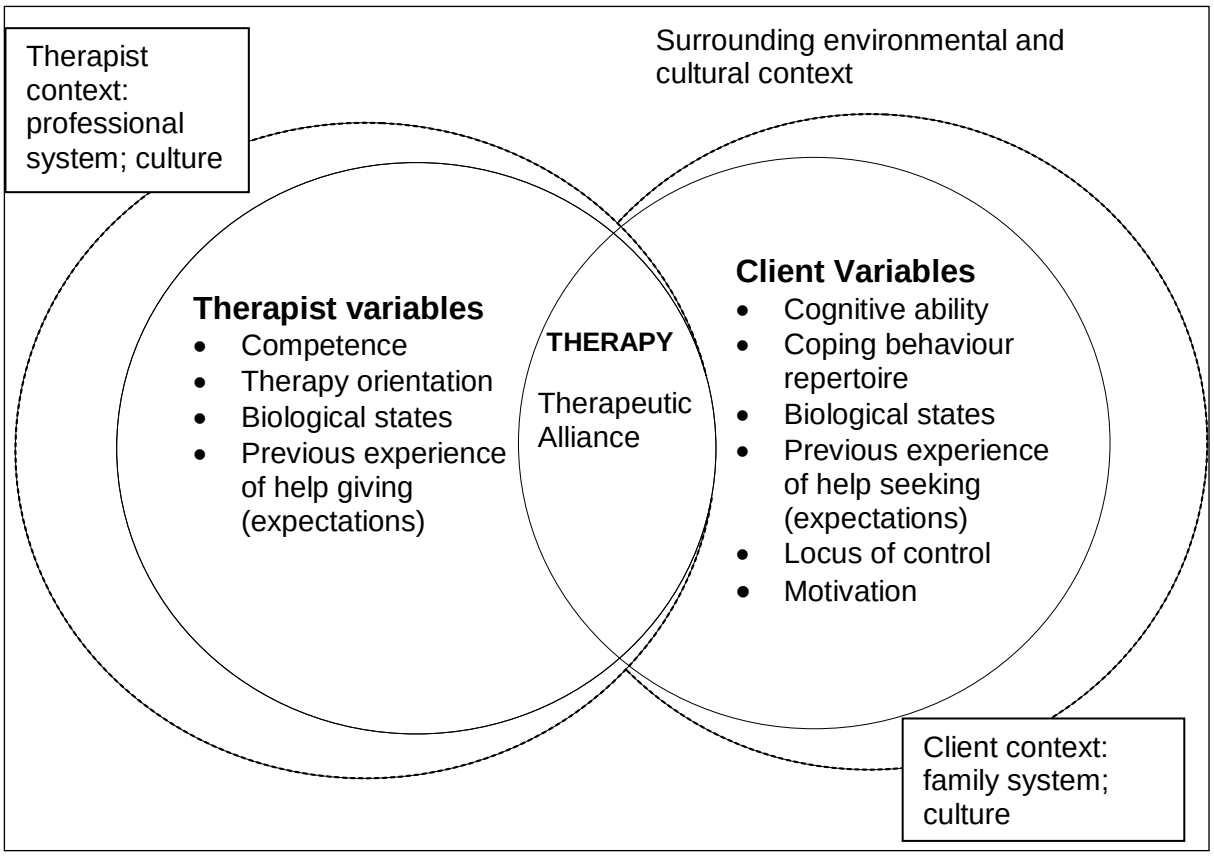
This review explores whether knowledge about intra-individual characteristics, such as psychobiological findings on stress reactivity, can contribute to our understanding of differences in the effectiveness of interventions to improve coping, specifically, stress-management interventions (SMIs) based on Cognitive Behavioural Therapy (CBT). CBT is well established as an effective treatment for a range of mental health problems and its use as a treatment for stress-related problems in occupational settings is also well evidenced; however, not every recipient of CBT in either setting will necessarily show improvement. Despite decades of research into the comparative effectiveness of psychological therapies like CBT, little is known still regarding how and why such therapies work. Mechanisms of change research in the field of therapeutic effectiveness has thus far focussed on therapy-specific variables or common factors such as therapist variables or the therapeutic alliance. Little attention has been paid to the role of individual client characteristics in processes of therapeutic change, and less still on psychobiological variables such as stress reactivity. High levels of stress reactivity have been found to constitute a risk factor for psychopathology, and further to impact upon cognitive processes of learning. The above is discussed along with consideration of the role of learning ability in therapeutic change. It is posited that stress reactivity may influence processes of therapeutic change by either an impact on in-session learning or by hindering the subsequent implementation of adaptive coping strategies in stressful situations.

Introduction

Exposure to stressors coupled with a basic failure to manage stress is a contributing factor to many common mental health problems and can be seen as central to the presentation of many who seek psychological help. CBT is established as an effective treatment for a variety of mental health problems, as well as an adjunctive treatment in physical health conditions (e.g., chronic fatigue syndrome: Lopez et al., 2011; and Halford & Brown, 2009). However, not all recipients show improvement following therapy and despite many decades of research demonstrating the efficacy of CBT and other psychotherapies, there is still relatively little known about the mechanisms of change involved (Kazdin, 2007). This limited efficiency of CBT (and indeed all therapies) is suggestive of a need for further exploration.

It is generally acknowledged that no one variable can be said to be wholly responsible for therapeutic change, yet research carried out thus far into mechanisms of change in CBT has largely focused on therapist and therapy factors. Many other variables which may be influential in the process of therapy are still to be systematically investigated (see Figure 1 for an illustration). Notably, the potential influence of intra-individual factors in processes contributing to therapeutic change appears largely to have been overlooked within the field of clinical psychology.

Figure 1: Illustration of some contextual factors in psychological therapy



The role of individual differences in cognitive abilities has received little research attention other than within the learning disability field (e.g., Taylor, Lindsay, & Willner, 2008); moreover, the cognitive processes underlying CBT are not clearly delineated in the literature. Learning, such as that required in therapy, implicates skills of attending to, encoding and consolidating information received; then, in order to utilise this learnt 'CBT knowledge', it needs to be reliably retrieved and implemented in trigger situations. However, these situations will be inherently stressful for the client and well-established findings about the negative impact of stress on memory retrieval (Wolf, 2009) suggest there is a need for the inclusion of such factors when considering mechanisms of change in therapy.

A growing evidence base suggests our early experiences and genetic make-up can influence important psychobiological variables, such as our biological susceptibility to experiencing situations as stressful – a concept termed 'stress reactivity' (Schlotz, Yim, Zoccola, Jansen, & Schulz, 2011). Therefore, potentially those with a higher stress reactivity level, that is a greater tendency to experiencing situations as stressful, may be more impaired by its negative effects – including those affecting cognitive processes needed for learning. It is therefore proposed that the effectiveness of interventions designed to improve adaptive coping – such as SMIs – may be influenced by an individual's level of stress reactivity.

As well as the potential role played by stress reactivity, an individual's level of intellectual ability may also influence their capacity to benefit from CBT, an oft-cited point in the historical argument against its offering to individuals with intellectual disabilities. Research into the prerequisite cognitive abilities needed to undertake CBT is scarce; more often than not, possession of such skills is assumed in the absence of a diagnosis of intellectual disability.

The coming together of these two issues – the differences in effectiveness of interventions to improve coping with stress and the potential influence of differing levels of stress reactivity and learning ability – is addressed in the empirical paper with the testing of hypotheses regarding an association between coping behaviour change following intervention, and stress reactivity and learning ability. It is proposed that a psychobiological variable such as sensitivity to stress influences the ability to benefit from CBT (or other

change-focused therapies).

To complement the empirical paper a narrative review was decided upon, as opposed to a systematic review, due to the lack of a body of studies specifically investigating stress reactivity in relation to therapeutic effectiveness and change. A narrative review seeks to generate a number of narrative conclusions resulting from a synthesis of the relevant literature and is valuable when one is attempting to link together many studies on different topics, either for purposes of reinterpretation or interconnection (Baumeister & Leary, 1997).

This narrative review begins with defining the concept of stress, moving onto to consider the role of stress in mental health settings and introduce the research regarding cognitive behavioural stress management (CBSM) interventions. The existing mechanisms of change literature are then considered, along with the burgeoning role of neuroscience in furthering our understanding of the impact of stress. Finally this narrative review introduces the concept of stress reactivity and presents a case for its consideration when exploring processes of therapeutic change, specifically through effects on learning and adaptive behaviour change.

Literature Review Search Strategy

To locate relevant papers, the electronic bibliographical database PsychINFO was used and due to the breadth of the proposed review a number of different search terms inputted: ‘stress reactivity’, ‘mechanisms of change’,

‘psychotherapy’, ‘cognitive behavioural stress management’, ‘stress management intervention’, ‘cortisol’, and ‘therapeutic effectiveness’. Combinations of these terms were searched across all fields (i.e. title, abstract, keywords). All searches were limited to English language, peer reviewed papers published in the past five years. Google Scholar was also searched using these terms. Additional search methods used were hand searching of references from retrieved papers (particular to identify seminal papers) and contact with experts in the field (mainly the researcher’s supervisor). Studies excluded from this review included those researching stress using non-human subjects.

The concept of stress

Stress is a word used to describe experiences that are challenging both emotionally and physiologically (McEwen, 2007). The concept of stress has evolved over the years with early ideas focusing on physiological regulation: Claude Bernard defined stress as a physical challenge to this internal process – vital to the ongoing survival of the organism – and the stress response as the physiological reaction to such threats (Bernard, 1865/1961; cited by Lovallo, 2005, p. 35). Later, Walter Cannon introduced the idea of homeostasis and was among the first to not only examine endocrine and autonomic responses to stress, but also the roles played by behavioural and psychological factors (Cannon, 1929; cited by Lovallo, 2005; p.35). Finally, Hans Selye, considered by many to be the father of stress research, was the first to systematically study the physiological responses to stress (in animals)

and observe a consistent pattern which he termed the ‘general adaptation syndrome’ (Lovallo, 2005); his findings still shape current research into stress.

In addition to this general response, Selye identified three separate stages of the stress response: alarm reaction, stage of resistance, and stage of exhaustion. A main feature of this stress response is the activation of the autonomic nervous system (ANS) and hypothalamo-pituitary-adrenal (HPA) axis, with the ‘fight-or-flight’ response being the classical way of understanding the behavioural and physiological response to a threat from a dangerous situation. This response to environmental threat produces a set of complex, highly orchestrated responses within the neural circuitry of the brain and peripheral neuroendocrine pathways regulating metabolic, immunologic, and other physiological functions (Boyce & Ellis, 2005).

Although the stress response was recognised as being adaptive to an organism’s survival, there was also a cost in the effort required to mount and sustain the response; Selye was among the first to observe that exposure to stress had long-term, as well as immediate, consequences for an organism, with the frequency and duration of such exposure being key to the resulting impact. Since then, the evidence supporting a link between exposure to stress and subsequent ill health, both physical and mental, has been growing (e.g., McEwen, 1998 and see Lovallo, 2005, for a comprehensive introduction to the topic). In depth discussion of stress and its impact upon physical health is beyond the scope of this review; however, the association

between exposure to stress and mental health problems will now be explored.

Stress and mental health

All human beings will experience stress at some point in their lives, usually as a result of exposure to adversity and some much more than others. Excessive activation of the HPA axis as a response constitutes a risk for psychopathology, such as depression (Ehlert, Gaab, & Heinrichs, 2001; Sandi & Richter-Levin, 2009) and increased sensitivity to stress, possibly related to severe early life stress, has also been posited as a biological risk factor for later mental health problems in adulthood (e.g., Heim et al., 2000; Myin-Germeys & van Os, 2007). Therefore, individual sensitivity to stress and subsequent ability to effectively manage it (i.e., cope) can be argued as being significant factors in vulnerability to mental health problems.

Although the effects of stress are more commonly looked at within occupational settings (e.g., junior doctors: Iversen, Rushforth, & Forrest, 2009), much research has been done into the association between early life stresses and later mental health functioning (e.g., Clark, Caldwell, Power, & Stansfeld, 2010). Interestingly, in adolescents at least a recent longitudinal study suggests it may be ongoing life stress which actually mediates the effect of early adversity on later mental health problems like depression (Hazel, Hammen, Brennan, & Najman, 2008). It is clear therefore that exposure to stress has implications for mental health, especially if such exposure is chronic and ongoing. The importance of skills in coping with life

stressors is highlighted by research such as Hazel and colleagues, even in cases where seemingly the ‘damage is done’. All of this strengthens the case for interventions which aim to improve coping and stress management.

For the many who seek psychological help, partly as a result of difficulties in managing stress, their coping strategies have often become unhelpful and maladaptive. The ability to cope with stress is an increasingly important skill in the modern Western world and demand for psychological help in general is growing, as is the cost of providing such services. It has long been recognised that improving an individual’s ability to cope with stressful life events generally makes for a more positive outcome; indeed, improved coping through the therapeutic treatment of anxiety is considered one of the great success stories of clinical psychology (Rachman, 2009). The dominant role in this success story has been (and still is) played by CBT.

Cognitive behavioural stress management (CBSM)

CBT is widely accepted and endorsed as the dominant form of psychological therapy in many parts of the world, both for practising clinicians and for researchers (Rachman, 2009). Described as “highly effective” (Butler, Chapman, Forman, & Beck, 2006, p. 28), this therapy represents the latest in a line of psychological approaches: the early Behaviourists saw mental ill health as products of ‘faulty’ learning which were maladaptive, but which could be ‘unlearnt’ too (mainly an American-driven perspective); the later Cognitivists challenged this view and saw mental ill health as products of ‘faulty’ maladaptive thinking, which could be ‘challenged’ or ‘reconstructed’ to

ameliorate the behavioural problems. CBT drew these two schools together (Rachman, 2009), an approach pioneered by Clark's cognitive theory of panic disorder in the 1980s, which went on to become a model for the cognitive analysis of various forms of anxiety.

The use of CBT as an efficacious treatment for psychological distress is supported by recommendation of its use in numerous guidelines compiled by the National Institute for Health and Clinical Excellence's (NICE; e.g., 2009). These guidelines are increasingly promoted as representing the best in evidence-based practice (EBP) and as such are implemented by the majority of NHS mental health services. Not being a diagnostic category in itself, stress is not commonly the primary problem presented to mental health services, and stress management interventions are more commonly seen in the setting of occupational and health psychology than clinical psychology (for a recent meta-analysis see Richardson & Rothstein, 2008).

Nevertheless, the need for intervention is no less than within clinical settings with the effects of stress increasingly a concern in occupational settings: the Confederation of British Industry (CBI) reports stress to be the second highest cause of absenteeism among non-manual workers, while non-work related stress is among the leading cause of long-term absence in this group (CBI, 2008). Increasingly, a link is being found between stress and ill-health, both mental and physical, with the governmental agency, the Health and Safety Executive (HSE), reporting an estimated 9.8 million work days lost to work-related stress in 2009/10, with this being the second most commonly

reported type of work-related illness (HSE, 2010). American and European business organisations also report similar concerns about employee stress (Richardson & Rothstein, 2008), suggesting that concerns regarding occupational stress can be generalised to most Western populations.

This problem of stress management in the workplace has been addressed by such a wide array of approaches that questions have been raised as to the validity or effectiveness of any or all of these. However, findings to the contrary were reported in a recent meta-analysis into the effects of occupational stress management intervention (SMI) programmes (Richardson & Rothstein, 2008). A total of 55 interventions were included, representing five different intervention types: cognitive-behavioural, relaxation, organisational, multimodal, and alternative interventions. The overall weighted effect size reported for all studies was reported as a significant medium to large effect (Cohen's *d* = 0.526; Richardson & Rothstein, 2008), suggesting that in general all the interventions had some positive effect on stress management. Nevertheless, intervention type was found to moderate outcome, with cognitive-behavioural interventions producing consistently larger effect sizes than other types of intervention programmes. That said, outcomes measures were mostly based on psychological variables, as opposed to physiological or organisational ones – both of which could be argued are important intervention effects worthy of measurement.

A study using physiological as well as psychological outcome variables

provides further evidence for the effectiveness of CBSM and, interestingly, preliminary evidence for its potential for use as a preventative measure in healthy participants. The randomised controlled study found that those participants who had received CBSM (consisting of a short group-based cognitive-behavioural stress management training) prior to experiencing an acute stress test (the Trier Social Stress Test, TSST) showed an attenuated endocrine response (assessed with salivary free cortisol response) and lower stress appraisal, compared to the control group participants who experienced the TSST before receiving the CBSM (Gaab et al., 2003). Furthermore, this attenuated response has been shown to persist over time (at four month follow-up; Hammerfald et al., 2006), and has also been evidenced in a more naturalistic setting with students sitting an examination (Gaab, Sonderegger, Scherrer, & Ehlert, 2006). All of which provides strong support for use of CBSM as performing a preventative as well as therapeutic function.

Similarly, Limm and colleagues reported positive effects of an SMI in the workplace on both psychological outcome variables (the primary one of perceived stress reactivity) and secondary physiological outcome variables (including a measure of sympathetic nervous system activation; Limm et al., 2010). Although the group-based intervention was primarily of an organisational type, elements of the SMI in this study could be argued to have some parallels with cognitive-behavioural interventions; for example, training on how to deal with negative emotions and a problem-solving approach to identified stressful situations.

Thus far, evidence for the use of SMIs, and particularly CBSM in the workplace is compelling; similarly, applications of SMIs within health settings have resulted in encouraging findings. Exploration of stress and its effects has been central to much health psychology research and well-researched applications of SMIs in health psychology include breast cancer (e.g., Phillips et al., 2008) and those living with HIV+ status (Scott-Sheldon, Kalichman, Carey, & Fielder, 2008). Such interventions have been found to significantly decrease levels of stress and anxiety in adults with HIV+ status, and generally improve mental health and quality of life (Scott-Sheldon et al., 2008). Moreover, although SMIs have been reported as having little effect on immunological or hormonal outcomes compared to controls, this may be more reflective of methodological issues with short follow-up periods (generally within one-week post-intervention) and sample characteristics (such as advanced stage of HIV status in Scott-Sheldon et al., 2008). It is possible that longitudinal studies may show an effect of SMIs on even physical health outcome variables and research involving a seemingly uncontrollable physical illness highlights the importance of individual responses to stressors. The potential for SMIs to influence physiological outcome variables is an area in need of further longitudinal studies.

Overall, the evidence is encouraging regarding the efficacy of SMIs in both an occupational and health setting. Findings show some success in attenuating both cognitive and endocrine responses and improving mental health outcomes. That said, the majority of studies thus far have been with healthy participants; replication with clinical populations in both real-life and

laboratory-based stressful situations is evidently needed. However, as with most psychological therapies this effectiveness is inevitably limited. Despite the success currently being enjoyed by CBT and its derived applications such as CBSM, reported effect sizes indicate clearly that not every recipient benefits: indeed, it is acknowledged that even the most potent of the available treatment are limited in their effects, helping many, but not all patients, regardless of clinical disorder (Kraemer, Wilson, Fairburn, & Agras, 2002). Treatment failures are to be expected, but remain a little-published aspect of the evidence-base (e.g., Coffman, Martell, Dimidjian, Gallop, & Hollon, 2007). Furthermore, the reasons for such non-response are rarely subjected to investigation.

To encourage further progress is not to belittle the indisputable achievements of psychotherapy and CBT to date, but treatment efficacy reached a plateau some years ago and, until recently, little had been done to improve on this situation (Moras, 2006). To address this issue, the recent resurgence of interest into mechanisms of change research is encouraging; the exact nature of such potential mechanisms of change could help determine the future of CBT and its application.

Mechanisms of change research

Most, if not all, psychological therapies proven as efficacious are limited in their efficiency (rates of improvement) and their effectiveness (rates of re-occurrence and sustained remission) (Moras, 2006). The more widely

disseminated interpretation of this is of all therapies as being generally equal in their (limited) efficacy; the focus of much research has therefore been to establish the mechanisms of change for specific therapies, seemingly in order to 'win the race' (the so-called 'dodo bird verdict'; Luborsky et al., 2002).

Investigation into "what works for whom" is possibly seen as the 'holy grail' of psychotherapy effectiveness research. Mechanisms are causal links between a treatment and its outcomes (Moras, 2006). Central concepts in change mechanisms research are moderators and mediators: a moderator identifies on whom and under what conditions treatments have different effects; while a mediator identifies why and how treatments have their effects. Mechanisms of change research can be divided into the study of specific factors – that is specific to the therapy being investigated – and the study of non-specific or 'common' factors. There have been advances in research on whether a particular treatment works, usually as compared to an alternative[1], but very little has been discovered, or indeed investigated, in terms of *how* and *why* proven efficacious psychological treatments work (Kazdin, 2007).
Whilst long recognised as vital by researchers for the application of scientifically based principles of therapeutic change to the treatment of psychological distress, causal mechanisms in therapy are still yet to be clearly defined. The development of structured techniques such as meta-analysis in the 1970s and RCT designs in the 1980s helped to improve the

[1] It is notable that this question is more amenable to being answered by available scientific methods such as the RCT design.

rigour of psychological treatment research, and settled scepticism about whether treatments actually worked (Moras, 2006); however, questions remained about the validity of associated methods to reliably determine and assess the problem(s) a psychological treatment is intended to target.

A primary justification for focussing on research into causal mechanisms of psychological treatment is to “optimize all treatments that are routinely provided” (Moras, 2006). As far back as the 1960s there were calls to scientifically establish, ‘‘what treatment, by whom, is most effective for this individual with that specific problem, under which set of circumstances’’ (Paul, 1967, p. 111: as cited in Doss, 2004). Though these calls continue in current research (e.g., Doss, 2004), the focus is on the therapeutic process and the ongoing debate about the relative contribution of specific and ‘common’ factors to different therapeutic treatment outcomes (for an interesting critique of the latter see, DeRubeis, Brotman, & Gibbons, 2006; and Kazdin, 2005).

However, many factors contribute to the therapeutic process and a consideration seemingly missing from the existing research is that of the influence of individual psychobiological variables – both as mechanisms of change, but also to potentially explain why some therapies do not result in improvement for some individuals. The interaction between our biology and behaviour, and the subsequent influence of this upon the therapeutic process, receives more interest in the field of Health Psychology than that of Clinical Psychology. Nevertheless, the role of bodily arousal in

psychopathology and its relationship to cognitive processes has been considered by Teasdale in his Interactive Cognitive Subsystems model (ICS; see Barnard & Teasdale, 1991; and Teasdale & Barnard, 1993). More recently the importance of affect regulation – and by implication bodily states – to psychological functioning is being explored by the growing literature on the subject of Mentalisation (particularly in relation to Borderline Personality Disorder, e.g., Fonagy & Luyten, 2009).

Nonetheless, a related area growing in interest is the influence and application of neuroscience to psychotherapy; the beginnings of this collaboration between psychobiological researchers and clinical researchers supports the idea of these variables as being important to processes underpinning therapy.

Neuroscience and psychotherapy

Neuropsychological research has three main branches: cognitive neuroscience, addressing the neural bases of cognitive functions such as learning, attention, memory, and perception; affective neuroscience, focusing on the neural bases of mood, emotion and affective style; and behavioural neuroscience, which focuses on explaining the basic mechanisms of behaviour via the study of neural and other biological substrates (Moras, 2006). It is the latter of these which affords the greatest link between clinical and neuropsychological schools of research.

Consideration of behaviour in psychological problems is of course nothing

new: both early American and British Behavioural psychologists construed psychological problems as problems of behaviour. However, though the influence of biology on behaviour was often recognised, ultimately it was considered these problems could only be ameliorated through adaptive behaviour change (Rachman, 2009). The subsequent cognitive revolution, although positive in its drive for recognition of the cognitive processes in psychological distress, is generally thought to have resulted in somewhat of an over-correction of the emphasis on behaviour; consequently, these processes became neglected in research.

Change mechanism research in CBT may still have much to discover but behavioural neuroscience, and the related emerging field of neurobehavioural therapies may help shed further light (e.g., Siegle, Ghinassi, & Thase, 2007). More usually researched in the context of physical health problems, Siegle and colleagues discuss therapies targeted to address neurobiological mechanisms thought to underlie psychological disorders. This shift in direction for psychological research is welcomed by Moras (2006) who, in her review paper, poses three key questions regarding: the nature of the problem to be treated, the causal change mechanisms of efficacious psychological treatments, and whether more efficient and broadly effective psychological treatments be developed. She synthesises the psychological and neuroscience research to argue that the latter can add to and accelerate progress in answering these questions.

As a way of reinstating the importance of behavioural processes in

psychological distress, in particular, behavioural neuroscience offers alternative ways of understanding behavioural change in therapy (where behaviour could be represented by cognitions as well as actions). A potential limitation of traditional therapies like CBT is a reliance on aspects of an individual's functioning which are both conscious and subject to 'wilful modification': for example, cognitive therapy (CT) posits that an individual can learn to monitor, evaluate, and then change specific thoughts and beliefs. However, client reports of an inability or helplessness to wilfully modify distressing thoughts in the face of intense emotional arousal suggests a weakness in CT: either in its theory or in the techniques derived from the theory of the nature of the problem to be treated.

Indeed, underlying mechanisms that are not conscious and not amenable to conscious and wilful regulation may represent obstacles to optimal outcomes in traditional therapies (Siegle et al., 2007). This is not a new premise; the entire psychodynamic and psychoanalytic schools of thought are built upon the idea of unconscious processes as being fundamental to mental distress. However, modern behavioural neuroscience differs in its argument against the existence of defensive mechanisms which prevent these unconscious processes from becoming conscious. For example, findings from neuroscience suggest these processes are unconscious because they *cannot* be made conscious.

The combining of neuroscience strategies with psychological research offers the potential to address knowledge gaps such as how psychological

treatments in general work versus how those found to be efficacious work in particular – and further elucidate the nature of mental distress in the process. Arguments for the relevance of brain-related research to psychological treatment research are not new: in the 1970s the level of individual nerve cells and their synaptic connections was posited as being crucial to the understanding of how psychotherapeutic interventions work (Kandel, 1979; cited by Moras, 2006), a suggestion repeated more recently (Etkin, Pittenger, Polan, & Kandel, 2005). However, this topic is rarely present in the clinical psychology literature, perhaps partly the result of a resistance even to the idea of integration amongst some researchers and, particularly, clinicians, citing doubts including the fear of reductionism and over-application of a medical model (Moras, 2006).

Nevertheless, the contribution of neuroscience to clinical psychology is slowly being recognised: for example, identification of brain mechanisms associated with problems or symptoms across several diagnostic categories, such as emotion regulation and poor impulse control (Siegle et al., 2007), is already helping to explain some of the limitations of the existing diagnostic classification system. Moreover, neurobehavioural therapies are themselves being developed, such as Cognitive Control Training for depression (CCT; Siegle et al., 2007), comprised of both a psychological element but also components designed to act upon specific areas of the brain hypothesised as contributing to various disorders, either causally or as maintaining factors (the prefrontal cortex in the case of CCT and depression). Results such as those of Siegle and colleagues are thus far promising, suggesting CCT aids

reduction in both physiological mechanisms underlying psychological distress as well as associated symptomatology.

The two fields of research briefly discussed above, that of psychological treatments and neuropsychological processes, are gradually discovering the value of each for the other. However, as yet there has been little investigation into the potential impact of psychobiological variables on the therapeutic experience. Nevertheless, the idea that temperament may be an important moderator in psychological processes can be traced back to Pavlov's famous studies on dogs: classified as belonging to one of four nervous system groups, excitatory, inert, active, and weak, similarities were also noted with the human classifications of choleric, phlegmatic, sanguine, and melancholic (Pavlov, 1955; as cited by Lovallo, 2005). Furthermore, it was observed that these temperaments interacted with environmental experiences to make one more or less susceptible to disturbance from stressful stimuli; a similar sounding concept to that of stress reactivity.

Principles of behaviour therapy and learning theory also provide support for the importance of psychobiological variables: processes of habituation and systematic desensitisation both implicate stress responses. Early theorists readily acknowledged physiological reactivity as a component of fear and anxiety (Lang, 1968; cited in Rachman, 2009). However, in more recent times, the potential role played by psychobiological factors has been relatively overlooked by both clinical psychology research and practice. The majority of research into psychological treatment for stress has focussed

upon the aspect of the 'experienced emotion': that is, the subjective interpretation of the physiological manifestation. Relatively little attention within the sphere of clinical psychology has been paid to the physiological aspect of stress itself: the process at the root of any psychological response to a threatening situation, the human stress response.

Introduction to stress reactivity

Psychobiological stress reactivity refers to individual differences in response to stressors (Schlotz et al., 2011), arguably an aspect of temperament. Often referred to as the 'fight or flight' response, although protective and essential in times of threat, the stress response can become maladaptive when repeatedly activated in the context of chronic or extreme stress. Unlike our ancestors, for those in the developed world the majority of daily life stressors are psychosocial in nature and, whilst these generally pose no particular physical threat to survival, the physiological response triggered remains the same. Therefore, individual susceptibility to this response being triggered, or 'stress reactivity', is hypothesised as being a significant factor in how stressful a situation is experienced as being.

As well as being implicated in the aetiology, stress reactivity may also help explain maintenance of psychological distress. A question yet to be answered by the research is why some people seemingly refuse to let go of the maladaptive beliefs and cognitions posited to underlie the maintenance of such distress, in particular anxiety (Rachman, 2009). Problems exist in determining causality in CBT research and results are often open to

interpretation: for example, reduced episodes of panic could lead to less catastrophic thinking, or vice versa (Rachman, 2009). The debate is ongoing about the relative contributions and interactions between cognitions and behavioural change in therapeutic outcome, but the potential influence of psychobiological factors is again overlooked. With regards to the above example, an alternative question to ask might be whether fewer episodes of panic occur as a result of a desensitised stress response.

The concept of stress reactivity provides an additional viewpoint: perhaps those who seem unable to 'let go' of maladaptive beliefs about anxiety, are also those with higher stress reactivity – and it is this reactivity and its consequences which are reinforcing the maladaptive beliefs (rather than needing to let go of the beliefs before the undesirable outcome will decrease). Investigation into whether and how this reactivity can be decreased may benefit those who are deemed to be 'resistant' to other traditional treatments, such as CBT.

Differential susceptibility to both physical and mental illness following exposure to known harmful factors continues to preoccupy researchers, providing as it may the key to understanding individual resilience and therefore enabling more appropriately targeted treatments. The concept of stress reactivity has been posited as, at least partly, explaining why not all of those exposed to chronic stress necessarily go on to develop stress-related illnesses. Stress reactivity assumes that individual stress responses are relatively stable across contexts and time, but that they are also variable

depending on the individual's current and historic experiences with chronic stress (Schlotz et al., 2011). Repeated exposure to stress is assumed to more negatively impact upon those individuals with high stress reactivity. However, if this is the case it raises questions about why high levels of stress reactivity persist in the human race; with such potential disadvantages, one would expect nature to have selected out this trait.

Stress reactivity: An evolutionary 'hangover'?

There have been challenges to the view of high stress reactivity as an evolutionary 'hangover': a necessary price to pay for the development of an effective stress response system. Boyce and Ellis (2005) highlight the interactive association between early experiences and stress reactivity (with a focus on children's stress reactivity) and argue that heightened stress reactivity may not simply reflect exaggerated arousal under challenging conditions, but actually a biological sensitivity to context (BSC), which confers potential for positive effects of supportive environments, as well as negative effects of adverse ones. Similarly, Belsky and Pluess (2009), building upon their earlier work looking at the role of nature in shaping individual differences in plasticity, posit the concept of stress reactivity can be extended and better understood as, what they term, differential susceptibility to environmental influences: that the same vulnerability to being adversely affected by exposure to aversive environments may actually confer an advantage for those individuals when in supportive environments, potentially such as in the context of therapy.

Both of these hypotheses extend the already well established diathesis stress model: that some individuals, due to an underlying vulnerability in their make-up (e.g., physiological or endophenotypic in nature) are disproportionately likely to be affected adversely by an environmental stressor. Belsky and Pluess criticise this model as encouraging too much of a focus on identifying those who are vulnerable to developing mental health problems and in doing so, missing the other side of the story. Moreover, they argue most diathesis-stress research data already reveals differential-susceptibility evidence, but that this has been overlooked in favour of reporting data to replicate existing findings and support the diathesis-stress model[2].

A common aspect to all these models is the crucial role played by endophenotypic markers (whether of differential susceptibility or underlying vulnerability). One such marker identified has been stress reactivity and data supporting the idea of stress reactivity as a marker also support the idea of differential susceptibility: students found to have high reactivity (measures included blood pressure, heart rate recovery) reported few stress symptoms when experiencing few daily hassles, and many stress symptoms when experiencing many daily hassles (Gannon, Banks, Shelton, & Luchetta, 1989). This differential susceptibility has also been found in pre-school aged children (Boyce, Alkon, Tschann, Chesney, & Alpert, 1995) and though most

[2] This viewpoint has parallels with Positive Psychology in its argument for the identification and investigation of individual differences which enhance functioning: that is, a focus on underlying strengths as well as underlying vulnerabilities in mental health and wellbeing.

research has been conducted with children, evidence for the lasting effects of differential susceptibility into early adulthood does exist (e.g., Aron & Aron, 1997).

Indeed, the selection of genes which enhance sensitivity to supportive environments would seem to make evolutionary sense, an unavoidable cost of which is perhaps the concurrent increased sensitivity to abusive environments; a situation of "for better *and* for worse" (Belsky et al., 2007; p. 888, original italics). This is an interesting concept which, if the case, suggests it is not enough in research to simply contrast "problem" with "no problem"; the other end of the spectrum also needs to be represented (e.g., by contrasting "problem" with, not only "no problem", but also "skill" or "high functioning" as appropriate). In doing so, it is posited that resilience factors, as well as risk factors, may be better understood.

Thus far, high stress reactivity seems to represent more of a risk factor than a benefit in mental health; however, in their theory of BSC, Boyce and Ellis (2005) provide more detail about the way in which such an endophenotype may be advantageous. High stress reactivity, or BSC, is posited as being necessary to enable optimal functioning in extreme environments, acting as a form of "enhanced, neurobiologically mediated sensitivity to context…favoured by natural selection" (Boyce & Ellis, 2005; p. 272). This hypothesis, and that of differential susceptibility, is supported by data showing that both highly stressful and highly protective environments yield disproportionate numbers of highly stress reactive children (Ellis, Essex, &

Boyce, 2005). Such data also suggests the relationship between early adversity and stress reactivity is curvilinear. This idea is similar to the concept of conditional adaptation, which to put it simply explains how nature and nurture might interact to produce optimal context-dependent functioning. Boyce and Ellis posit that humans may have developed mechanisms which are sensitive to levels of supportiveness versus stressfulness in the early years, resulting in a kind of calibration of the stress response system to match the environment. Indeed, evidence that extreme stress (e.g., systematic abuse) or trauma may be associated with a *reduction* in stress reactivity further supports the idea of conditional adaptation, in as much as such a 'blunting' response to extreme conditions may serve a protective function. Thus, as well as facilitating differential susceptibility to environmental influences, BSC posits that high stress reactivity itself may in fact develop as a response to the quality of early caregiving environment an individual finds themselves in. Therefore, biological reactivity to environmental stressors is widely implicated in this process linking early psychological adversity to mental health problems. Given that those who seek the help of psychological services have often experienced such adversity, consideration of the subsequent impact of stress reactivity upon therapy is important.

Nevertheless, the early caregiving environment, as well as biological reactivity, is still of crucial influence: those individuals with high stress reactivity who experience a secure childhood generally enjoy better mental health outcomes than their high stress reactive peers who have experienced

poor childhoods (Boyce & Ellis, 2005). This is not surprising given the indisputable evidence for the importance of early experiences in shaping later psychological functioning, and perhaps suggests that, although high stress reactivity may optimise gain from either environment, 'for better' is still more advantageous for healthy development and outcomes than 'for worse'.

Belsky and Pluess acknowledge their paper, based on existing data, represents only preliminary speculation about the ideas of differential susceptibility and BSC. Much more rigorous investigation (e.g., meta-analysis) is now needed to facilitate the exploration of, for example, whether people are differentially susceptible to both enriching and abusive environments, or just one (or neither; Belsky & Pluess, 2009). The generally accepted phenomenon of neural plasticity can partly explain the mechanics of differential susceptibility, but questions need to be answered about what factors shape this plasticity: the age-old nature versus nurture.

These concepts of differential susceptibility and BSC have practical implications for clinical psychology: as well as being disproportionately more likely to develop mental health problems (and therefore seek help), those individuals who are differentially susceptible to adverse early experiences will perhaps actually be at an advantage in the supportive context of therapy. It is therefore possible that high stress reactivity represents an *advantage* in therapeutic intervention. Furthermore, the concept of BSC suggests that those clients who have experienced a childhood which was neither overly stressful nor overly protective could fare comparatively worse in therapy due

to their relative insensitivity to the environmental context – supportive or otherwise; an interesting concept worthy of further investigation.

As discussed, strong evidence exists to support early adversity as a risk factor for later poor mental health (Clark et al., 2010); therefore, given the majority of those who seek therapy as adults may well have experienced stressful early environments, it becomes even more important to establish the influence of individual stress reactivity in their presentation. The focus of the existing research has been with children and as yet little is known as to whether differential susceptibility, or BSC, may vary over time or across contexts; clearly, further investigation is needed, for example, longitudinal studies investigating stress reactivity and the development of mental health problems. Related to this, further research into the plasticity of the stress response is also important, for although high stress reactivity may facilitate optimal functioning in a stressful early environment, if this reactivity remains unchanged it may represent a dysfunctional response in the context of adulthood.

Stress reactivity therefore may represent an important variable in processes of therapeutic change through its impact on sensitivity to the supportive context of therapy, and also sensitivity to the stressful life experiences leading to the need to seek help in the first instance. For example, those with higher levels of stress reactivity may struggle with therapeutic techniques centred on adaptive behaviour change through exposure to those stressors. However, a further way in which this reactivity may influence success in

therapy is through the deleterious effect of stress on learning.

Stress and learning

In contrast to the as-yet unknowns regarding the potential impact of stress reactivity on the therapeutic process, the negative impact of stress on learning in general is well established; an impact which can only represent an obstacle in therapies such as CBT. Nowadays, the idea that psychological interventions fundamentally involve or promote learning is well accepted, as is the idea that therapeutic change inherently involves synaptic change (Moras, 2006). Central to participation in any therapy are the cognitive abilities of learning: “the processes by which changes in behaviour arise as a result of experience interacting with the world” (Gluck, Mercado, & Myers, 2008; p. 2). Illustrative of the importance placed upon these abilities is an historic resistance to using CBT with those individuals diagnosed with learning disabilities, who are deemed to not possess the requisite cognitive capabilities needed to benefit from such a resource (however, this stance is changing, see: Willner, 2005).

Other than cognitive therapy-specific skills however (e.g., the ability to recognise the mediating effect of cognitions about a situation on emotions; Willner, 2005), delineation in the literature is lacking as to what those capabilities might be; seemingly, more often than not, those without a diagnosis of learning disability are presumed to possess them. Therefore, given the implied importance of such capabilities for participation in CBT, investigation into factors which may impact upon learning ability seems

warranted.

The impact of stress on the abilities of learning is a well researched area, with the focus on memory processes (for a recent review see: Wolf, 2009). As with cognitive abilities, the memory systems implicated in therapeutic learning are not clearly delineated in the literature; however, it can be presumed that processes of encoding, storage and retrieval are essential to the success of CBT-based interventions, given the need for a client to learn new ways of coping. One well established important finding is that of stress impairing memory retrieval (e.g., Kuhlmann, Piel, & Wolf, 2005; Smeets, Otgaar, Candel, & Wolf, 2008; Tollenaar, Elzinga, Spinhoven, & Everaerd, 2008). The potential impact of this on successful implementation of strategies learnt in therapy is yet to be explored, but seems crucial given the inherently stressful nature of situations in which the individual would need to use the newly learnt strategies.

Further highlighting the importance of exploring the role of stress in therapy, other research has reported the stress hormone cortisol as having an enhancing effect on consolidation during encoding of material (Cahill & McGaugh, 1998; LaBar & Cabeza, 2006). These effects of cortisol have been found to be stronger for emotionally-laden material, with deleterious effects of cortisol on memory retrieval being stronger for negative (Wolf, 2009) and positive (Kulhmann et al., 2005)[3] material. These findings are in line with the

[3] Again, an evolutionary explanation for these effects posits them as adaptive functions:

idea that the amygdala (responsible for emotional functioning) interacts with the hippocampus (responsible for memory functions) to mediate the effect of cortisol (Roozendaal, Griffith, Buranday, de Quervain, & McGaugh, 2003; Roozendaal, Hahn, Nathan, de Quervain, & McGaugh, 2004); the retrieval effect suggests cortisol acts to impair the hippocampus, whilst the enhancement effect suggests cortisol acts to enhance the amygdala. In order for learning to take place, consolidation of the material needs to occur; however, the longer the gap between stress, learning and retrieval, the harder it is to distinguish between effects of stress on learning and effects of stress on consolidation. The nature and direction of the relationship between stress and these brain systems remains to be established (Schwabe et al., 2007).

In view of these findings, in the context of therapy, it is hypothesised that a more easily stressed individual is more likely to experience these negative effects on memory than an individual with more resilience to stressful situations. Thus, level of stress reactivity could be seen as potentially influential in the relationship between stress and learning. Findings such as these may lend clarity to psychopathological processes, for example, in the maintenance of phobias: enhanced memory for emotionally salient information (e.g., the feared stimulus) combined with impaired memory for prior coping in similar situations, may contribute to the formation of vicious

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when in danger, the salient points of the situation needed to be remembered to enhance sensitivity to future risk but recall of all previous fearful memories may risk the individual becoming overwhelmed.

cycles. However, as yet, the effects of stress on everyday problem-solving in naturalistic settings (and therefore more reflective of therapy context) have received little research attention. Clearly further research in this area is needed and careful consideration needs to be given to the encoding and retrieval contexts in therapy, in order to optimise therapeutic learning and gain.

Stress reactivity and adaptive behaviour change

It is clear therefore that learning is affected by stress, usually negatively, both at encoding and retrieval. However, CBT is not only about the learning of new adaptive information, it is also about the successful implementation of that information, usually in situations inherently stressful for the individual. The impact of stress on coping is therefore an important consideration when therapy is aiming for adaptive behaviour change in order to ameliorate presenting problems – as is usually the case with CBT. For example, if an individual is hoping to react differently to a stressful situation, the impact of that stress upon their ability to change their usual coping behaviour – coping flexibility – is crucial. Moreover, it is posited that the stress reactivity level of that individual will influence the extent of any impact of stress on this coping flexibility.

Recent research shows different memory systems are used under stress, with evidence for less use of cognitive (hippocampal based) strategies but more use of caudate-based stimulus response strategies (i.e., habits; Schwabe et al., 2007). High stress reactive individuals would be expected to

be more adversely affected by environmental stressors and distractions when performing learning and decision-making tasks, and indeed develop conditioned responses more easily and quickly than their low stress reactive peers (Boyce & Ellis, 2005). Recent research findings support this, and psycho-social stress induced prior to learning has been found to promote habit-behaviour (conditioned responses) at the expense of a more cognitively learnt, goal-directed, strategy (Schwabe et al., 2007).

In other words, when experiencing stressful situations people are more likely to base their subsequent decisions on habitual responses than on what they may know to be more helpful, or goal-directed. An evolutionary explanation for this centres on the idea of 'habit' based strategies as requiring less cognitive effort than cognitively learnt strategies; therefore leaving more cognitive capacity to deal with the current stressor and problem-solve, suggestive of an adaptive behavioural response to stress (Schwabe et al., 2007). This preference for stimulus response based strategies was not found to be an explicit memory bias – participants could explain their thoughts about choosing to use the stimulus response strategy, which perhaps suggests a conscious choice to use less effortful strategies and supports the evolutionary hypothesis.

The above findings have implications for the success of therapy involving behaviour change, and especially with individuals who experience higher levels of stress reactivity. Most individuals seeking help, regardless of their stress reactivity will likely feel anxious about the therapy experience itself,

with habitual responses which are likely to be maladaptive (hence their seeking help). These habitual responses may therefore risk being selectively implemented in stressful situations at the expense of goal-directed behaviours such as adaptive coping strategies learnt in-session. It therefore follows that the higher the level of stress reactivity, the more interference of habitual responses would be expected for any implementation of adaptive coping strategies. Although Schwabe and colleagues utilised a spatial learning task and their findings are yet to be replicated with real-life learning and problem-solving, such as that encountered in therapy, the influence of stress on memory, and stress reactivity in general are clearly important considerations for change-focussed therapies such as CBT.

Conclusions and Summary

The ability to manage stress is an increasingly important skill in the western world. Failure to do so or the use of maladaptive coping strategies such as substance misuse can often contribute to the onset of mental health problems. The use of CBT in the treatment of such mental health problems is increasingly favoured by an NHS constrained by budgetary and efficiency demands; however, not all recipients of such treatments show improvement. Research into what works for whom and more specifically *why* certain psychotherapeutic interventions work for certain individuals, still has a long way to go in answering such questions. The focus thus far has generally been on therapist and therapy factors, with the crucial role played by the client and their characteristics often neglected.

This review has considered the literature surrounding the hypothesis that psychobiological factors such as stress reactivity may be related to an individual's ability to benefit from change-focussed therapies like CBT. Based upon the evidence herein, it is concluded that this hypothesis is neither supported nor rejected, due to a dearth of literature on this specific subject. However, related to this hypothesis the following narrative conclusions can be drawn.

Firstly, the negative impact of stress on mental and physical health is well-established and individual sensitivity to stress has been posited as a risk factor for mental health problems. Individual stress reactivity has been shown to be associated with mental ill health, but investigation in relation to the process of therapeutic change is yet to be conducted. Importantly, existing research supports the idea of stress reactivity as being important in behaviour change, for example through the impact of stress on selective implementation of habit-based coping strategies. Therefore, further investigation of stress reactivity in relation to therapeutic processes of change is needed.

Secondly, research has also established the broadly negative impact of stress on learning, particularly in terms of deleterious effects on memory retrieval. However, the learning and cognitive abilities necessary and sufficient for participation in therapy are not clearly delineated in the literature. Further definition of these will be necessary before research into their role in behaviour change can be undertaken.

Finally, there is an imbalance in the literature with a relative lack of research into *how* psychological therapies work as opposed to whether they work, for example in terms of symptom reduction (Kazdin, 2007). Although mechanisms of change are increasingly the subject of investigation in the field of clinical psychology, the important category of client characteristics and how these may impact upon processes in psychological therapy, as opposed to therapy or therapist factors, is an under-researched area ripe for further investigation.

Therefore, it is concluded that further investigation is justified into the hypothesis regarding the role of stress reactivity in adaptive behaviour change, operating either through an impact on learning in therapy or an impact on adaptive coping behaviour change following a CBT-based intervention.

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The Roles of Learning Ability and Stress Reactivity in Coping Behaviour Change:

A brief CBT-based Stress Management Intervention

Empirical Paper

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Abstract

High levels of stress reactivity have been found to constitute a risk for psychopathology and also to impact on processes of learning. CBT is well evidenced as treatment for a variety of mental health problems, including stress-related problems in occupational and health settings. However, not every recipient of CBT will necessarily show improvement and despite decades of research there is still much to discover about how and why particular therapies work – or do not work – for certain individuals. No study to date has explored the role of stress reactivity in processes of therapeutic change. Therefore, this study recruited 63 university undergraduates for a longitudinal control group design to investigate whether stress reactivity was associated with the amount of coping behaviour change observed in the intervention group compared with the control group three weeks after receiving a brief CBT-based stress management intervention; the role of learning ability in this process was also explored. Mixed-design ANOVAs showed no significant intervention effect and correlations showed no significant relationship between stress reactivity and amount of coping behaviour change reported. However, a significant negative relationship was found between the variables of stress reactivity and learning ability, and consideration of these factors in future research into therapeutic effectiveness may be beneficial. Results and limitations of this study are discussed, along with suggestions for further research and implications for clinical practice.

1. Introduction

Behaviour change is a key outcome variable for many therapeutic interventions, most notably Cognitive Behaviour Therapy (CBT) with its focus on the opportunity for new adaptive learning and on producing changes outside the clinical setting (Hawton et al., 1989; chap. 1). CBT has been evaluated as an effective treatment for a range of mental health problems (for a review see Butler, Chapman, Forman, & Beck, 2006); however, the level of this effectiveness has reached somewhat of a plateau in recent decades and many researchers argue that psychological science is still a long way from understanding how and why different therapies work, and for whom they are effective (e.g., Kazdin, 2007).

Although widely used as an effective treatment for stress, particularly in occupational settings (e.g., Limm et al., 2010), efficacy studies have shown that not every recipient of CBT sees a benefit. Most psychological therapies proven as efficacious are limited in their rates of improvement and sustained effectiveness (Moras, 2006). Identification of the mechanisms of change is an important aspect of research which thus far has focussed on exploration of 'common' factors between therapies, such as the therapeutic alliance (Elvins & Green, 2008); less importance has been placed on investigating the effects of any interaction between psychobiological client variables and the therapeutic process, despite the general consensus that the majority of therapeutic change remains unaccounted for. In order to move forward with improving therapeutic effectiveness, identification of change mechanisms will

not only help clarify why certain therapies work for some individuals, but also why certain therapies result in little improvement for other individuals.

This study investigated one such client variable, that of stress reactivity, positing it as helping to explain why some people benefit more than others from change-focussed therapies such as CBT. Stress reactivity is a concept already used in health psychology to investigate the relationship between stress and ill health. Defined as “relatively stable individual differences in response to stressors” (Schlotz, Yim, Zoccola, Jansen, & Schulz, 2011; p.3), findings have suggested high stress reactivity increases the risk for ill health, and such a relationship has also been found for mental ill-health (Schlotz et al., 2011). A main feature of the stress response is the activation of the autonomic nervous system (ANS) and hypothalamo-pituitary-adrenal (HPA) axis, commonly referred to as the ‘fight-or-flight’ response. Although this response has been recognised for its adaptive function in an organism’s survival, there is also a cost in the effort required to mount and sustain such a physiologically resource-intensive response, with the frequency and duration of exposure to stressors being key elements in determining the subsequent impact (Lovallo, 2005).

Excessive activation of the HPA axis has been found to be a potent risk factor for psychopathology such as depression (Ehlert, Gaab, & Heinrichs, 2001) and interest in the relationship between stress exposure and mental ill health has been growing, particularly regarding the impact of early life adversity on longer term mental health outcomes (e.g., Clark, Caldwell,

Power, & Stansfeld, 2010). It therefore follows that increased sensitivity to stress, and subsequent ability to effectively cope with such stress, are also important factors in this relationship (e.g., Myin-Germeys & van Os, 2007).

Evidence suggesting that stress promotes habit behaviours at the expense of goal-directed performance (Schwabe & Wolf, 2009) may represent a further explanation for the relationship between high stress reactivity and poor mental health: those individuals who are easily stressed are perhaps more likely to resort to previously used, potentially maladaptive, coping strategies over and above any consciously (goal-) directed behaviour. Interest in stress reactivity within the Clinical Psychology field is thus far lacking, potentially due to the fact that studies involving traditional ways of measuring stress reactivity can prove expensive and resource-intensive, often relying on saliva samples, cortisol responses and other biological markers of stress. However, the psychobiological variable of perceived stress reactivity has been found to be related to biological markers of stress reactivity (such as those mentioned) and therefore a valid method of assessing individual stress reactivity (Schlotz et al., 2011).

Findings regarding the role of stress reactivity in vulnerability to mental health problems also strengthen the case for further investigation of its impact in the therapeutic process; in particular, the relationship between stress reactivity and coping. Coping strategies refer to the specific efforts, both behavioural and psychological, that people employ to master, tolerate, reduce, or minimise stressful events. The ability to adaptively modify coping responses

to stressors is particularly important in a CBT-based stress-management intervention, and when considering potential for therapeutic benefit from such interventions two prerequisite abilities are proposed: (1) the ability to learn, implicating cognitive processes of attention and encoding; and (2) the ability to generalise and use these strategies outside of the therapy session. For the former, the importance of cognitive abilities in order to gain from CBT interventions such as stress management is a little researched area[4] ; nevertheless, logically implicated would be the ability to learn stimulus-response associations (e.g., stressor-coping strategy). This ability partly depends on reliable storage and retrieval of the information in order to use it, but also on the level of coping flexibility needed to selectively use the newly learnt adaptive coping strategy over the competing maladaptive strategy previously used in that situation. It is proposed in the current study that an individual's level of stress reactivity will impact upon their ability to benefit from a CBT-based stress management intervention through the negative effect on coping flexibility – illustrated by the following hypothetical vignette:

> *Mrs A is experiencing physiological feelings of high anxiety, including breathlessness and heart palpitations. During therapy she learns that rather than trying to breathe in more at these times, it would be more helpful to breathe out and use distraction. However, Mrs A reports that every time she experiences these*

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[4] This importance is more commonly assessed when exploring the use of CBT for people with intellectual disabilities (Sams, Collins, & Reynolds, 2006)

physical feelings, she cannot help her behaviour of increasing her attempts to breathe in – despite knowing cognitively this is unhelpful.

The current study proposes it is potentially the high stress reactivity which influences coping behaviour change and prevents implementation of the more adaptive behaviour learnt in session – and therefore, from long-term therapeutic gain.

In addition to this effect on coping flexibility, a further effect of stress reactivity may be on the therapy learning process itself. It is well established that the physiological experience of acute stress detrimentally affects the cognitive resources available for tasks other than responding to the stressor (McGrady, 2007). Some may experience a therapy session as a stressor in itself with the consequent stress-response interrupting attention and encoding processes during therapy. Therefore, those with high levels of stress reactivity may be more likely to experience therapy as stressful and consequently more vulnerable to decreased learning ability during sessions. It would therefore be expected that those with high levels of stress reactivity may exhibit less in-session learning ability than those with lower levels.

To summarise, it is proposed that high stress reactivity may impact on coping flexibility, that is the ability to implement adaptive coping strategies, by either or both of an effect on in-session learning processes, or an effect on whether an adaptive or maladaptive (but previously used) coping strategy is chosen in the face of a stressor. Such a consideration is particularly important in CBT-

based stress-management, with its aim of raising awareness about unhelpful thinking and behaviour patterns in order to promote more adaptive coping in the face of everyday stressors. The concept of stress reactivity as impacting upon the therapeutic process is yet to be studied in non-clinical populations; therefore, the current study will explore this in a population frequently exposed to stressful situations – university undergraduates, whose individual abilities in coping flexibility may constitute an important variable in their academic success and potentially impact upon their mental health throughout life.

1.1 Research Questions

1. What effect will a brief CBT-based stress-management intervention (SMI) have on adaptive coping strategies?
2. What is the relationship between the intervention effect on adaptive coping strategies and either or both of the stable factors of learning ability and perceived stress reactivity?
3. What is the relationship between learning ability and stress reactivity?

1.2 Hypotheses

Primary hypothesis:

There will be a positive effect of the brief CBT-based SMI on problem-solving adaptive coping strategies in the intervention group: levels of adaptive state

coping will be significantly higher at follow-up in the intervention group compared to the control group, adjusted for baseline coping.

Secondary hypotheses:

Hypothesis 2a:

Learning ability will be associated with the intervention effect: participants in the intervention group who do not demonstrate learning will show less positive change in adaptive coping at follow-up than those who do demonstrate learning.

Hypothesis 2b:

Perceived stress reactivity (PSR) will be associated with the intervention effect: participants in the intervention group with higher PSR levels will show less positive change in adaptive coping at follow-up than those with lower PSR levels.

Hypothesis 2c:

Learning ability will be negatively correlated with stress reactivity: those with higher PSR levels will demonstrate less learning ability than those with lower PSR levels.

2. Method

2.1 Participants

Participants were 63 students of a British university, (60 of whom completed follow-up), recruited through a university intranet research booking website

(including a course-credit scheme operated for undergraduate psychology students) and campus advertisements (Appendix A). Non-psychology disciplines were encouraged in order to minimise demand characteristics or a female gender bias[5] ; however, the majority of the participants (>85%) were undergraduate students of Psychology. Total randomisation of allocation to control or intervention group was not possible given the fact that participants needed to know number of study credits and slot duration for advance booking; therefore, participants self-selected to conditions. Study information available to participants, and therefore potentially influential variables in their decision, included: the length of time required for participation in the first part of the study (being significantly less for control group participants); the perceived need/desire to receive "stress management tips and strategies" (as quoted in the intranet booking study advert, Appendix B); and finally, a need for the greater number of course credits/payment offered by participation in the intervention group. Individual availability for booking slots may also have influenced this self-selection. Of the participants, 53 (84.1%) booked through the course credits scheme (mandatory for their degree course) whilst the remainder received payment. Inclusion criteria for the study were: (1) an ability to understand written or spoken English; (literacy support was available for those participants who required it); and (2) to be over the age of 18 (for consent purposes). The first of these was justified by the verbal and written content of the assessment measures used in the current study.

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[5] However, as the gender ratio in adult mental health is 2:1 females to males, such a selection bias may actually be more representative of the target population.

In total, 32 and 31 participants self-selected to the control and intervention groups respectively. Their characteristics are presented in Table 1. Of the participants, 54 were female with no significant difference in the sex ratio between the two conditions. As expected, the majority of participants were aged between 18 and 25 years (see Table 1), with few in the over 26 age brackets, and the majority were of White British ethnicity (79.4%); there were no significant differences between the two conditions in these respects. Recruitment was restricted to this population for two reasons: primarily, as the study variables of stress reactivity, learning ability and coping styles had not been investigated together in clinical populations it was considered ethical practice to conduct preliminary explorations with a sample of healthy participants; secondly, students are exposed to significant stressors in the form of examinations and general academic workload and are therefore appropriate participants for a study exploring stress management interventions.

Table 1: Baseline characteristics of participants in the intervention and control groups. Significance tests are of the null hypothesis of no difference between the two groups.

	Intervention (*N*= 31)	Control (*N*= 32)	Statistic	*p* value
Females (%)	26 (83.87)	28 (87.5)	$X^2 = 0.17$	.73[c]
Age Range (%)				
18 – 21 yrs	26 (83.87)	24 (75)		
22 – 25 yrs[a]	5 (16.13)	4 (12.5)		
26 – 29 yrs[a]	0	2 (6.25)		
>30 yrs[a]	0	2 (6.25)	$X^2 = 0.76$	.54[c]
Ethnicity (%)				
White British	26 (83.87)	24 (75)		
Caribbean[b]	0	1		
Any other White background[b]	3 (9.68)	3 (9.38)		
Chinese[b]	1 (3.23)	2 (6.25)		
White & Black Caribbean[b]	0	1 (3.13)		
African[b]	0	1 (3.13)		
Any other ethnic group[b]	1 (3.23)	0	$X^2 = 0.76$	.54[c]

[a & b] These groups were combined for the chi-squared test. [c] Fisher's exact test due to low numbers in some cells.

2.2 Design

This was a mixed design study using both within-group (across time) and between-group (across conditions) methods. A longitudinal control group intervention design was employed to investigate the primary hypothesis that there would be a positive effect of the brief CBT-based SMI on problem-solving adaptive coping strategies in the intervention group*;* allocation to control or intervention group was determined by participant self-selection.

The independent, or predictor variable, for the primary hypothesis was the condition; that is whether the participant was in the control or intervention group. The dependent, or outcome variable, was the level of self-reported adaptive coping (across time).

For the secondary hypotheses, the two predictor variables were learning ability and individual perceived stress reactivity, with the outcome variable the same as for the primary hypothesis: the level of self-reported adaptive coping.

The main data gathering technique was quantitative, through the use of questionnaires to assess coping strategies and perceived stress reactivity. Also investigated as potential confounds of changes in coping strategies were the secondary variables of current and chronic stress levels. Alongside this methodology, a computer-based associative learning task was employed to assess learning ability.

A priori power analysis was calculated using G*Power version 3 (Faul, Erdfelder, Lang, & Buchner, 2007). Assuming achievement of at least a small-medium effect size (f =.20; Cohen, 1992) it was calculated that at least 52 participants were needed to achieve 80% and 5% significance level. Participant recruitment and retention can be unpredictable; therefore, compromise power, a novel concept in statistics which can be applicable in uncontrollable recruitment situations (Faul et al., 2007), was also calculated.

Assuming achievement of at least the same effect size *(f* =.20), a sample size of 35 would have produced 70% power.

2.3 Materials

A university intranet-based survey tool (iSurvey) was utilised for the majority of data collection in the form of the questionnaire measures; additional to this were the computer-based associative learning task (CBALT; based upon Thorwart, Glautier, & Lachnit, 2010), a published self-help booklet: "Introduction to Coping with Stress", and a manualised brief CBT-based stress-management intervention (SMI; created and delivered by the researcher).

Demographic information was obtained via electronic form prior to presentation of the questionnaires; categories included age group, ethnicity, and gender.

2.4 Psychometrics

2.4.1 Assessment of stress reactivity

Perceived Stress Reactivity Scale (PSRS; Schlotz et al., 2011).

The PSRS consists of a self-report 23-item questionnaire assessing reactions to past situations; it is a standardised measure with good psychometric properties, including consistently high reliability coefficients in the current study (see Table 2). Respondents are required to pick one of three possible answers and scoring of the PSRS yields a total score (max = 46) along with reactivity scores for five different domains including work overload, social

conflict, and failure (see Appendix C for a copy of the PSRS, free for use in non-commercial research).

2.4.2 Assessment of coping strategies

COPE (Carver, Scheier, & Weintraub, 1989)

The COPE is a 60-item self-report questionnaire (see Appendix D) designed to tap a predetermined set of state coping strategies. It is designed for adaptation to suit the requirements of the study; in this case, the state (as opposed to trait) version was administered, and a two-week time-limited period was used for the instructions in order to fit with the follow up timescale. It is widely used in research settings due to its constant set of scales and items, and yields 15 factors reflective of active versus avoidant coping strategies. Ratings are made on a 4-point Likert-type scale and it has good psychometric properties, with high reliability coefficients being reported in the current study (see Table 2).

2.4.3 Assessment of stress levels

Perceived Stress Scale (PSS; Cohen, Kamarck, & Mermelstein, 1983).

The PSS is a short standardised 10-item self-report questionnaire (Appendix E), assessing the frequency of particular feelings in the last month and stress-related appraisal of situations using a 5-point Likert-type scale ranging from 0 ('Never') to 4 ('Very Often'). It comprises six negative and four positive elements: the negative element is intended to assess lack of control and negative affective reactions, while the positive element measures the degree of ability to cope with existing stressors. Reported psychometric properties

are good (e.g., Leung, Lam, & Chan, 2010) with high reliability coefficients reported in the current study (see Table 2).

Short Trier Inventory for Chronic Stress, (STICS; Schlotz & Schulz, 2009). The STICS is a (copyrighted) 30-item self-report questionnaire (although only 24 of these are used to compute scores) providing a measure of the different domains in which a person may be experiencing chronic stress, (e.g., 'performance pressures', and 'excessive demands'), as opposed to simply measuring stress levels. Participants were requested to indicate how often given descriptions of situations and experiences have happened to them in the past three weeks on a Likert scale from 'Never' to 'Very Often'. For example: "Situations in which I have to make an effort to win other people's trust" and "Times I can't stop thinking about things that worry me". Preliminary analyses have reported good reliability and validity coefficients (Schlotz & Schulz, 2008) and as Table 2 shows, high reliability coefficients were reported in the current study.

Table 2: Reliability and completion time of psychometric tools

Psychometric	Reliability coefficient*	Time to Complete
PSRS	.81 - .88	5 mins
COPE	.88 - .91	5-10 mins
PSS	.86	3-5 mins
STICS	.87 - .91	5-10 mins

*Cronbach's alpha calculated from both time points of current study data

2.5 Assessment of learning ability

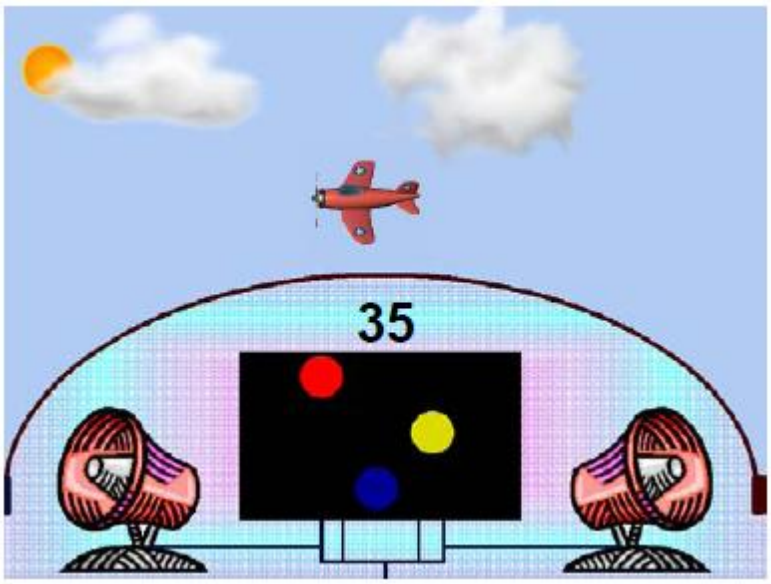
For the purposes of this study, learning within a therapeutic setting was defined through the cognitive processes involved in the taking in of information (attention and encoding) and its subsequent appropriate and accurate use. In order to assess learning, the current study utilised a computer-based associative learning task (CBALT) designed by one of the creators of a feature-negative discrimination task used by Glautier & Elgueta, (2009) and Thorwart et al. (2010). This task has previously been used as a measurement of learning and took approximately 30-40 minutes to complete. In feature-negative discrimination "stimulus A is reinforced when presented alone (A+), but non-reinforced when presented together with a second stimulus B (AB−, with B called the feature-negative"; Thorwart et al., 2010, p. 207). For purposes of data collaboration only, the task consisted of four conditions to which participants were successively allocated: auditory (aa), visual (vv), auditory-visual (av), and visual-auditory (va); condition allocation determined which sensory modality A and B came from (e.g., in condition 'va' stimulus A was visual and stimulus B was auditory). Between-condition data yielded from this task were not relevant to the hypotheses of the current study and therefore not included in subsequent analyses.

2.5.1 Description of task

Participants sat in front of a laptop (placed on a laptop stand with a separate keyboard) and watched events on a computer screen where the display delivered the impression of a flight control centre (see Fig. 1). Prior to commencing the task, an onscreen script instructed participants to learn the

extent to which different signals can be used to predict pollution levels produced by a plane ‘flying’ across the screen (see Appendix F for exact onscreen instructions).

Figure 1: Example of screen: The coloured circles served as conditioned stimuli, the number displayed above represents the air pollution level.



Conditioned stimuli (CS) were nine coloured circles and/or auditory signals (auditory stimuli presented only in the two auditory conditions of the task: ‘av’ and ‘va’); the circles could appear in one of nine positions within a black rectangle on the lower half of the screen (see Fig. 1), whilst the auditory signals were heard via headphones (either presented with the circles in conditions ‘av’ and ‘va’ or presented alone in condition ‘vv’). Auditory signals and colour and position of the circles were assigned randomly for each participant (but were consistent within participants). The CS were presented for 3 seconds.

The unconditioned stimulus (US) was a ‘positive outcome’, consisting of an increase in pollution level to an average of 40 (range 35 – 45). The pollution level produced by a plane which moved across the computer screen was displayed continuously as a number above the coloured circles and updated approximately every 0.25 seconds. It varied randomly around an average of 20 (range 15-25) except when the US was scheduled.

The task for the participants was to learn to predict the pollution level, based on the presentation of the CS. Each trial began with a plane flying across the screen and a CS coming on for 3 seconds. If a positive outcome (pollution rise to 40) was scheduled to occur, it did so 1 second after CS onset and lasted 2 seconds. The task consisted of 86 trials, participants experienced 48 training trials in total, comprising the target stimuli: A+, J+; the feature negative stimuli compounds: AB–, JK–, AJ–, JA–; and filler cues: C–, EF+, L–, MN+, B–, CK+, L–, KB+. Filler cues were included so there was a mixture of reinforced and non-reinforced trials (but only target stimuli were consistently presented with the US). Stimuli were randomly assigned the letters A-O. Condition allocation within the task determined the stimuli presented (see Table 3).

Table 3: Design of the CBALT; plus denotes reinforced trial and minus denotes non-reinforced trial

Group (condition)	**Critical discrimination**		**Filler cues**	**Transfer test**
	Target stimuli (CS & US presented)	**Feature-negative stimuli (CS but not US presented)**		
Visual+, Visual feature– (vv)	A+	AB-	C- EF+	AG, ABG
Auditory+, Auditory feature– (aa)	J+	JK-	L- MN+	JO, JKO
Visual+, Auditory feature– (va)	A+	AJ-	B- CK+	AO, AJO
Auditory+, Visual feature– (av)	J+	JA-	L- KB+	JG, JAG

For example, a participant allocated to condition ‘vv’ (the first row of Table 3) would experience training trials of A+ (stimulus A in the presence of the US), AB- (stimuli A and B not in the presence of the US), C-, and EF+ (filler cues). In test trials these stimuli would be presented again to test if the participant could predict when pollution levels would rise (and would be deemed to have learnt the critical discrimination if they could discriminate between A and AB). Transfer tests would then test if the participant could still discriminate between stimuli A and AB when presented in a different context (with visual stimulus G). Condition allocation determined from which sensory modality A and B came; for example, in condition ‘vv’, both A and B were visual stimuli (coloured circles) and no auditory stimuli were encountered.

The task was arranged in blocks of training trials after each of which there was a test stage consisting of four trials in which participants were asked to enter the predicted pollution level based on the CSs being presented (coloured circle(s) and/or auditory signal(s)). The task finished with transfer tests where novel stimuli (G or O) were presented along with conditioned stimuli (for stimuli compounds see Table 3); this assessed how well the discrimination transfers to a different context. Transfer tests were included to represent learning of information in the context of therapy, but the need for this information to be implemented in a different context (i.e., real-life situations).

Participants' responses during the tests were self-paced; they had as much time as needed to respond. The order of test trials was determined randomly as was the order in each training block.

Learning ability was assessed according to whether the participant demonstrated learning of the critical discrimination – that is how many trials it took to learn the difference between the target (the US being presented with the CS, e.g. A+) and the feature negative (the US not being presented with the CS, e.g. AB-) trials. This classification was achieved with the following formula, where X= target trial (prediction of pollution level in presence of CS alone, e.g. A) and XY = feature negative trial (prediction of pollution level in presence of CS and feature negative, e.g. AB):

If (X7+x8+X9) > (XY7+XY8+XY9) = learner

This formula compared the last six blocks of the two cue levels: if a participant gave higher overall prediction scores for the target trials (e.g., X7, X8 etc.) than the feature negative trials (e.g., XY7, XY8 etc), they were judged to have learnt to correctly discriminate and therefore predict the US.

2.6 Additional materials

Self-help booklet: "*Introduction to Coping with Stress*" (Brosan, 2010).
This booklet was developed by psychologists for independent or supported use, mainly in primary care mental health settings; given to all intervention participants as a summary of material covered in the brief SMI (participants of the control group received the booklet upon completion of the three-week follow up). Additionally, a whiteboard was utilised in the brief SMI sessions to illustrate points and facilitate understanding.

2.6.1 Manualised stress-management brief intervention

The researcher, experienced in the delivery of psycho-education with adults, created the manual based on the aforementioned self-help booklet as a guide for the brief SMI (see Appendix G for full manual). The contents of the session were designed to introduce participants to the CBT model and educate individuals about the physiological effects of stress, as well as encouraging participants to think about current coping strategies and consider future goals for improved coping. The session was broadly based on the first session of an evidence-based five week stress management course widely delivered in adult primary care mental health settings. The 45 minute session covered the following:

- Introduction to the five-systems CBT model (illustrated with participant-elicited example on a whiteboard);
- Explanation of physiological stress response; fight/flight response;
- Introduction of The Beaker Analogy to illustrate the importance of a balanced lifestyle; eliciting of current coping behaviours
- Introduction to cognitive techniques such as awareness of thoughts, unhelpful thinking patterns, and thought-challenging;
- Goal-setting; consideration of improved future coping strategies
- Relaxation exercise: progressive muscle relaxation (offered to participants as an optional element)

2.7 Procedure

The first part of the procedure for all participants (control and intervention group) was as follows:

2.7.1 Part One

Participants individually met with the researcher for the first part of the study, completion of which took on average 45 minutes; the location of sessions, on university premises, remained the same throughout the study and information about where to meet was included at the time of slot booking. After brief introduction of the researcher, participants were directed to a computer screen displaying the Participant Information Sheet (PIS; hosted by the intranet survey tool, iSurvey; see Appendix H). Participants were instructed to read this information and electronically complete a consent form (tick-box

indicated consent), demographics form, and the four questionnaires (randomised presentation): PSS, STICS, PSRS, and COPE.

Following completion of the questionnaires, all participants were directed to an adjacent laptop to carefully read the on-screen task instructions and complete the CBALT. Following completion of this task, all participants were given an opportunity to ask questions or provide feedback. Control group participants were then informed of the three-week follow-up procedure whence they would be emailed a link to the follow-up questionnaires (again, hosted on iSurvey) and subsequently forwarded the self-help booklet (if desired). This constituted the end of their involvement in the first part of the study; intervention group participants continued onto the second part of the study.

2.7.2 Part Two

This part of the study took on average 45 minutes. Following completion of the CBALT, intervention group participants were informed of the brief individual CBT-based stress management session aims (see manual, Appendix G) and given opportunity to ask questions. Individuals were clearly informed that they should only answer questions they felt comfortable with – and to make something up if they preferred. The intervention was then delivered by the researcher to individual participants, in the form of didactic teaching with the use of a whiteboard for the drawing of models, analogies, and elicited responses. A ‘Further Support Information’ sheet was provided at the end of the session (see Appendix I) as was the self-help booklet

"Introduction to Coping with Stress" as a summary of the information covered and additional reading for those who wanted it.

2.7.3 Follow-up

Three weeks after their initial participation, participants were emailed a link to the iSurvey website for completion of the PSS, STICS, PSRS, and COPE questionnaires again. Upon completion of these questionnaires, a de-briefing statement was displayed (Appendix J) and interested participants were advised of contact details for further information about the study and a summary of its findings.

2.7.4 Ethics

All data was coded with a participant-generated identifier to ensure anonymity and confidentiality. Ethical approval was obtained from the School of Psychology Ethics Committee and permission to undertake the study was obtained from Research Governance, as per School policy (see Appendices K & L). Since this study did not recruit from NHS services, Local Research Ethics Committee approval was not required.

2.9 Data preparation

2.9.1 CBALT:

Due to a technical problem, six participants (in the visual only [vv] condition) did not receive the final transfer test; however, this made no difference to the assessment of general learning. Two participant's data sets were excluded from analysis due to abnormally low pollution counts being entered (far below

what would be expected by chance); inclusion of these would have risked biased results. Data exploration revealed several instances of anomalous key entries; based on the complete data set for that individual, these were judged to be mis-keys on the part of the participant. In such cases, the average of a participant's preceding and subsequent entries for that condition (aa, av, va, and vv) was substituted for the purposes of data analysis.

Data exploration also revealed a significant number of participants had not exhibited learning at all in the task; participants were classified as 'learner' or 'non-learner' for the purposes of analysis and comparison.

2.9.2 COPE dimension reduction

The 60-item COPE questionnaire yields 15 scale scores; a principal component analysis (PCA) was conducted on 14 of these items with oblique rotation (promax) in order to identify common underlying factors. The scale score of Religious Coping was endorsed by very few participants and therefore removed from the PCA. The Kaiser-Meyer-Olkin (KMO) measure verified the sampling adequacy for the analysis, KMO = .65 ('mediocre' according to Field, 2009), and Bartlett's test of sphericity χ^2 (91) = 285.07, p < .001, indicated that correlations between items were sufficiently large for PCA. An initial analysis was run to obtain eigenvalues for each component in the data. Five components had eigenvalues over Kaiser's criterion of 1 and in combination explained 69.43% of the variance. The scree plot was slightly ambiguous and showed inflexions that would justify retaining both 5 and 6 components. Given the convergence of the scree plot and Kaiser's criterion

on five components, this is the number of components that were retained in the final analysis. Table 4 shows the factor loadings after rotation. The items that cluster on the same components suggest that component 1 represents approach and problem-focused coping strategies, component 2 represents approach and emotion-focused coping strategies, component 3 represents avoidance and problem-focused coping, component 4 represents avoidance and emotion-focused coping, and component 5 indicates substance use oriented coping strategies (see Table 4). Coping strategies categorised as 'approach' were interpreted as being 'adaptive', whilst avoidance and substance-use coping strategies were interpreted as being 'maladaptive'. The factor structure of the COPE as shown in Table 4 (with the exception of substance misuse uniquely loading onto component 5) is very similar to a previously published factor structure (Litman, 2006), the only difference being that the item 'mental disengagement' loaded onto a factor identified as representing avoidant strategies. However, not dissimilar is the identification of the absence of mental disengagement as representing an approach type of coping in the current PCA.

A four-factor loading of the COPE (frequently with the removal of substance use items loading uniquely onto the fifth factor in the current study) has consistently been found in previous research (see Litman, 2006). Scale scores were calculated for each participant based on the five-factor loadings, and all subsequent data analyses were performed using these.

Table 4: Summary of PCA results for the COPE questionnaire (*N* = 63).

Item	Rotated Factor Loadings				
	1	**2**	**3**	**4**	**5**
	Approach & Problem-Focused	**Approach & Emotion-Focused**	**Avoidance & Problem-Focused**	**Avoidance & Emotion-Focused**	**Substance-Use**
Active coping	**.90**				
Planning	**.79**				
Suppression of competing activities	**.77**				
Use of emotional social support		**.87**			
Focus on & venting of emotions		**.83**			
Use of instrumental social support	.53	**.69**			
Mental disengagement		**-.40**			
Acceptance			**.74**		
Humour			**.71**		
Restraint			**.66**		-.46
Positive reinterpretation and growth	.31		**.66**		
Denial				**.86**	
Behavioural disengagement				**.73**	
Substance use					**.90**
Eigenvalues	3.54	2.22	1.58	1.31	1.08
% of variance	25.29	15.85	11.26	9.33	7.70

Note: factor loadings < .30 were omitted from analysis and those over .40 appear in bold.

3.0 Results

Specifically, three questions guided this research: (a) What will be the effect of a brief CBT-based stress-management intervention (SMI) on adaptive coping strategies?, (b) What is the relationship between the intervention effect on adaptive coping strategies and either or both of the stable factors of learning ability and perceived stress reactivity?, and (c) What relationship is there between learning ability and stress reactivity?

3.1 Primary hypothesis: effects of SMI on coping

The first research question concerned the intervention effect of the SMI on coping strategies. Mixed-design analysis of variance (ANOVAs) were conducted to analyse changes in the five factors of coping strategies in the two groups before intervention (T1) and at 3 week follow up (T2). An alpha level of .05 was used for all statistical tests.

As indicated in Table 5 overleaf, significant change occurred in the control group but not the intervention group for two factors of the COPE questionnaire only. (ApPF = Approach & Problem Focused; ApEF = Approach & Emotion Focused; AvPF = Avoidance & Problem Focused; AvEF = Avoidance & Emotion Focused; and SU = Substance Use oriented coping).

Table 5: Within-group change from T1 to T2 as measured by the COPE, PSRS, STICS, and PSS questionnaires. The *t* test is based upon a simple difference in means.

Measure		*N*	Mean (*SD*) T1	Mean (*SD*) T2	*t* statistic (*N*-1 *df*)	*p* value
COPE						
ApPF	Intervention	29	28.45 (5.74)	27.48 (5.75)	1.07	.29
	Control	31	30.53 (6.34)	28.29 (7.60)	2.23	.03*
ApEF	Intervention	28	42.58 (8.32)	41.04 (8.22)	0.70	.49
	Control	31	42.38 (7.92)	41.16 (8.86)	1.03	.31
AvPF	Intervention	28	35.45 (6.95)	36.18 (6.10)	-0.50	.62
	Control	31	38.88 (8.26)	37.26 (7.11)	2.24	.03*
AvEF	Intervention	28	11.26 (3.04)	12.00 (3.89)	-0.88	.39
	Control	30	12.56 (3.68)	12.57 (4.52)	0.28	.78
SU	Intervention	29	6.13 (2.86)	6.25 (2.74)	0.22	.82
	Control	31	5.78 (2.80)	5.77 (2.64)	0.14	.89
PSRS Total	Intervention	30	26.65 (5.38)	25.37 (6.45)	1.21	.24
	Control	31	23.28 (5.66)	22.74 (7.21)	1.14	.26
STICS Total	Intervention	30	52.61 (10.08)	49.03 (13.20)	1.40	.17
	Control	31	51.91 (15.04)	50.19 (16.09)	0.86	.40
PSS Total	Intervention	29	20.94 (5.08)	19.14 (5.01)	1.28	.21
	Control	31	19.72 (6.40)	19.87 (6.34)	-0.04	.97

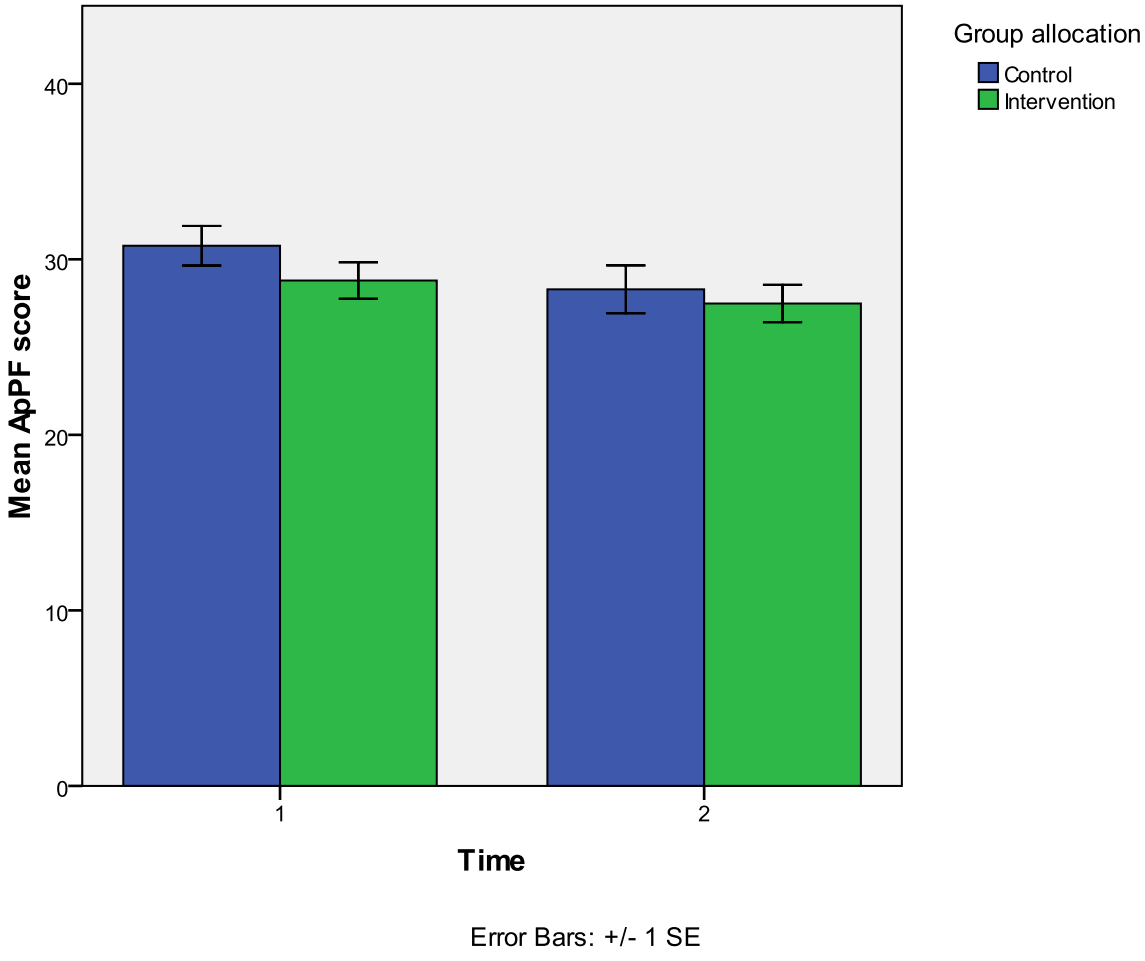
*significant at the .05 level

3.1.1 Approach and Problem-Focused (ApPF) Coping:

As shown in Figure 2, there does appear to be an effect of time on ApPF scale scores on the COPE, as both groups appear to report decreased usage slightly. A mixed-design ANOVA did demonstrate a small but significant effect of time: $F(1, 58) = 5.28$, $p = .025$, but there was no main effect of group: $F(1,$

58) = 0.96, p = .33, and no significant interaction between group and time: $F(1, 58) = 0.51$, p = .48. Therefore, although overall scores on this coping factor did appear to decrease, there was no statistical difference depending on which group a participant was in. Furthermore, paired-sample t tests showed this decrease was only significant for the control group: t (30) = 2.23, $p < .05$. This is interesting given that a decrease in ApPF coping would represent a decrease in adaptive coping strategies in participants of the control group, whereas the decrease in the intervention group was not significant.

Figure 2: Error bar chart showing between-group change in mean ApPF coping scores



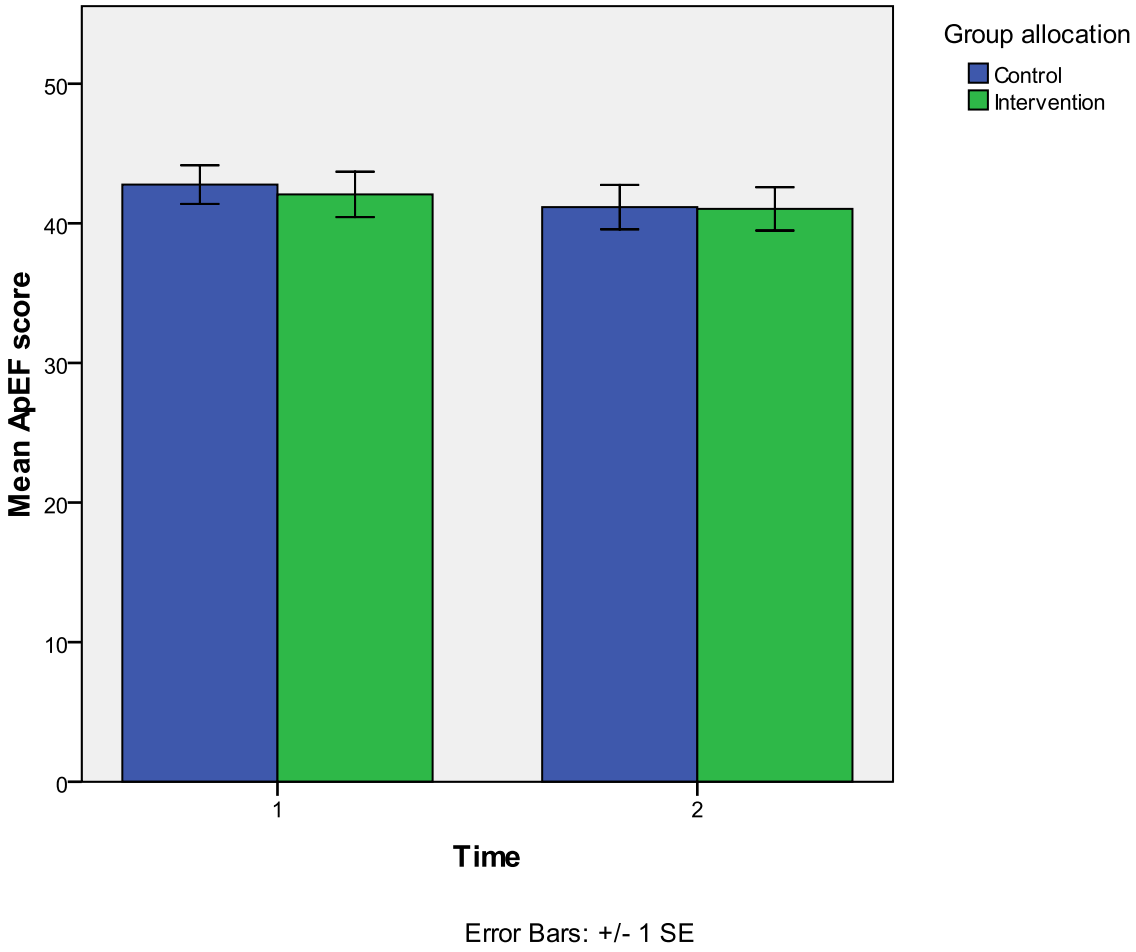
It is possible that current or chronic stress levels were a factor of this decrease in adaptive ApPF coping strategies. Therefore, Pearson's *r* correlations were carried out in order to explore any relationships between averaged PSS scores and average STICS scores with the outcome variable of ApPF coping (average score across T1 and T2). Average STICS score was found to significantly correlate with average ApPF coping score: $r = .25$, $p = .05$; however, there was no significant correlation between average PSS score and average ApPF coping score: $r = .16$, $p > .05$. The two variables of average STICS and PSS scores were also included as covariates in the mixed-design ANOVA with the same results: STICS score was found to significantly co vary with ApPF coping change over time ($F(1, 56) = 6.11$, $p = .017$) whilst PSS score did not ($F(1, 56) = 1.80$, $p = .19$). Together, these results suggest the existence of a positive relationship between chronic stress levels and use of Approach and Problem Focused coping: those participants who reported higher levels of chronic stress also reported higher usage of an approach and problem-focused coping style.

3.1.2 Approach and Emotion-Focused (ApEF) Coping

As Figure 3 indicates, there appears to be very little change over time in ApEF scale scores on the COPE. Mixed-design ANOVA confirmed this with a non-significant main effect of time: $F(1, 57) = 1.48$, $p=.23$; and a non-significant main effect of group: $F(1, 57) = 0.05$, $p = .83$. There was also no significant interaction effect of group and time: $F(1, 57) = 0.07$, $p = .79$, suggesting that regardless of which group participants were allocated to,

there was no significant change in use of Approach and Emotion Focused coping strategies across time.

Figure 3**: Error bar chart showing between-group change in mean ApEF coping scores**



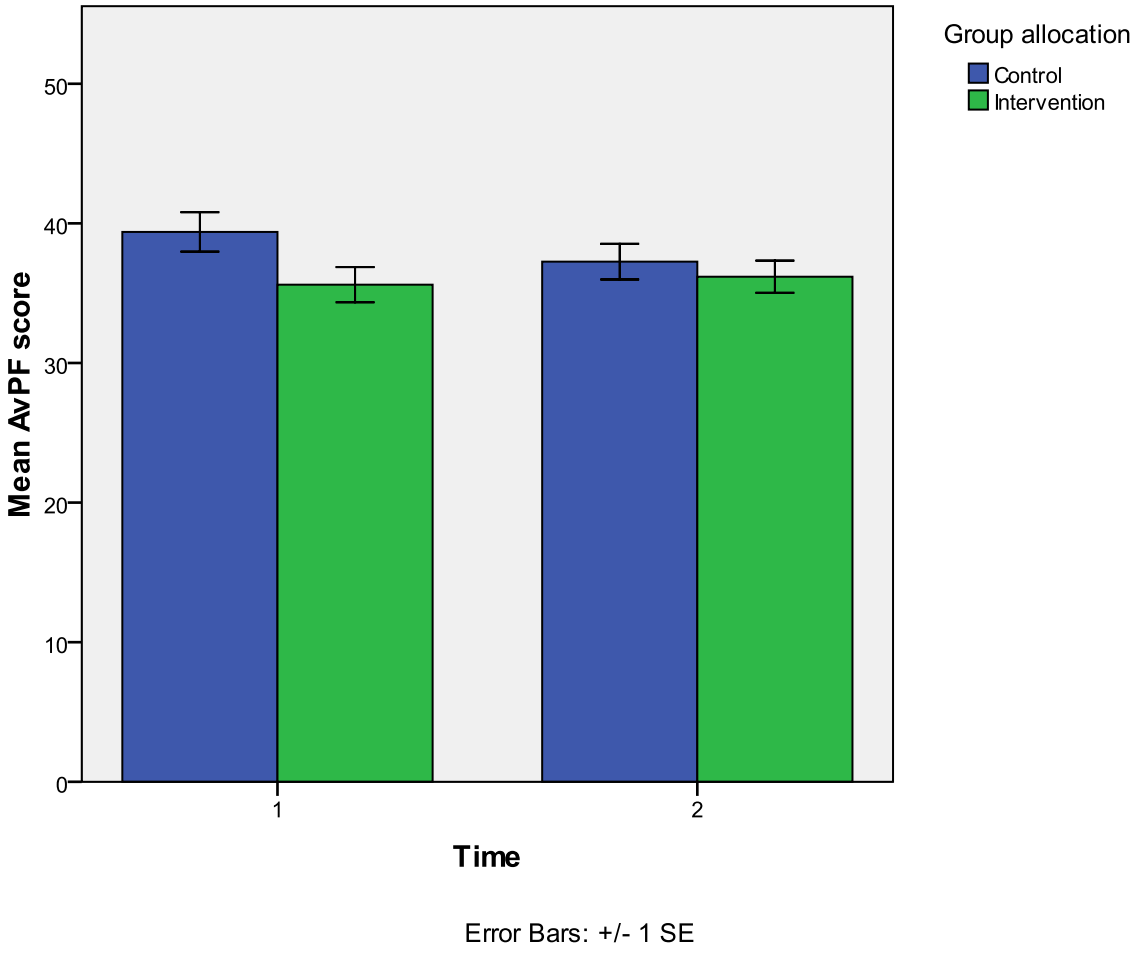
3.1.3 Avoidance and Problem-Focused (AvPF) Coping

Mixed-design ANOVA showed no main effect of time on AvPF coping: $F(1, 57) = 1.11$, p=.30, and no main effect of group: $F(1, 57) = 2.12$, $p = .15$. There was also no significant interaction between time and group: $F(1, 57) = 3.33$, $p = .07$. This suggests that again regardless of which group participants were

allocated to, there was no significant change in use of Avoidance and Problem Focused coping strategies across time.

However, as can be seen in Figure 4, control group participants did appear to report decreased usage of AvPF coping strategies across the two time points; paired-samples T-test reported this decrease as significant: t (30) = 2.24, $p < .05$. In contrast, although the intervention group appeared to report slightly increased usage of AvPF coping strategies, this was non-significant: t (27) = -0.50, p=.62. However, as there was no main effect of group, this apparent significant decreased usage by the control group participants may have been the result of insufficient power.

Figure 4: Error bar chart showing between-group change in mean AvPF coping scores



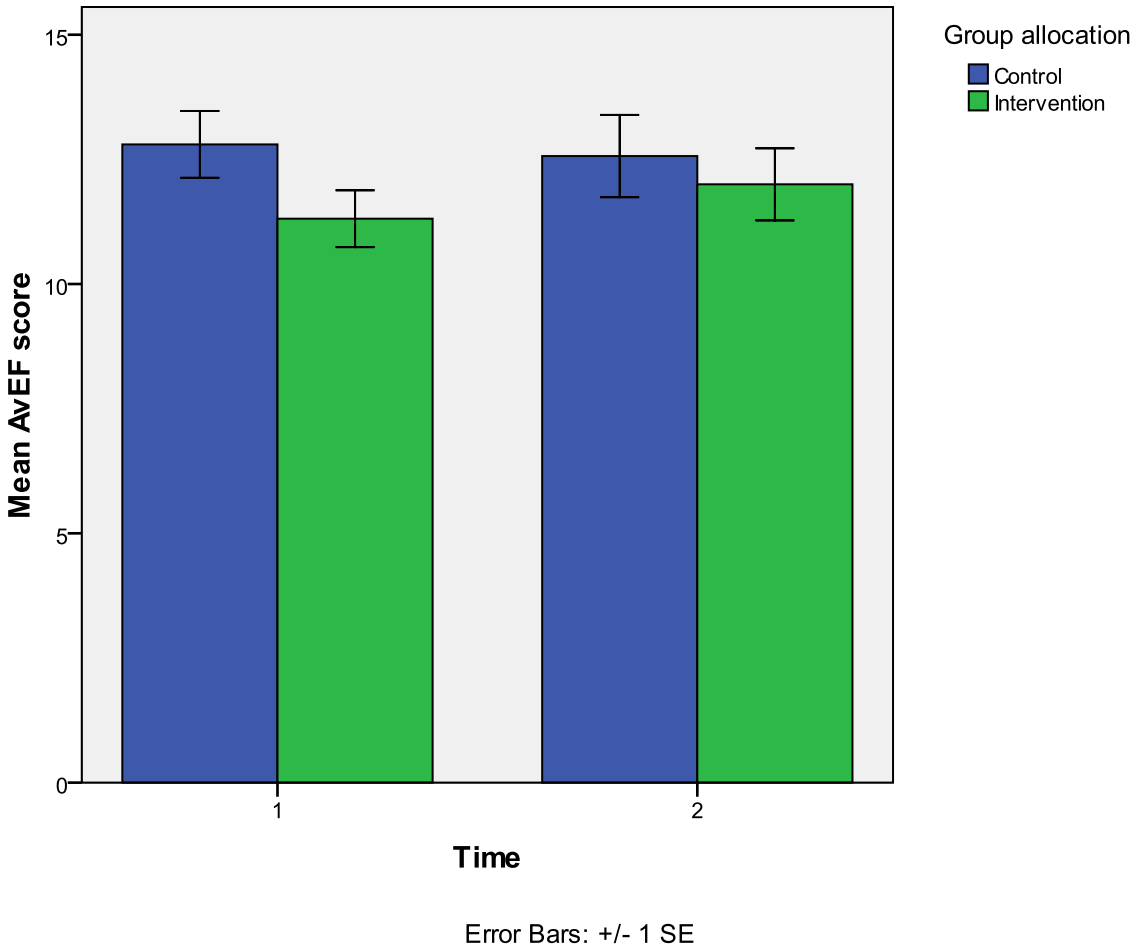
3.1.4 Avoidance and Emotion Focused (AvEF) Coping

Mixed-design ANOVA demonstrated a non-significant main effect of time: $F(1, 57) = 0.16$, $p=.70$, a non-significant main effect of group: $F(1, 57) = 1.60$, $p = .21$, and a non-significant interaction effect of time with group: $F(1, 57) = 0.64$, $p = .43$. These results suggest that regardless of which group participants were allocated to, there was no significant change in use of Avoidance and Emotion Focused coping strategies across time.

As illustrated by Figure 5, both the control and intervention groups appeared to report very minor changes in use of AvEF coping strategies over T1 and

T2, albeit in opposite directions; paired sample *t* tests showed these changes to be non-significant: control, *t* (29) = 0.28, *p*=.78; and intervention, *t* (28) = -0.88, *p*=.39.

Figure 5: Error bar chart showing between-group change in mean AvEF coping scores

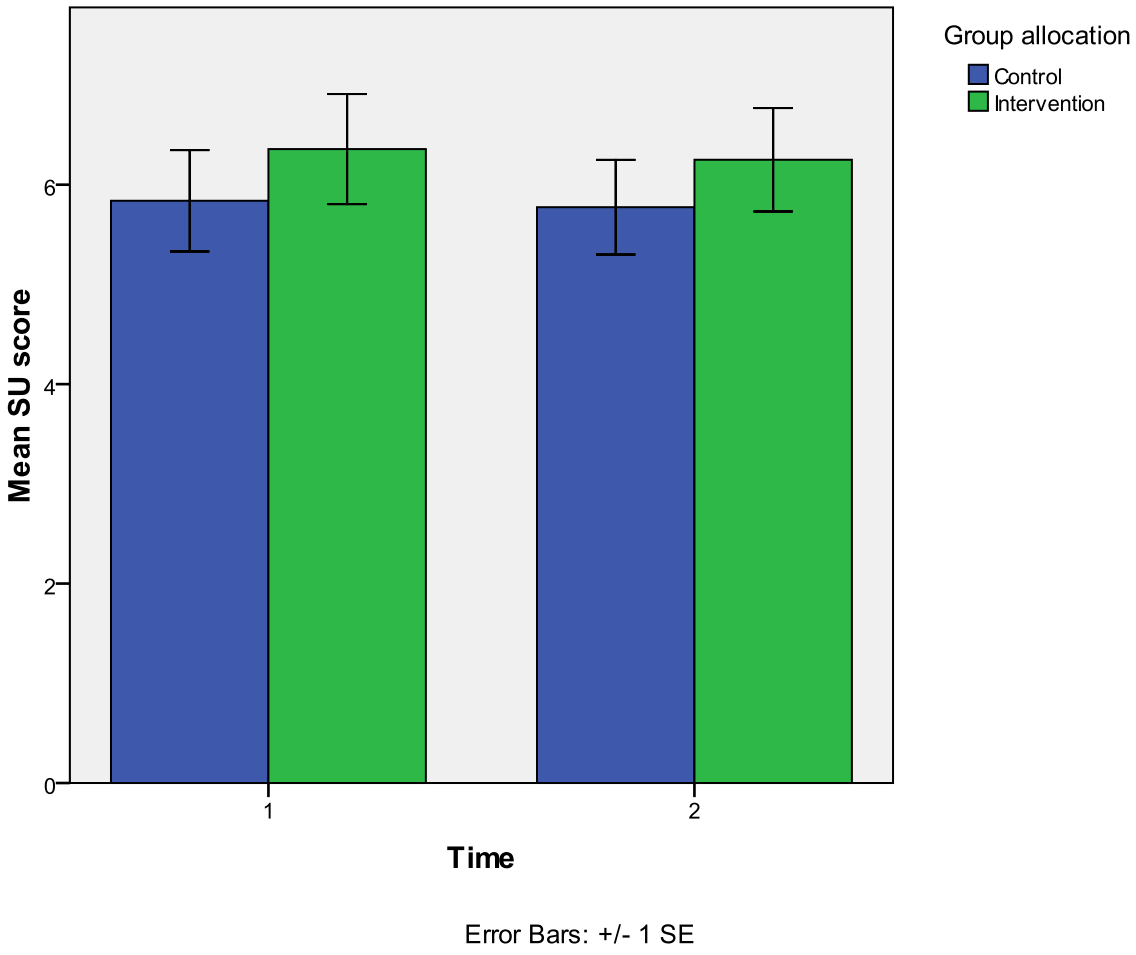


3.1.5 Substance Use (SU) Coping

Mixed-design ANOVA demonstrated a non-significant main effect of time: *F*(1, 57) = 0.07, *p*=.80, a non-significant main effect of group: *F*(1, 57) = 0.59, *p* = .44, and a non-significant interaction effect of time by group: *F*(1, 57) = .004, *p* = .95. This again suggests that regardless of which group participants

were allocated to, there was no significant change in use of Substance Use coping strategies across time, as illustrated by Figure 6.

Figure 6: Error bar chart showing between-group change in mean SU coping scores



3.1.6 Summary of results for Hypothesis 1

In summary, thus far these results suggest that across the five coping styles, methods of coping used by participants of the intervention group did not change significantly following the intervention and 3-week follow up period. In contrast to this, participants of the control group reported significantly decreased usage at time point two of both Approach and Problem-Focused

coping and Avoidance and Problem-Focused coping strategies. Overall, the primary hypothesis that a brief CBT-based SMI would result in a positive change in coping behaviour is not supported by the results of the current study. However, it is important to note the potential role of other extraneous variables, such as external stressors and resources, in determining participants' use of coping strategies during the three follow-up period.

3.2 Secondary hypotheses

3.2.1 Learning ability and the intervention effect

The second research question guiding this study concerned the relationship between learning ability and the intervention effect; it was anticipated that those participants of the intervention group who demonstrated learning on the computer-based learning task (CBALT) would evidence greater levels of change in coping behaviour than those participants who did not demonstrate learning.

Table 6: Mean COPE factor scale scores for learner and non-learner groups

COPE factor	Mean: Learner		Mean: Non-learner	
	Time 1	Time 2	Time 1	Time 2
ApPF	29.12 (6.30)	28.42 (7.67)	30.00 (5.69)	26.77 (5.66)
ApEF	41.94 (7.86)	39.94 (8.05)	43.14 (8.69)	41.82 (9.06)
AvPF	37.67 (7.16)	37.39 (6.56)	36.50 (8.17)	35.36 (6.90)
AvEF	11.85 (3.60)	11.55 (4.17)	12.36 (3.58)	13.27 (4.20)
SU	5.85 (2.65)	5.64 (2.54)	6.05 (3.06)	6.18 (2.74)

At time point one, *t* tests showed non-significant differences existed between learners versus non-learners (as classified by performance on the CBALT) on the five coping factors. This was also the case at time point two, suggesting that coping behaviour did not differ significantly between those participants classified as learners and those classified as non-learners (Table 6).

In order to test for any effect of learning ability on coping behaviour change across time, differences between T1 and T2 coping scores were calculated for all five factors of the COPE (Table 7). As shown in Table 7, *t* tests reported non-significant differences on all five factors between the mean difference scores of learner and non learner participants, suggesting that coping behaviour change over time did not differ according to learning ability (as measured by the CBALT).

Table 7: Difference in coping scores across T1 and T2 in learners and non-learners

COPE factor	Learning ability as assessed by CBALT	*N*	Mean Difference Score (*SD*)	*t* statistic	*p* value
ApPF	Learner	35	-1.09 (6.75)	-1.23	.22
	Non-learner	23	-3.17 (5.67)		
ApEF	Learner	34	-1.65 (8.06)	0.15	.88
	Non-learner	23	-1.30 (8.88)		
AvPF	Learner	35	-0.60 (6.12)	-0.34	.74
	Non-learner	22	-1.14 (5.30)		
AvEF	Learner	34	-0.29 (3.45)	0.73	.47
	Non-learner	23	0.65 (5.57)		
SU	Learner	34	-0.21 (2.09)	0.24	.81
	Non-learner	23	-0.04 (3.07)		

Thus far, results from the current study have suggested there was no significant intervention effect on coping behaviour and no significant difference between learners' and non-learners' coping behaviour change over time. The role of perceived stress reactivity will be considered next.

3.2.2 Perceived stress reactivity and the intervention effect

The third research question guiding the current study concerned the relationship between perceived stress reactivity (as measured by the PSRS) and the intervention effect; it was anticipated that those participants in the intervention group with higher PSR levels would show less positive change in coping at follow-up than those with lower PSR levels.

Firstly, the variable of PSRS was explored. Mixed-design ANOVA reported a non-significant main effect of time on PSRS score: $F(1, 59) = 2.74$, $p = .10$. There was also a non-significant main effect of group: $F(1, 59) = 3.36$, $p = .07$; and no interaction effect between time and group: $F(1, 59) = 0.01$, $p = .91$. These results suggest that regardless of allocation to control or intervention group there was no significant change in PSRS scores over time, suggesting that perceived stress reactivity can be viewed as a relatively fixed factor.

Interestingly, at time point one the intervention group reported significantly higher scores on the PSRS questionnaire than the control group; $t (61) = -2.42$, $p<.05$. In order to investigate this further, the mean scores for the five

subscales of the PSRS were analysed for differences between the two groups; two subscales were significantly higher for the intervention group: Reactivity to Social Conflict, t (61) = -2.61, p<.05; and Reactivity to Failure, t (61) = -2.08, p<.05. Post intervention at time point two, these differences were non-significant although Reactivity to Failure was approaching significance, t (59) = -1.89, p = .06.

In order to test for associations between PSRS score and amount of coping behaviour change observed, difference scores on the COPE factors were explored for correlations with PSRS scores (Table 8).

Table 8: Correlations between PSRS score and amount of coping behaviour change observed for each COPE factor (difference score).

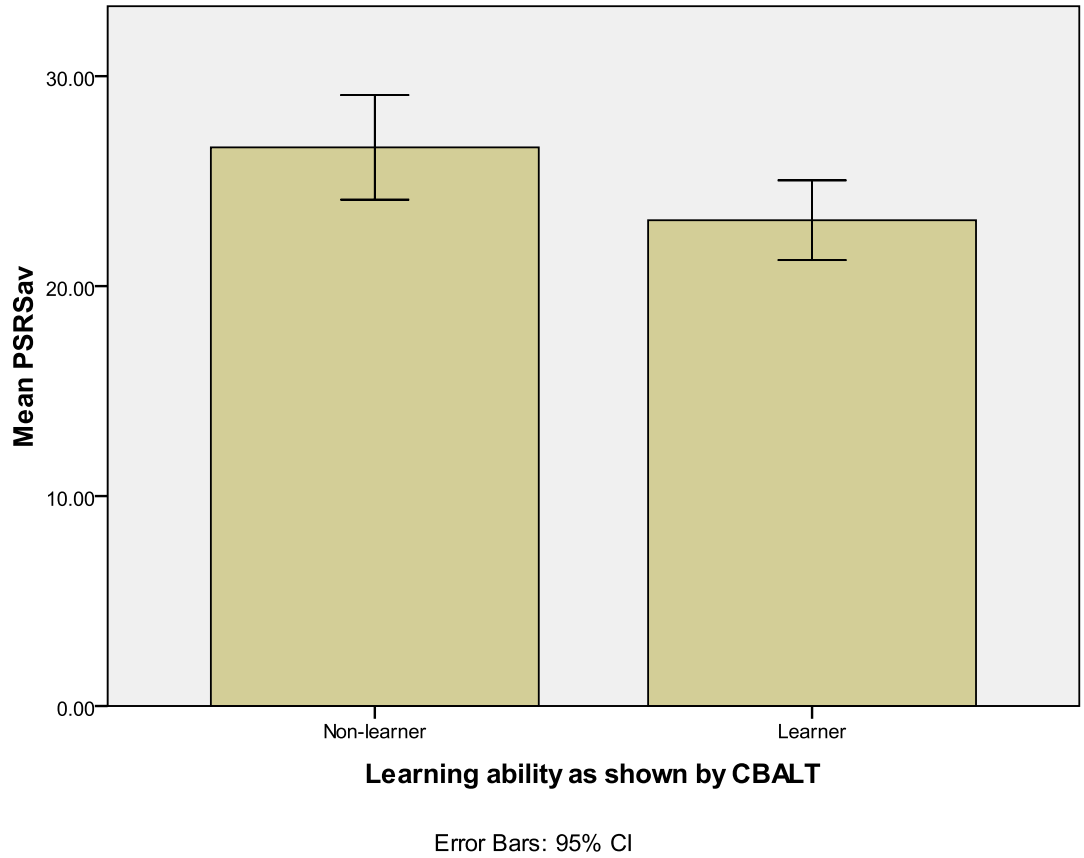
COPE factor	*N*	Pearson's *r*	*p* value
ApPF	60	.05	.70
ApEF	59	-.08	.56
AvPF	59	.18	.17
AvEF	59	-.05	.71
SU	59	-.05	.70

As shown by Table 8, no significant correlations were reported; the hypothesis was not supported by these results and this suggests there was no significant relationship between amount of coping behaviour change over time and PSRS score.

3.2.3 Learning ability and stress reactivity

The final question guiding the current study concerned the relationship between stress reactivity and learning ability. Due to well established findings regarding the negative impact of stress on learning it was anticipated that a negative relationship would exist between learning ability and stress reactivity: that is, those with higher levels of perceived stress reactivity would demonstrate less ability in learning on the CBALT than those with lower levels of perceived stress reactivity.

Figure 7: Bar chart with error bars showing learner and non-learner between-group differences in average PSRS scores



As illustrated by Figure 7, those participants who demonstrated non-learning on the CBALT appeared to report higher average PSRS scores than those

who demonstrated learning; indeed, the two groups did score significantly differently on the PSRS (total score averaged across T1 and T2): t (57) = 2.29, p<.05, suggesting an association between learning ability and perceived stress reactivity.

In summary, this study set out to answer three questions about the effect of a brief CBT-based SMI on coping behaviour, the role played by learning ability in this and the potential association between stress reactivity and the ability to benefit from the intervention. Results reported broadly refute the primary hypothesis that intervention would lead to positive change in coping behaviour, although there was some change in coping behaviours reported by the control group participants. The hypotheses around the potential relationships between intervention effect and learning ability and stress reactivity were also not supported by the results of this study. However, the expected negative relationship between learning ability and stress reactivity was observed. Potential reasons for these findings, along with the implications, will be discussed in the next section.

4. Discussion

The current study aimed to investigate the potential role of stress reactivity in the ability to benefit from a change-focused therapy such as cognitive behaviour therapy (CBT). In order to do this, a brief CBT-based stress management intervention (SMI) was designed and implemented; therefore, an initial aim of this study was to investigate the impact of such an

intervention on participant's adaptive and maladaptive coping behaviours. In line with calls from the therapeutic effectiveness field (e.g., Doss, 2004) this study was intended to begin to answer one of the fundamental questions that research into mechanisms of change in CBT has left unanswered: what works for whom, and by implication, what does *not* work for whom. More specifically the question posed by the current study concerned the impact of an individual client's psychobiological variables on the therapeutic process of change. The current methodology was used to investigate the relationship of both perceived stress reactivity and learning ability to adaptive behaviour change following intervention, as a possible future means of optimising benefit from therapeutic intervention for individuals. This approach was also used to study the effect on coping behaviour of a brief psychoeducation-based intervention, an important question in its own right given the increasing reliance upon such approaches for mild to moderate mental health concerns (e.g., Redding, Herbert, Forman, & Gaudiano, 2008).

As can be seen from the results presented above, overall following the intervention, participants of the intervention group did not report significant change in their coping behaviours; more specifically, no increase in adaptive or decrease in maladaptive coping behaviours was found. Results however did show that participants of the control group had significantly decreased aspects of both their adaptive and maladaptive coping behaviours at follow-up; specifically, avoidant and approach problem-focused strategies.

As the results of the current study also show, perceived stress reactivity was not found to be significantly associated with the amount of behaviour change in either the control or intervention group, and similarly nor was learning ability. However, as predicted given the extensive research findings regarding the deleterious impact of stress on learning (e.g., Wolf, 2009), a negative correlation between stress reactivity and learning ability was observed in the current study. This significant finding supports the suggestion of a potentially important relationship between these two client variables, one which may benefit from further consideration in therapeutic intervention planning.

Despite the finding that aspects of control group participants' coping behaviour did change slightly between the two time points, there was no significant main effect of group and the current study failed to show any significant change in coping behaviours following the brief CBT-based SMI. The current study also failed to show any significant influence of perceived stress reactivity or learning ability on the amount of behaviour change observed over time. Therefore, neither the primary nor secondary hypotheses were borne out. There are a number of interesting factors which may help to explain these results. Firstly, it could be that there were methodological problems with the current study, which either prevented change being seen when it should have been, or failed to recognise change that did actually occur. Secondly, it could be argued that the nature of the intervention and limited exposure to it was such to render positive change unlikely. Thirdly, it could be that the intervention should effect change, but the nature of the sample population prevented this.

The first explanation encompasses a number of possible difficulties with the study itself. For reasons of practicality participants' self-selected to the control or intervention group and this could be argued as an influential factor in any results. However, descriptive statistics carried out for time point one data indicated no significant differences between the two groups on nearly all of the measures; the exception to this was the significantly higher PSRS scores reported by the intervention group. Such a finding could be argued as suggesting those participants who self-selected to receive the intervention did so due to high perceived stress levels. The use of true randomised allocation in future studies may help to address this issue.

A further potential explanation for the lack of results in the current study is the sensitivity and appropriateness of the outcome measures. It is possible the COPE questionnaire did not reflect the behaviour change targeted by the brief SMI. The content of the brief SMI aimed to facilitate participants in identifying their helpful and unhelpful coping strategies through raising awareness of thoughts and feelings. It is therefore possible the items included in the COPE questionnaire covered too broad a spectrum of coping behaviours to be able to detect small (but significant) change in individual coping following the intervention, hence the non-significant results reported in the current study. Similarly, using the COPE questionnaire in their study Fortune, Richards, Griffiths and Main (2004) also failed to find an effect on self-reported coping of a CBT-based intervention for psoriasis – despite positive intervention effects being reported with other, more treatment-specific measures. It is therefore possible that the use of more intervention-

specific measures may have detected change. Moreover, use of a different factor structure of the COPE to that of the one identified in the current study may have produced different results; however, given the similarities between published factor structures (e.g., Litman, 2006) and that of the current study, the effect of this is debatable.

Additionally, it may have been interesting to assess trait, as well as state, coping strategies, as one would not expect change in the former. However, assessment of trait coping style using the COPE involves very similar wording to the assessment of state coping, and it was decided that this plus the COPE's relatively long length ran the risk of participants experiencing fatigue effects or a potentially confounding variable of their answers on one interfering with their answering of the other.

Nevertheless, one would still expect to see change in the general measures of stress levels given the intervention's focus on stress management techniques such as goal setting. However, as discussed, data from the current study did not show any significant change over time for the PSS or STICS, suggesting that overall there was no significant effect of the intervention on levels of perceived or chronic stress. Further research would be needed to explore whether a more comprehensive evidence-based intervention would result in coping behaviour change being reflected in changes in the COPE measure.

An additional methodological flaw with the study may have been the learning assessment itself. It is notable that roughly half of the participants were classified as non-learners from their performance on the computer-based assessment of learning task (CBALT). However, the external validity of this task could be criticised in terms of the level of its similarity to learning processes in a teaching experience. There is a lack of literature regarding the learning processes involved in a therapeutic context, but educational theorists have explored adult learning in general, such as Kolb and his Experiential Learning Cycle (Kolb, 1984). The cycle suggests four stages of learning, including reflection and abstract conceptualisation; therefore, it could be argued that a more ecologically valid learning assessment would involve assessment of abilities in these areas. In contrast, the CBALT was originally designed to measure a specific learning skill – that is the ability to discriminate between feature negative stimuli. Poor performance on such a specific learning task should therefore not be extrapolated to suggest poor learning ability for a wider variety of stimuli, such as the material within a therapeutic intervention and especially the ability to reflect. Indeed, it would be very concerning if just over half of a university student sample were said to be unable to learn. However, in the current study use of more traditional methods of assessing cognitive capabilities (e.g., intelligence tests such as the Wechsler Adult Intelligence Scale [WAIS]) was discounted due to both practical reasons (duration and intensity of assessment) and a need to assess more process-based learning abilities to better reflect those implicated in therapy. Further studies may benefit from more comprehensive assessment of both concrete cognitive capabilities, such as attention and

memory, and these more process-based skills, such as the ability to reflect. Nevertheless, the CBALT arguably does measure an aspect of learning ability and, as such, the association found between learning ability and stress reactivity in the current study can be considered a valid one, although perhaps meriting caution when extrapolating to real-life situations.

The second explanation concerns the nature of and limited exposure to the intervention. On the one hand, the fact that the researcher-designed SMI failed to evidence coping behaviour change at time point two is not entirely surprising given the intervention is not in itself an evidence-based one. On the other hand, the SMI implemented in the current study included the receipt of a self-help booklet written by psychologists for use as a standalone or supported method of psychoeducation. Analysis of time point one data showed that over half of the intervention group reported higher than the average level of perceived stress, suggesting the presence of an increased motivation to utilise such a self-help resource; as the results of the current study suggest however, this was not the case. To find minimal effect is concerning given the increasing emphasis on self-help tools such as these as a first-line intervention for mild to moderate mental health issues; however the results of the current study are consistent with findings regarding the variable effectiveness of such tools (Redding et al., 2008). Nevertheless, again the important role of motivation to change cannot be ignored and it is possible that this moderated any potential benefit of the booklet - if indeed it was read by the participants, another important consideration.

A further consideration concerns the nature of the intervention used and in particular its brevity and format. A main aim of the intervention was to help individuals by learning and considering different, more adaptive ways of coping, which could then be applied in future stressful situations. However, it could be argued that crucial aspects of the learning process were not facilitated by the one-session format of the intervention used in the current study. In particular, educational learning theorists suggest that reflection is critical to experiential learning. For example, Kolb's Experiential Learning Cycle (Kolb, 1984) proposes four stages of learning from experience: concrete experience, reflective observation, abstract conceptualisation, and active experimentation. All stages must be followed in sequence to enable learning to take place (although it does not matter at which point the cycle is entered). Specifically, the learner must make the link between the theory and action by planning, acting out, reflecting and relating it back to the theory (Kolb, 1984). Crucially the theory posits that to simply have an experience is not sufficient to learn from it.

It could therefore be argued that the one-session stress management intervention used did not in fact facilitate any of Kolb's four stages (an interesting point in itself for the self-help industry) and a format of several sessions may better enable key aspects of the learning process, such as reflective observation and the necessity to reflect on the experience in order to make generalisations and formulate concepts which can then be applied to new situations. As such, implementation of a more valid format of learning

through intervention may help future studies exploring factors affecting adaptive behaviour change.

Nevertheless, anecdotally, upon receiving the psychoeducation SMI a number of participants commented on its interest and potential usefulness in their lives; therefore, an additional consideration may be the relatively short time frame for follow-up. It is possible that with a longer follow-up period more coping behaviour change may have been seen; in further research it would be interesting to measure over a longer time period in order to explore longer-term gains from such an intervention.

The final explanation concerns the nature of the sample population, and specifically the intervention group: the participants were not presenting as being 'in need' in the same way as a clinical population might. This point is perhaps key to the interpretation of the results from the current study; motivation to change is an important component of any successful behavioural intervention and given the majority of participants utilised the course credits scheme, their motivation to effect any behavioural change in their lives is questionable. This potentially important confounding variable may benefit from measurement in future studies.

An interesting alternative explanation for the results of the current study posits the SMI as having a preventative function. Although the intervention failed to effect positive (or any) change for participants of the intervention group, some changes were observed in the control group. Although no main

effect of group was found it could be cautiously interpreted that receipt of the SMI functioned to *protect* those participants in the intervention group from increases in maladaptive coping behaviours – especially in the context of the three-week follow up period which encompassed exams and Christmas breaks for many. Prevention of mental ill health and a focus on increasing resilience in general is increasingly a topic of worldwide public interest (e.g., World Health Organisation [WHO], 2004) although evaluations of CBT-based interventions in a preventative or protective capacity are few and far between for adult mental health. However, such an approach is increasingly being used with children and adolescents, particularly within educational settings and with broadly positive results (for a recent comprehensive review see: Barry, Canavan, Clarke, Dempsey, & O'Sullivan, 2009). However, it must also be noted that the participants of the control group also reported a decrease in maladaptive avoidance coping strategies; therefore the protective function of such intervention needs further exploration before being implemented in this way. Nevertheless, the prospect of utilising interventions such as CBT for preventative purposes is an appealing one, with some promising preliminary evidence particularly with young people (Andrews & Wilkinson, 2002).

4.1 Implications for clinical practice

The lack of any change seen in the current study has implications for brief CBT-based interventions, particularly those self-help tools used in primary care mental health – often without therapeutic support. The results suggest that use of brief CBT-based intervention as a generic stress management

tool for a student population is not an efficient use of resources and may not lead to positive change. Nevertheless, in a health service increasingly driven by a need to ensure efficient delivery of interventions and the greatest possible value for money, the concept of self-help materials such as the booklet used in the current study may well seem a tempting one.

Research into the interaction between client variables and therapeutic processes is an underdeveloped area with a particular lack of theory-driven hypotheses (Kazdin, 2007). The differential effectiveness of therapies is an increasingly important issue in mental healthcare, particularly given the current input from the government in the form of policies such as Increasing Access to Psychological Therapies (IAPT) and the emphasis on CBT therein. Despite the results of the current study not supporting stress reactivity as being associated with behaviour change, it is argued that further exploration is needed into psycho-biological client variables such as this and how they interact and impact on the therapeutic process. It is hoped that such research may eventually help to inform how psychological treatments can be better matched to individual clients and limited mental health resources more appropriately distributed.

4.2 Suggested directions for further research

The current study found an association between learning ability and stress reactivity. Given the well-established findings regarding the negative impact of stress on the learning process, it would seem important to further investigate the impact of stress reactivity on therapeutic processes of change

with a clinical population and an evidence-based intervention known to effect behaviour change. In addition to this, much more needs to be done to further explore the role of learning ability in therapeutic effectiveness with those not diagnosed as having a learning disability. It is questionable that all individuals above a certain IQ level possess the requisite cognitive abilities for optimal therapy outcome; an issue thus far only investigated in learning disabled populations. Therefore, research studies which assess learning ability and therapy outcome will be informative in answering this question.

Although findings of the current study were not found to support the hypotheses, it is important that outcome research moves away from its focus on effectiveness studies to include studies which aim to inform as yet unanswered questions about what works for whom – and how.

4.3 Conclusions

The current study set out to investigate the impact on coping behaviour change of a brief CBT-based stress management intervention – and to explore the relationship between stress reactivity and learning ability in any consequent behaviour change. Findings of the current study showed no significant intervention effect on coping behaviour change, and no significant relationship between stress reactivity or learning ability and coping behaviour change over time. Given the study limitations discussed, these results mainly suggest that either the brief intervention used was not sufficient to produce behaviour change, or the sample population lacked the necessary motivation to effect such change – inevitably a risk when using a non-clinical population.

Although the hypotheses of the current study were not supported, it is likely that the previously discussed limitations of the methodology may account for this.

This was an exploratory study with no previous research having looked at these specific variables in relation to therapy outcome and behaviour change; the exact role of stress reactivity in behaviour change is still yet to be ascertained through further research. However, the well-reported negative impact of stress on learning, and the importance of learning for optimal outcomes in therapy, strongly suggests that stress reactivity may represent an important, thus far unaccounted for, client variable in therapeutic outcome research and mechanisms of change.

With the increasing emphasis on cost-effectiveness of psychological therapies, and the ever-present financial constraints of the NHS, it is important that all variables are taken into consideration when matching appropriate therapies to individuals, both in order to optimise chances of a positive outcome client and therapist, and to ensure that increasingly precious resources are allocated to those who can most benefit from them.

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List of Appendices

Appendix A:

Poster advert for study

START DATE: 8/11/2010 FINISH DATE: 31/01/2011

Take part in a study looking at what affects how we cope in stressful situations—and get a

FREE COPING WITH STRESS GUIDE!!

Participation will involve completion of four questionnaires and a short computer-based task, after which, dependant on group allocation, you will receive some stress management tips and strategies. This will take between 1 and 2 hours of your time.

Follow-up after 3-weeks will involve online completion of the four questionnaires via a link sent by email. This should take 30mins of your time.

Upon completion of follow-up, you will be awarded at least 6 credits for Psychology students (£9 will be paid to non-Psychology students).

Participants need to be able to read and understand English to a high standard.

FOR MORE INFORMATION & TO SIGN UP, PLEASE TAKE A TEAR-OFF SLIP & CONTACT ME
OR SEE PSYCHOBOOK ADVERT

Stress & Coping Study: jcrt1g08@soton.ac.uk

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Appendix B:

Intranet booking study advert wording

Stress, Coping, and Behaviour Change

PLEASE ENSURE YOU SIGN UP TO **ONE** GROUP ONLY

How easily can we change our habitual ways of coping with the stresses of life, even if we realise they are unhelpful?
This study will investigate the relationships between stress, learning, and habitual coping behaviour change. All participants will be asked to complete four questionnaires via isurvey, and a computer-based associative learning task, which will take up to 45mins in total.
Following this, participants of the experimental group will then be offered a short session (45mins) of stress-management with a trainee clinical psychologist, consisting of tips about how to cope with anxiety and stress.
Three weeks after this, follow-up will be in the form of an email requesting completion of the same questionnaires via an online link, and you will receive a free self-help stress management booklet, "Introduction to Coping with Stress"
The study will take place in building 44 (Shackleton building) at a time of your convenience. Participants who are allocated to receive the stress management session, and who complete the follow up, will receive 8 credits or payment of £12 if this scheme does not apply. Those who are allocated to completion of the tests and computer task only will receive £7.50 or 5 credits after follow-up.

Appendix C:

Perceived Stress Reactivity Scale (PSRS; Schlotz *et al.*, 2011)

The 23-Item Version of the Perceived Stress Reactivity Scale (PSRS)

Instructions: This questionnaire asks about your reactions to situations which you may have experienced in the past. Three answers are suggested. Please indicate the answer that most closely describes your own reaction in general. Please don't skip any item, even if it may be hard to find the best answer.

01	*When tasks and duties build up to the extent that they are hard to manage . . .*	o I am generally untroubled o I usually feel a little uneasy o I normally get quite nervous
02	*When I want to relax after a hard day at work . . .*	o This is usually quite difficult for me o I usually succeed o I generally have no problem at all
03	*When I have conflicts with others that may not be immediately resolved . . .*	o I generally shrug it off o It usually affects me a little o It usually affects me a lot
04	*When I make a mistake . . .*	o In general, I remain confident o I sometimes feel unsure about my abilities o I often have doubts about my abilities
05	*When I'm wrongly criticized by others . . .*	o I am normally annoyed for a long time o I am annoyed for just a short time o In general, I am hardly annoyed at all
06	*When I argue with other people . . .*	o I usually calm down quickly o I usually stay upset for some time o It usually takes me a long time until I calm down
07	*When I have little time for a job to be done . . .*	o I usually stay calm o I usually feel uneasy o I usually get quite agitated
08	*When I make a mistake . . .*	o I am normally annoyed for a long time o I am normally annoyed for a while o I generally get over it easily
09	*When I am unsure what to do or say in a social situation . . .*	o I generally stay cool o I often feel warm o I often begin to sweat
10	*When I have spare time after working hard . . .*	o It often is difficult for me to unwind and relax o I usually need some time to unwind properly o I am usually able to unwind effectively and forget about the problems of the day
11	*When I am criticized by others…*	o Important arguments usually come to my mind when it is too late to still make my point o I often have difficulty finding a good reply o I usually think of a reply to defend myself

12	*When something does not go the way I expected . . .*	○ I usually stay calm ○ I often get uneasy ○ I usually get very agitated
13	*When I do not attain a goal . . .*	○ I usually remain annoyed for a long time ○ I am usually disappointed, but recover soon ○ In general, I am hardly concerned at all
14	*When others criticize me . . .*	○ I generally don't lose confidence at all ○ I generally lose a little confidence ○ I generally feel very unconfident
15	*When I fail at something . . .*	○ I usually find it hard to accept ○ I usually accept it to some degree ○ In general, I hardly think about it
16	*When there are too many demands on me at the same time . . .*	○ I generally stay calm and do one thing after the other ○ I usually get uneasy ○ Usually, even minor interruptions irritate me
17	*When others say something incorrect about me . . .*	○ I usually get quite upset ○ I normally get a little bit upset ○ In general, I shrug it off
18	*When I fail at a task . . .*	○ I usually feel very uncomfortable ○ I usually feel somewhat uncomfortable ○ In general, I don't mind
19	*When I argue with others . . .*	○ I usually get very upset ○ I usually get a little bit upset ○ I usually don't get upset
20	*When I am under stress . . .*	○ I usually can't enjoy my leisure time at all ○ I usually have difficulty enjoying my leisure time ○ I usually enjoy my leisure time
21	*When tasks and duties accumulate to the extent that they are hard to cope with . . .*	○ My sleep is unaffected ○ My sleep is slightly disturbed ○ My sleep is very disturbed
22	*When I have to speak in front of other people . . .*	○ I often get very nervous ○ I often get somewhat nervous ○ In general, I stay calm
23	*When I have many tasks and duties to fulfil . . .*	○ In general, I stay calm ○ I usually get impatient ○ I often get irritable

Appendix D:

The COPE questionnaire (State version; Carver, Scheier, & Weintraub, 1989)

COPE

We are interested in how people respond when they confront difficult or stressful events in their lives. There are lots of ways to try to deal with stress. This questionnaire asks you to indicate what you generally did and felt in response to any stressful events you have experienced **in the last two weeks**.

Respond to each of the following items by choosing from the response choices listed. Please try to respond to each item separately in your mind from each other item. Please answer every item. There are no "right" or "wrong" answers, so choose the most accurate answer for YOU--not what you think "most people" would say or do.

1 = I didn't do this at all
2 = I did this a little bit
3 = I did this a medium amount
4 = I did this a lot

1. I tried to grow as a person as a result of the experience.
2. I turned to work or other substitute activities to take my mind off things.
3. I got upset and let my emotions out.
4. I tried to get advice from someone about what to do.
5. I concentrated my efforts on doing something about it.
6. I said to myself "this isn't real."
7. I put my trust in God.
8. I laughed about the situation.
9. I admitted to myself that I couldn't deal with it, and quit trying.
10. I restrained myself from doing anything too quickly.
11. I discussed my feelings with someone.
12. I used alcohol or drugs to make myself feel better.
13. I got used to the idea that it had happened.
14. I talked to someone to find out more about the situation.
15. I kept myself from getting distracted by other thoughts or activities.
16. I daydreamed about things other than this.
17. I got upset, and was really aware of it.
18. I sought God's help.
19. I made a plan of action.
20. I made jokes about it.
21. I accepted that this had happened and that it couldn't be changed.
22. I held off doing anything about it until the situation permitted.
23. I tried to get emotional support from friends or relatives.
24. I just gave up trying to reach my goal.
25. I took additional action to try to get rid of the problem.
26. I tried to lose myself for a while by drinking alcohol or taking drugs.
27. I refused to believe that it had happened.
28. I let my feelings out.
29. I tried to see it in a different light, to make it seem more positive.

30. I talked to someone who could do something concrete about the problem.
31. I slept more than usual.
32. I tried to come up with a strategy about what to do.
33. I focused on dealing with this problem, and if necessary let other things slide a little.
34. I got sympathy and understanding from someone.
35. I drank alcohol or take drugs, in order to think about it less.
36. I kidded around about it.
37. I gave up the attempt to get what I want.
38. I looked for something good in what was happening.
39. I thought about how I might best handle the problem.
40. I pretended that it hadn't really happened.
41. I made sure not to make matters worse by acting too soon.
42. I tried hard to prevent other things from interfering with my efforts at dealing with this.
43. I went to movies or watched TV, to think about it less.
44. I accepted the reality of the fact that it had happened.
45. I asked people who have had similar experiences what they did.
46. I felt a lot of emotional distress and I found myself expressing those feelings a lot.
47. I took direct action to get around the problem.
48. I tried to find comfort in my religion.
49. I forced myself to wait for the right time to do something.
50. I made fun of the situation.
51. I reduced the amount of effort I was putting into solving the problem.
52. I talked to someone about how I felt.
53. I used alcohol or drugs to help me get through it.
54. I learnt to live with it.
55. I put aside other activities in order to concentrate on this.
56. I thought hard about what steps to take.
57. I acted as though it hadn't even happened.
58. I did what had to be done, one step at a time.
59. I learned something from the experience.
60. I prayed more than usual.

Scales (sum items listed, with no reversals of coding):

Positive reinterpretation and growth: 1, 29, 38, 59
Mental disengagement: 2, 16, 31, 43
Focus on and venting of emotions: 3, 17, 28, 46
Use of instrumental social support: 4, 14, 30, 45
Active coping: 5, 25, 47, 58
Denial: 6, 27, 40, 57
Religious coping: 7, 18, 48, 60
Humour: 8, 20, 36, 50
Behavioral disengagement: 9, 24, 37, 51
Restraint: 10, 22, 41, 49
Use of emotional social support: 11, 23, 34, 52

Substance use: 12, 26, 35, 53
Acceptance: 13, 21, 44, 54
Suppression of competing activities: 15, 33, 42, 55
Planning: 19, 32, 39, 56

Appendix E:

Perceived Stress Scale (PSS; Cohen, Kamarck, & Mermelstein, 1983)

PSS

INSTRUCTIONS:

The questions in this scale ask you about your feelings and thoughts during THE LAST THREE WEEKS. In each case, please choose the response which most closely fits with how often you felt or thought a certain way. Please do not skip any item, and answer all items even if it is hard to choose the best response.

	Never	Almost Never	Sometimes	Fairly Often	Very Often
	1	2	3	4	5
How often have you been upset because of something that happened unexpectedly?	○	○	○	○	○
How often have you felt that you were unable to control the important things in your life?	○	○	○	○	○
How often have you felt nervous and "stressed"?	○	○	○	○	○
How often have you felt confident about your ability to handle your personal problems?	○	○	○	○	○
How often have you felt that things were going your way?	○	○	○	○	○
How often have you found that you could not cope with all the things that you had to do?	○	○	○	○	○
How often have you been able to control irritations in your life?	○	○	○	○	○
How often have you felt that you were on top of things?	○	○	○	○	○
How often have you been angered because of things that were outside your control?	○	○	○	○	○
). How often have you felt difficulties were piling up so high that you could not overcome them?	○	○	○	○	○

Appendix F:

Onscreen task instructions for the CBALT

Instructions for participants in CBALT

During this experiment you will see a plane "flying" across the computer screen. Below the plane is a display of its instrument panel. The instrument panel gives a continuous display of the pollution level that is produced by the plane's engine. High pollution levels are critical because they breach health and safety regulations. The instrument panel also provides visual signals that might indicate that changes in pollution levels are about to occur. Your job is to learn the extent to which different signals can be used to predict pollution levels. What you have learned about the different signals will be tested at various points during the experiment. During a test trial the display of the plane will stop and you will be presented with instructions for making your rating.

When you have read the instructions press a key and a signal will be presented. Once the signal has been presented you will be asked to indicate the level of pollution you would expect to follow that signal. Some test signals might be ones that you haven't experienced before. Use your experience to estimate what you think the pollution level would be. Once you have made your rating the experiment will continue when you press the RETURN key. When you have read and understood these instructions press a key to continue.

Appendix G:

Stress Management Intervention manual (created by researcher)

Stress & Coping Study: Intervention Manual
Version 1: 7/11/2010

Aims of the 45min session:

1) Understand the physiological effects of adrenaline
2) Recognise the impact of lifestyle on stress, including the importance of exercise and time for self
3) Understand the usefulness of separating out thoughts, feelings and behaviour (5-systems model) and how this gives a way in to tackling mood difficulties and other problems associated with stress
4) To have some understanding of "why me?", "why now?" and be able to normalise feelings
5) To have some understanding of Negative Automatic Thoughts and unhelpful thinking patterns
6) Have learnt a method of identifying and challenging unhelpful thoughts

CBT model

Ask for an example of a recent stressful situation
Take the example and draw up the CBT model – elicit the thoughts, feelings, physical feelings, and behaviours
Explain the links between these

Fight/flight response

Take the physiological feelings elicited and explain the fight/flight response (if not known) and reason for each feeling

1. Fast shallow breathing
2. Heart beats faster
3. Pain in our muscles
4. Tingling or pins and needles in our extremities
5. Digestive system-nausea /dizziness and diarrhoea
6. Pass much more urine
7. Mouth may become dry; we may get indigestion or even ulcers
8. Pale or blush
9. Unable to think clearly when stressed
10. Light headed or headachy
11. Sweat
12. Vision becomes blurred
13. Tired and achy

Helpful strategies

Introduce idea of relaxation as a helpful strategy to reduce adrenaline
Introduce breathing technique (out longer than in) as helpful strategy for panic

Beaker Analogy

Draw up on flipchart

Elicit 'tap' activities

Thoughts

Take the thoughts elicited previously, and introduce idea of these as an entry point for changing the cycle
Explain Negative Automatic Thoughts, and Unhelpful Thinking Patterns
Introduce idea of paying attention to thoughts and interrupting unhelpful patterns; use analogy of runaway train – can't put brakes on unless aware it's running away

Thought challenging

Elicit the 'hot' thought (the most distressing one) and explain thought challenging as a strategy
What would you say to a friend?
What is the evidence for/against?
Is this thought helping me?

Introduce idea of asking "is this helping me?" as a useful strategy

Making Changes

Explain SMART goals
Small/specific
Measurable – when will I know I've achieved my goal?
Achievable – do I have the resources?
Realistic
Time-limited/bounded – exactly when and for how long

Importance of Review and Reward
Elicit a (small) behaviour change they'd like to do – frame it in a SMART goal

Relaxation

If comfortable with it, do a Progressive Muscle Relaxation to finish

Thank you – any questions?
Give the stress booklet
Sign the receipt (if applicable)
Please fill in the follow-up email questionnaires in three weeks (give date)

Goodbye!

Appendix H:

Participant Information Sheet (PIS)

PARTICIPANT INFORMATION SHEET (Version 1, 21/06/10)

Study Title: The roles of learning ability and stress-reactivity in a CBT-based stress management intervention

Researcher: Miss Jose Thomas
Ethics number: 1167

Please read this information carefully before deciding to take part in this research. If you are happy to participate you will be asked to indicate consent.

What is the research about?
I am a Trainee Clinical Psychologist conducting a study to investigate what might affect our ability to benefit from learning more helpful coping techniques. Many people turn to therapy when they are finding life difficult, and lots of research has looked at how different types of therapy might help those people. I am interested in how our individual characteristics might impact on the effectiveness of therapy, particularly as regards our learning ability and sensitivity to stressful situations: that is, how easily we become stressed. The findings of this study may help therapists and clients to choose the most helpful focus for therapy and maximise the chance of achieving the desired effect.

Why have I been chosen?
University undergraduates have been chosen as a group of people exposed to a lot of stressful situations, namely your exams! Opportunistic sampling has been used within this, which is anyone who responded to the advertisements.

What will happen to me if I take part?
If you decide to take part, you will be asked to attend one session, lasting up to two hours, to do the following: electronically complete 4 questionnaires and some demographic information (approx 30mins); and complete a computer-based associative-learning task (approx 30mins).
After these tests depending on random allocation you may be offered a short (45min) stress-management session with the researcher (Jose Thomas) consisting of general tips to help manage stress and anxiety.
Follow-up will consist of an email sent to you three weeks after the first visit, requesting that you complete the same 4 questionnaires online.
Following either the follow-up or the stress management session, you will receive a free self help booklet entitled: 'Introduction to Coping with Stress'.

Are there any benefits in my taking part?
You may learn some useful strategies for managing stress. Individual feedback regarding performance will not be available within the resources of this study.

Are there any risks involved?
When thinking about emotional and stressful situations there is a risk of becoming upset: further information about sources of support will be provided, and you can take a break from the tests as and when needed.

Will my participation be confidential?
All data collected through the questionnaires and computer-based task will be handled and stored in line with the Data Protection Act and University policy and will be coded and kept on a password protected computer. During the stress-management session, all information received will be treated as confidential, except in cases where there is reason for concern about your own or someone else's safety, where you would be openly informed with regards to with whom the information would be shared.

What happens if I change my mind?
You have the right to withdraw your consent to participate at any time during the data collection, without your legal rights being affected. This would not affect any other aspect of your university education.

What happens if something goes wrong?
If you have any questions about your rights as a participant in this research, or if you feel that you have been placed at risk, you may contact:
Chair of the Ethics Committee
Department of Psychology
University of Southampton
Southampton
SO17 1BJ
Phone: (023) 8059 5578.

Where can I get more information?
If you have any further queries about this study, you can contact the researcher, Jose Thomas, by emailing jcrt1g08@soton.ac.uk

Appendix I:

Further Support Information sheet

Further Support Information Sheet

(Version 1, 21/06/10)

If you feel you would like further support with areas of your life related to the subject matter of this study, you may find the following suggestions helpful.

Useful Websites

- http://www.ntw.nhs.uk/pic/leaflet.php?s=sh

This website has a variety of downloadable booklets on how to cope with common life problems

- http://www.rcpsych.ac.uk/mentalhealthinfo.aspx

Readable, user friendly and accurate information about mental health problems, produced by the Royal College of Psychiatrists

Help lines

The Samaritans: 08457 909090 or email: jo@samaritans.org

Saneline: 0845 767 8000 sanemail@sane.org.uk

SANEline is a national out-of-hours telephone helpline offering emotional support and information for people affected by mental health problems

Don't forget…

If you are a student at the University of Southampton, the counselling service is provided for all current students and staff of the University of Southampton and is one form of help available to you:

- Tel: +44 (0)23 8059 3719 (internal 23719)

  Email: counser@soton.ac.uk

If you have concerns about your own safety or that of someone you know please seek advice from your GP or other person of trust as soon as possible

Appendix J:

Debriefing Statement displayed to participants upon completion of follow-up

Debriefing Statement (Version 1, 21/06/10)

The roles of learning ability and stress-reactivity in a CBT-based stress management intervention

The aim of this research was to investigate what might affect our ability to benefit from learning more helpful coping strategies. It is expected that, following a stress-management session, people who display higher levels of stress reactivity will find it harder to change their usual coping strategies, regardless of their learning ability. Your data will help our understanding of the ways in which therapy might be used to benefit different individuals. Once again results of this study will not include your name or any other identifying characteristics. This research did not use deception. Upon completion of this research, you may have a summary of the research findings if you wish; however, feedback regarding individual performance is not available within the resources of this study.
If you have any further questions, or to obtain a summary of the results (after May 2011) please contact me, Jose Thomas, at jcrt1g08@soton.ac.uk

Thank you for your participation in this research.
Jose Thomas
Trainee Clinical Psychologist

If you have questions about your rights as a participant in this research, or if you feel that you have been placed at risk, you may contact the Chair of the Ethics Committee:
Department of Psychology
University of Southampton
Southampton
SO17 1BJ
Phone: (023) 8059 5578.

Appendix K:

Copy of email confirming ethics committee approval for study

Your Ethics Form approval

Psychology.Ethics.Forms@ps2.psy.soton.ac.uk
[Psychology.Ethics.Forms@ps2.psy.soton.ac.uk]
You forwarded this message on 01/07/2010 18:32.
Sent: 25 June 2010 15:48
To: thomas j.c.r. (jcrt1g08)

This email is to confirm that your ethics form submission for "The Roles of Learning Ability and Stress Reactivity in A CBT-based Stress-Management Intervention" has been approved by the ethics committee

Project Title: The Roles of Learning Ability and Stress Reactivity in A CBT-based Stress-Management Intervention
Study ID : 1167
Approved Date : 2010-06-25 15:48:23

Click here to view Psychobook

If you haven't already submitted the Research Governance form for indemnity insurance and research sponsorship along with your ethics application please be aware that you are now required to fill in this form which can be found online at the link below.
Research Governance Form:
http://www.psychology.soton.ac.uk/psyweb/psychobook/admin/ethics/research_governance.doc
This will need to be returned to the address provided on the form.

Please note that you cannot begin your research before you have had positive approval from the University of Southampton Research Governance Office (RGO). You should receive this by email in a maximum of two working weeks. If you experience any delay beyond this period please contact Barbara Seiter.
More information about Research Governance can be found at the link below. (You will be prompted to log into sussed.)
http://www.soton.ac.uk/corporateservices/rgo/index.html

Appendix L:

Letter of Research Governance Office endorsement

UNIVERSITY OF Southampton

Miss Josephine Thomas
School of Psychology
University of Southampton
University Road
Highfield
Southampton
SO17 1BJ

RGO Ref: 7348

01 July 2010

Dear Miss Thomas

Project Title The Roles of Learning Ability and Stress Reactivity in A CBT-based Stress-Management Intervention

This is to confirm the University of Southampton is prepared to act as Research Sponsor for this study, and the work detailed in the protocol/study outline will be covered by the University of Southampton insurance programme.

As the sponsor's representative for the University this office is tasked with:

1. Ensuring the researcher has obtained the necessary approvals for the study
2. Monitoring the conduct of the study
3. Registering and resolving any complaints arising from the study

As the researcher you are responsible for the conduct of the study and you are expected to:

1. Ensure the study is conducted as described in the protocol/study outline approved by this office
2. Advise this office of any change to the protocol, methodology, study documents, research team, participant numbers or start/end date of the study
3. Report to this office as soon as possible any concern, complaint or adverse event arising from the study

Failure to do any of the above may invalidate the insurance agreement and/or affect sponsorship of your study i.e. suspension or even withdrawal.

On receipt of this letter you may commence your research but please be aware other approvals may be required by the host organisation if your research takes place outside the University. It is your responsibility to check with the host organisation and obtain the appropriate approvals before recruitment is underway in that location.

May I take this opportunity to wish you every success for your research.

Yours sincerely

Dr Lindy Dalen
Research Governance Manager

Tel: 023 8059 5058
email: rgoinfo@soton.ac.uk