



DOCTORATE IN CLINICAL PSYCHOLOGY

**An Investigation into the Relationship between Depressive
Symptoms, Approach-Related Affect, Cognitive Appraisals and
Striving Behaviour**

LITERATURE REVIEW AND MAJOR RESEARCH PROJECT

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Contents

| | |
|-------------------------------------|----|
| Literature Review | 3 |
| References..... | 20 |
| Major Research Project | 26 |
| Abstract | 28 |
| Introduction | 30 |
| Research Aims and Hypotheses | 33 |
| Method | 35 |
| Data analysis | 42 |
| Results | 43 |
| Discussion | 60 |
| Conclusions..... | 65 |
| References..... | 67 |
| Appendices | 69 |



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LITERATURE REVIEW

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Contents

| | |
|--|----|
| Abstract | 5 |
| Introduction | 6 |
| Approach System Theories of Depression | 7 |
| Reward Related Affect, Cognitions and Behaviour in Depression | 10 |
| Reduced Positive Affect in Depression | 10 |
| Reduced Behavioural Striving in Depression | 11 |
| Negative Approach Related Cognitive Appraisals in Depression..... | 12 |
| Studies Linking Reward Related Affect, Cognitions and Behaviour in Depression | 14 |
| Implications of Emotion Theory for the Role of Approach-Related Affect in Depression..... | 15 |
| Overview of the Literature | 17 |
| The Current Research Study | 18 |
| References | 20 |

An Investigation into the Relationship between Depressive Symptoms, Approach-Related Affect, Cognitive Appraisals and Striving Behaviour

Abstract

As well as a persistent lowering of mood, depression is characterised by anhedonia, a lack of interest or pleasure in normally rewarding experiences. Relatedly, depression has also been linked with low levels of approach motivation, a term used to describe “the energization of behaviour by, or the direction of behaviour toward, positive stimuli” (Elliot, 2008, p.8). This literature review focused on the role of the approach system in depression. A systematic literature search using only those articles from peer-review journals and written in English and subsequent screening of these yielded a total of 48 relevant papers. These papers included review articles as well as studies using both clinical and non-clinical populations. The review of these papers highlighted a seemingly limited evidence base relating to affect during reward anticipation/goal striving in depression. The studies, together with the theoretical evidence reviewed, did however suggest that approach related behaviour is a consequence of both approach-related cognitive appraisals and approach-related cognitive affect, and depression affects levels of both. Based on this reviewed literature, a proposed model was constructed of the effect of depression on behavioural striving, and subsequent levels of depression, proposing that depressive symptoms negatively impact both approach related affect and cognitions, and this then negatively impacts of striving behaviour and subsequent levels of depression.

Introduction

Depression is currently the fourth leading cause of disability, and is projected to become the second by 2030 (Mathers & Loncar, 2006). The estimated prevalence of major depressive disorder in the UK at any one time point is 2.1%, with the prevalence of mixed anxiety and depression being 9.8% (National Institute of Clinical Excellence, 2004). Depression is often a recurrent and chronic disorder, with a greater than 80% risk of repeated episodes following initial presentation (Judd, Akiskal & Maser, 1997), and a 40% risk of relapse following recovery within a year (Belsher & Costello, 1988). It is estimated that approximately 15% of people suffering from severe clinical depression will go on to commit suicide (Davies, Naik & Lee, 2001).

In terms of symptoms, as well as a persistent lowering of mood, depression is characterised by anhedonia, a lack of interest or pleasure in normally rewarding experiences. Although the terms 'interest' and 'pleasure' are often used interchangeably when describing anhedonia, they are in fact thought to be distinct concepts. Indeed, Klein (1974) proposed two phases of reward processing, a pre reward (anticipatory) phase, and a post reward (consumatory) phase. Although both phases are thought to be related to positive affect in the general population, with the pre reward phase eliciting feelings such as eagerness and enthusiasm and the post reward phase leading to feelings of pride and contentment, they appear to be biologically distinct and dissociable (Pecina, 2008). The concepts are not however necessarily mutually exclusive in that one may affect the other (i.e. a diminished emotional response to rewards may influence anticipation of rewards). Furthermore, it is unclear the extent to which anticipatory pleasure in relation to predicted goal attainment can be disassociated from feelings of eagerness and enthusiasm when striving towards a goal.

Despite the centrality of anhedonia to depression, the capacity of depressed people to experience anticipation of pleasurable events has received little empirical attention, and a literature search failed to reveal any studies investigating emotions related to the striving or

wanting phase of goal pursuit (i.e. approach related affect) in depression. Furthermore, there is limited evidence concerning the importance of cognitive appraisals (e.g. expectancies and control) in relation to goal striving in depression, and only a few studies that have investigated this in relation to real life goal striving rather than reward based paradigms. The current study aims to narrow this gap by investigating links between approach-related affect, cognition and behaviour in relation to personal goals and an experimental reward task. Research questions will include whether symptoms of depression are related to lower levels of approach related affect and striving behaviour in the presence of a potential reward, and the extent to which cognitive appraisals of outcome expectancy and control impact on these variables. The study will also investigate whether approach related affect, cognition and behaviour are predictive of depressive symptoms at follow-up.

This literature review will begin with a review of approach system theories of depression and evidence supporting such approaches. It will then go on to discuss evidence of reduced positive affect, behavioural striving and negative cognitive appraisals in depression, followed by studies linking reward related affect, cognition and striving behaviour in depression. The review will then discuss theories of emotion and the possible role of emotion in the link between depression and reduced striving behaviour. It will then end with a description of the current study, its aims and its rationale¹.

Approach System Theories of Depression

Two prominent and overlapping theories relating to anticipatory reward processing and goal striving are Gray's (1994) motivational systems account and the approach-withdrawal model of depression (Davidson, 1998; 2004). Both approaches focus upon two interacting systems that underpin emotion and motivation. The behavioural approach system (BAS) is conceptualised as controlling appetitive and goal directed behaviour, and is proposed to

¹ For literature search strategy, see Appendix 1

respond to incentive and reward, both internal and external, and relief from punishment. Activation of the BAS is believed to trigger increased arousal, positive affect and reward-seeking behaviour. The BAS has been linked to brain activity in the left prefrontal cortex and is believed to be activated at the pre reward stage. It has been suggested that the approach system may be underactive in depression, thus making depressed people less responsive to potential rewards in the environment and thus less motivated to strive towards approach goals. Depressive symptoms are thought to reflect extreme manifestations of BAS inactivity. The second system, the Behavioural Inhibition System (BIS), is conceptualised as controlling withdrawal, inhibition and anxiety, in response to cues of threat and punishment.

Evidence for an underactive approach system in depression has been provided by studies using the Behavioural Inhibition System/Behavioural Activation System Scales, a self-report measure designed to tap into the sensitivity of the approach system (BIS/BAS scales: Carver & White, 1994). Kasch, Rottenberg, Arnow and Gotlib (2002) reported that BAS sensitivity, as measured using the BAS subscales on the BIS/BAS scale was lower in depressed participants, that there was a negative correlation between BAS and depression, and that lower levels of BAS were associated with a worse outcome at 8-month follow-up. McFarland, Shankman, Tenke, Bruder and Klein (2006) reported that BAS sensitivity predicted levels of depression among people with major depressive disorder (MDD) at a 6-month follow up.

Evidence from brain activity studies has also provided support for approach theories of depression and the existence of underlying approach and reward processing deficits in depression. Brain imaging studies looking at reward related brain function when at rest, have reported reduced activity in brain areas associated with anticipation of and response to reward (e.g. the left prefrontal cortex) among depressed versus non-depressed participants (Debener et al, 2000). Research has also found similar patterns in people whose

depression has recovered (Henriques & Davidson, 1990), and children of mothers with depression (Dawson et al, 1999).

In relation to brain activity during approach tasks, Smoski et al. (2009) reported that fMRI data showed reduced activation of brain areas associated with reward during reward selection, anticipation and feedback on the wheel of fortune task in depressed participants compared with the control group. Shankman, Klein, Tenke and Bruder (2007) found that during an approach task, participants with early onset depression did not show increased activity in the left prefrontal cortex, whereas controls and those with late onset depression did. Dichter et al. (2009), reported increased activation in brain areas associated with reward anticipation and response to reward during a gambling task following behavioural activation for depression, a therapeutic technique that aims to enhance positive affect through increased engagement with rewarding stimuli. Forbes et al. (2010) have provided preliminary evidence to suggest that reward-related brain function pre treatment may predict treatment outcome in depressed young adults, with greater levels of striatal reactivity being associated with a more favourable outcome at follow-up.

In summary, approach system theorists view depression as a manifestation of an underlying dysfunction of brain systems responsible for reward processing. Evidence from brain activity studies have supported this assumption, indicating that brain areas related to reward processing may indeed be underactive in depression, and preliminary evidence seems to suggest that reward related brain activity may even be predictive of the course of depression and its outcome. On the basis of such brain activity studies, theorists have proposed decreased activity in the prefrontal cortex as a biological marker of an affective style that predisposes people to depression (e.g. Davidson, 1992).

Theories relating to an underactive approach system in depression suggest that anticipation of reward in depression and goal striving should be blunted. If this is indeed the case, the

impact of this underactive system should be observable at the affective, cognitive and behavioural level. The following sections will consider evidence of anticipatory deficits in depression at each of these levels.

Reward Related Affect, Cognitions and Behaviour in Depression

Reduced Positive Affect in Depression

In terms of general levels of positive affect, depressed people have been found to demonstrate lower levels of trait positive affect, as measured using the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988), than those without depression (Lovejoy & Steuerwald, 1995; Peeters, Nicolson, Berkhof, Delespaul, & deVriews, 2003) and changes in positive affect rather than negative affect may be important in predicting recovery from depression. Geschwind, Nicolson, Peeters, Van Os and Wichers (2010), for example, found that early change in positive affect, as compared to negative affect, best predicted clinical response following a course of antidepressant medication. In relation to state levels of positive affect, a recent meta-analysis has reported that depressed individuals are less emotionally reactive to positive stimuli (e.g. humorous films) than non depressed controls (Bylsma, Morris, & Rottenberg, 2008).

Although low levels of positive affect then is clearly an important indicator of depression, there seems to be a lack of research focusing specifically on anticipatory affect, or the emotions people experience when striving toward a goal (e.g. enthusiasm and eagerness). However, based on the theories and evidence suggesting that the BAS is underactive in depression, this is the affect that we would expect to be compromised. Preliminary evidence of reduced anticipatory affect in depression comes from McFarland and Klein (2009), who reported that currently depressed participants' self rated emotional reactivity in response to reward anticipation was weaker than in non-depressed and previously depressed controls.

Reduced Behavioural Striving in Depression

One of the symptoms of depression is a general slowing down of thoughts and physical movements, often referred to as psychomotor retardation. This may result in difficulties in performing tasks that would normally require little effort (e.g. taking a shower, walking up a flight of stairs). A number of cross-sectional studies have linked depression to reduced levels of physical activity (e.g. Kritz-Silverstein, Barrett-Connor & Corbeau, 2001; Lindwall, Rennemark, Halling, Berglund, & Hassmen, 2007), and longitudinal studies have reported a negative association between depression and levels of physical activity (McFarland, B. H., & Lu, 2001; Roshanaei-Moghaddam, Katon & Russo, 2009; Rosqvist et al., 2009; van Gool et al., 2003). Van Gool et al. (2003), for example, conducted a community based study in which they found reduced time spent engaged in physical activity predicted depressed mood at follow-up. A recent review of the literature has suggested that baseline levels of depression are significantly associated with a subsequent reduction in physical activity (Roshanaei-Moghaddam et al., 2009) and depressive episodes have been linked with increased risk of becoming inactive (Patten, Williams, Lavorato & Eliasziw, 2009). There is also evidence of a longitudinal effect of increased activity on levels of depression, with physical-activity interventions being found to increase mood state in those with depression (Penedo & Dahn, 2005).

In terms of reduced behavioural striving for potential rewards in depression, Henriques, Glowacki and Davidson (1994) reported that participants with high BDI scores, unlike those with lower scores, failed to form a response bias to the rewarding condition in a memory task. Henriques and Davidson (2000) later replicated these findings using a clinically depressed population, and more recent research has also supported these findings (Pizzagalli et al 2009). In the Pizzagalli et al. (2009) study, participants were given a task where correct responses to a target were three times more likely to be rewarded than correct responses to another target. Participants in the healthy control group developed a strong

preference for the former target, whereas those with a diagnosis of depression maintained a conservative bias. However, these studies are only tangentially related to striving, as behavioural choices lack the 'active' component of prolonged effort.

In summary, research has demonstrated a link between depression and decreased levels of general physical activity. Although there seems to be a lack of research into the link between depression and behavioural aspects of striving in relation to goals and/or rewards, there is some evidence to suggest that people with depression are less able to adapt and direct their behaviour towards rewards following reinforcement, although it must be noted that causality cannot be established from these studies alone.

Negative Approach Related Cognitive Appraisals in Depression

The cognitive theory of depression views depressive symptoms as a result of negative thought processes relating to the self, the world and the future (e.g. Beck, 1976). Theoretical models and evidence from research have linked expectancies of success and perceived level of control as factors that influence goal striving and that are linked with depression. Bandura's model of self efficacy has linked depression with reduced expectancies of success when faced with a challenge or goal. Self-efficacy refers to a person's belief about their capability to succeed in a given situation (Bandura, 1994). Those with a strong sense of self efficacy view challenging tasks as an opportunity for mastery, have a deeper sense of interest and commitment in activities they participate in and quickly recover following setbacks. Depression has been linked to a weakened sense of self-efficacy, where people tend to avoid challenging tasks, have low expectancies in their ability to perform well on difficult tasks, focus on failings and negative outcomes, and quickly lose confidence following setbacks or failure (Bandura, 1994). Seligman's (1975) learned helplessness theory of depression links depression with a perceived lack of control over outcomes of a situation.

Social psychology researchers have implicated cognitive appraisals of expected success and control as being important factors in a motivational context (Pekrun, 2006). A person's appraisal of expected outcome, combined with their level of perceived control over success, will affect their levels of affect and associated engagement in the task. This control-value theory of motivation predicts that high levels of expectancy and control will lead to associated levels of anticipatory joy in those approaching a goal that they wish to succeed in (Pekrun, 2006). Furthermore, given that they value the goal, people will be more likely to engage if they expect to do well, and/or believe that if they try hard they will be able to succeed (Pekrun, 2006).

In terms of research evidence supporting these theories and the importance of cognitive appraisals in goal striving, depression has been linked to negative expectancies of long term career and academic success (Meyer et al, 2003). It has also been found that depressed people are less able to anticipate future positive experiences than non-depressed controls and also predict experiencing less pleasure from these positive events, although the former could not be fully accounted for by the latter (MacLeod & Salaminiou, 2001). Dickson and MacLeod (2006) found that dysphoric students generated fewer approach goals and more reasons why these goals would not be achieved than did controls. Dickson, Moberly and Kinderman (2011) found that clinically depressed adults were able to generate just as many approach goals as non-depressed people, but were more pessimistic about achieving them and had lower levels of perceived control over outcome. This study was the first of its kind to look at control and expectancies in relation to personal goals in a clinically depressed population.

Studies Linking Reward Related Affect, Cognitions and Behaviour in Depression

According to BAS theories, approach-related affect, cognitions and behaviour are all manifestations of an underactive BAS system, and so should all be compromised in depression, although very few studies have investigated this link. Two studies were however identified in the literature search, one correlational investigation looking into relationships between all three components and depression in the general population (Robinson, Meier, Tamir, Wilkowski & Ode, 2009) and one using experimental methods to investigate the link between approach related affect and striving behaviour in a clinical sample (Sherdell, Waugh & Gotlib, 2012). These studies will now be described and discussed.

In relation to goal striving, Robinson et al. (2009) conducted a series of studies with undergraduate students to investigate the relationship between behavioural facilitation (faster performance over time), approach-related cognitions, approach-related positive affect and depressive symptoms. The researchers found that higher levels of behavioural facilitation predicted more optimistic self-ratings of the likelihood of future positive events (but not pessimism concerning future negative events), greater perceived progress towards own personal goals, higher levels of positive affect (but not lower levels of negative affect), higher informant ratings of positive affect (but not negative affect), reward (but not punishment) accuracy and response time on a choice reaction time task, and lower levels of depressive symptoms (but not negative affect). In their final study, using a more naturalistic approach which involved participants being given mini computers which paged them 6 times a day for a week, the researchers found that high behavioural facilitation scores correlated with high momentary appraisals of reward in life (but not low threat), a higher likelihood of approaching desired goals (but not avoiding undesired goals) and higher levels of positive affect in daily life (but not lower levels of negative affect).

This evidence does suggest that behavioural response to potential rewards is related to both affect and cognitive appraisals at least in the general population. The study was however purely correlational and so no causal inferences can be made. Preliminary experimental evidence linking affect to striving behaviour has been provided by Sherdell et al. (2012) who reported that among depressed participants, levels of anticipatory anhedonia predicted motivation to exert effort in the form of mouse clicking to view a humorous film. There was, however, no evidence of a difference in exerted effort between the depressed and non-depressed groups. This study, however, used a rather general measure of anticipatory affect rather than a specific measure of approach motivation deficits in relation to the goal in question. They also failed to consider cognitive appraisals such as expectancies and control.

Implications of Emotion Theory for the Role of Approach-Related Affect in Depression

Despite a lack of evidence and research relating to approach related emotions and their effect on behaviour, theories of emotion suggest that emotions play a key role in directing behaviour. A brief overview of relevant theories will now be given, followed by a discussion of their relevance to striving in depression.

Hedonic theories are based on the supposition that people are motivated to approach pleasure and to avoid pain. Skinner's (1938) notion of operant conditioning, whereby behaviours are strengthened through positive reinforcement and weakened through punishment, is reflective of this basic hedonistic principle. Hedonic theories however focus primarily on the experience of immediate pleasure, rather than motivation to strive for pleasure in the long-term.

Instrumental theories of emotion view the function of emotion as guiding behaviour towards goals (e.g. Tamir, 2009; Frijda, 2010). In this sense, we are not always motivated by the desire to experience immediate pleasure; when future pleasurable benefits (i.e. delayed pleasure from successful goal pursuit), outweigh immediate benefits (i.e. immediate pleasure) we may be motivated to feel emotions that are useful, but not necessarily pleasant. In support of this instrumental view, mood induction has been shown to enhance performance on mood congruent tasks, and people have been shown to make preferences for mood inductions congruent, but not necessarily pleasant, with the task they are about to complete. Tamir, Mitchell and Gross (2008), for example, reported that participants showed a preference for anger-inducing activities prior to a computer game involving killing enemies, and that manipulation of anger using music improved performance when competing in this confrontational computer game.

Specifically relating to goal attainment and striving, Bagozzi and Pieters (1998) proposed a model whereby a person's appraisal of the outcome of a goal (e.g. reward for successful attainment vs. punishment for non-attainment) leads to anticipatory emotions that elicit goal-directed intentions and lead to appropriate actions. The researchers provided support for this theory in a large scale longitudinal study investigating bodyweight regulation via dieting and exercise. Participants in the study reacted to the possibility of succeeding or failing to reach their bodyweight goal with positive and negative anticipatory emotions which then contributed to intentions and goal directed-behaviours in terms of diet and exercising.

In depression, there is evidence to suggest that emotional responses do not always match the context. Ellis, Beevers and Wells (2009), for example, reported that the emotional response of dysphoric participants, unlike in the healthy controls, did not differ significantly according to whether they received positive or negative feedback following a bogus social intelligence task. This is suggestive of an emotion regulation deficit in depression, and

suggests that depressed people may not be responsive to rewards in the environment, as postulated by approach theories of motivation.

The theories and evidence outlined above suggest that behaviour is heavily influenced by underlying emotions and that in depression there may be a fundamental difficulty in generating emotional response to emotionally relevant stimuli. In relation to reward striving, this evidence suggests that reduced behavioural striving in depression may be more than just a consequence of pessimistic appraisals, and may represent a fundamental difficulty generating positive emotional responses (e.g. enthusiasm and eagerness) in relation to potential rewards in the environment.

Overview of the Literature

Despite the centrality of anhedonia to depression, the capacity of depressed people to experience anticipation of pleasurable events has received little empirical attention. Furthermore, there is limited evidence concerning the importance of cognitive appraisals (e.g. expectancies and control) in relation to goal striving in depression, and only a few studies, that have investigated this in relation to real life goal striving rather than reward based paradigms, with existing studies being limited often to non-clinical and very small samples. Theoretical models however suggest that these aspects may be central, and based upon integrating the predictions of affective, social/cognitive and behavioural activation system theories, each of which is supported by empirical evidence, a new model was developed (see Figure 1).

The model proposes that approach related behaviour is a consequence of both approach-related cognitive appraisals and approach-related cognitive affect, and depression affects levels of both. Based on Pekrun's (2006) control-value theory, it also proposes that appraisals influence approach related affect. Finally, congruent with research looking at the

links between depression and behavioural striving (e.g. Penedo & Dahn, 2005), reductions in approach related behaviour is seen as contributing towards the maintenance of depression.

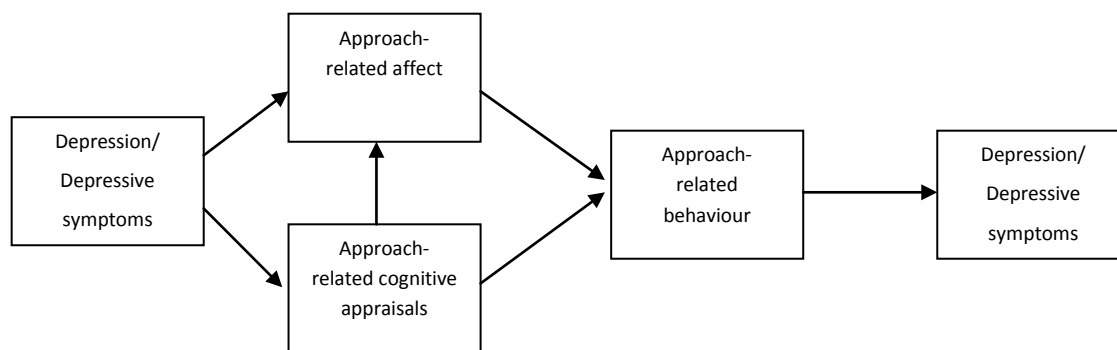


Figure 1: Model to demonstrate the hypothesised effect of depression on behavioural striving in relation to goals and/or rewards, and its subsequent effect on depression

The Current Research Study

The current investigation aimed to test the model proposed in Figure 1. by exploring interrelationships between approach-related affect, cognitions and striving behaviour, and any relationships which may exist between these variables and depression. Participants completed measures of current depression level, approach related affect, cognitions and behaviour in relation to striving toward personal goals and an experimental task that involved the manipulation of expectancies and control. A two week follow-up was then conducted to investigate whether approach related affect, cognitions and striving behaviour predict depression at follow-up. According to BAS theories, approach-related affect, cognitions and behaviour are all manifestations of an underactive BAS system, and so should all be compromised in depression and be predictive of depression severity at follow-up. Social/cognitive theories of striving and motivation suggest that more positive cognitive appraisals should lead to increases in both approach related positive affect and goal directed behaviour in the general population. However, consideration of the BAS theories would

suggest that in depression this relationship may not be as evident as approach-related affect, behaviour and cognitions are all purportedly manifestations of an underactive BAS.

If it is found that expectancies of and control over success mediate the relationship between depression and approach motivation, and that manipulating expectancies and perceived control can lead to increased striving behaviour in depression, this will have important therapeutic implications. The results would suggest that targeting negative thoughts about success and control during therapy, as is highly consistent with the techniques used in CBT, may be a useful strategy when working with people with depression. However if, as predicted, the effect is weaker in those with higher levels of depressive symptoms, it may also be useful to focus on enhancing approach-related affect (e.g. body techniques/enthusiasm inducing techniques such as videos) and behaviour (e.g. advice to not allow feelings stop doing the behaviour) in parallel.

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DOCTORATE IN CLINICAL PSYCHOLOGY

**An Investigation into the Relationship between Depressive
Symptoms, Approach-Related Affect, Cognitive Appraisals and
Striving Behaviour**

MAJOR RESEARCH PROJECT

Intended Journal: Journal of Affective Disorders²

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² For instructions to authors, see Appendix 2

Contents

| | |
|---|----|
| Abstract | 28 |
| Introduction | 30 |
| Research Aims and Hypotheses | 33 |
| Method | 35 |
| Participants..... | 35 |
| Design. | 35 |
| Measures & Materials..... | 36 |
| Procedure..... | 41 |
| Data Analysis | 42 |
| Results | 43 |
| Discussion | 60 |
| Implications | 64 |
| Conclusions | 65 |
| Acknowledgements | 66 |
| References | 67 |

An Investigation into the Relationship between Depressive Symptoms, Approach-Related Affect, Cognitive Appraisals and Striving Behaviour

Abstract

Background

Theories of emotion see affective processes as important in guiding behaviour, and social/cognitive theories have implicated cognitive appraisals in a motivational context. The control-value theory combines these approaches, predicting that high levels of expectancy and control lead to associated levels of anticipatory affect in those approaching a goal. This theory, combined with literature on approach motivation in depression, led to the proposed model of the effect of depression on behavioural striving, and subsequent levels of depression. The current study aimed to test this model.

Method

Sixty participants completed measures of depression, approach-related affect, cognitive appraisals and striving behaviour in relation to their own personal goals, with follow-up measures of depression and striving behaviour completed two weeks later. They also participated in an experimental manipulation of approach-related cognitive appraisals.

Results

The model received mixed support, with strongest evidence for the proposed pathway from depression to anticipatory affect via cognitive appraisals, especially for those who were at least mildly depressed. However contrary to the model, depression was not found to be associated to striving, and no variables other than depression predicted future depression.

Limitations

The study was conducted with a non-clinical population, there was reduced power at follow-up, and the experimental manipulation may have been unsuccessful.

Conclusions

This study provided preliminary support for the new model, and although findings were mixed, future research may be more conclusive. Findings suggest that therapy specifically tapping into approach-related cognitive appraisals, as well as approach-related affect, may be therapeutically beneficial in working with depression.

Keywords: Depression, Approach Motivation, Behavioural Activation System, Response to Reward.

An Investigation into the Relationship between Depressive Symptoms, Approach-Related Affect, Cognitive Appraisals and Striving Behaviour

Introduction

As well as a persistent lowering of mood, depression is characterised by anhedonia, a lack of interest or pleasure in normally rewarding experiences. Relatedly, depression has also been linked with low levels of approach motivation, a term used to describe *“the energization of behaviour by, or the direction of behaviour toward, positive stimuli”* (Elliot, 2008, p.8). Therapy often involves working with depressed clients to help motivate them to re-engage in rewarding activities and the pursuit of meaningful goals. Despite being clinically relevant however, there has been very little research into the thoughts and feelings associated with striving for potential rewards in the environment, and how these processes present in depression.

Cognitive theories such as Bandura’s (1994) model of self efficacy and Seligman’s (1975) learned helplessness theory of depression have linked expectancies of success and perceived level of control as factors that influence striving. In support of these theories, Dickson, Moberly and Kinderman (2011) found that clinically depressed adults were able to generate just as many approach goals as non-depressed people, but were more pessimistic about achieving them and had lower levels of perceived control over outcome. This study was the first of its kind to look at control and expectancies in relation to personal goals in a clinically depressed population. However the study did not include experimental manipulation and had no measure of actual striving behaviour. The above theories and research also fail to consider the impact of underlying emotions on the relationship between cognitive appraisals and striving.

Theories of emotion suggest that behaviour is in fact heavily influenced by underlying emotions (e.g. Tamir, 2009; Frijda, 2010) and that in depression there may be a fundamental difficulty in generating emotional response to emotionally relevant stimuli. In relation to reward striving, this suggests that reduced behavioural striving in depression may be more than a just a consequence of pessimistic appraisals, and may represent a fundamental difficulty generating positive emotional responses (e.g. enthusiasm and eagerness) in relation to potential rewards in the environment. In this sense, even if cognitive appraisals can be improved in depression, if the system that responds to potential rewards in the environment responds sluggishly to this information, emotional responses will be weaker and result in less actual striving behaviour. Indeed, according to behavioural activation system (BAS) theories, approach-related affect, cognitions and behaviour are all manifestations of an underactive BAS system, and so should all be compromised in depression and be predictive of depression severity at follow-up.

Social/cognitive theories of striving and motivation suggest that more positive cognitive appraisals should lead to increases in both approach related positive affect and goal directed behaviour in the general population. These theories have implicated cognitive appraisals of expected success and control as being important factors in a motivational context (Pekrun, 2006), with a person's appraisal of expected outcome, combined with their level of perceived control over success, affecting their levels of affect and associated engagement in the task. This control-value theory of motivation predicts that high levels of expectancy and control will lead to associated levels of anticipatory affect in those approaching a goal (Pekrun, 2006). However, we propose that in depression this relationship may not be as evident as approach-related affect, behaviour and cognitions are all purportedly manifestations of an underactive BAS. Based on the reviewed literature, a proposed model was constructed of the effect of depression on behavioural striving, and subsequent levels of depression (see Figure 1).

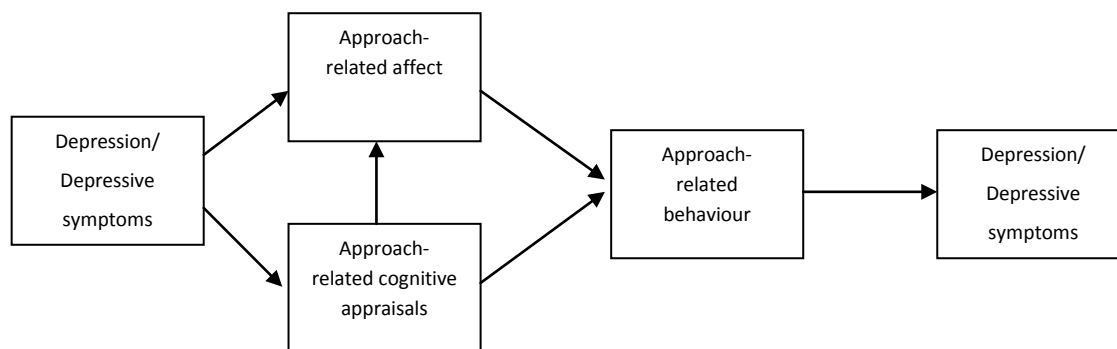


Figure 1: Model to demonstrate the hypothesised effect of depression on behavioural striving in relation to goals and/or rewards, and its subsequent effect on depression

The current study aims to investigate the validity of this model, with research questions including whether depressive symptoms are related to more negative cognitive appraisals of outcome expectancy and control and lower levels of striving behaviour when presented with a potential reward, and the extent to which lower levels of approach related affect impacts on these variables. The study will also investigate whether approach related affect, cognition and behaviour are predictive of depressive symptoms at follow-up.

If it is found that expectancies of and control over success mediate the relationship between depression and approach motivation, and that manipulating expectancies and perceived control can lead to increased striving behaviour in depression, this will have important therapeutic implications. The results would suggest that targeting negative thoughts about success and control during therapy may be a useful strategy when working with people with depression. However, if the effect is as predicted, weaker in those with higher levels of depressive symptoms, it may also be useful to focus on enhancing approach-related affect (e.g. body techniques/ enthusiasm inducing techniques such as videos) and behaviour (e.g. advice to not allow feelings stop doing the behaviour) in parallel.

Research Aims and Hypotheses

The current investigation aims to investigate the interrelationships between approach-related affect, cognitions and striving behaviour, and any relationships which may exist between these variables and depression in relation to the model proposed in Figure 1.

In keeping with previous findings, and consistent with BAS theory, H1 predicts there will be a negative correlation between levels of depression and levels of sensitivity of the approach system, H2 predicts there will be positive inter-correlations between the variables of: cognitive appraisals of goal outcome expectancy and perceived level of control over success, approach motivation related affect whilst imagining striving towards an approach goal and intensity of striving behaviour, and H3 predicts that there will be negative correlations between levels of depression and i) goal outcome expectancies and perceived level of control over success ii) approach motivation related affect whilst striving towards an approach goal and iii) striving behaviour. Consistent with the control-value model, H4a predicts that the association between levels of depression and measures of approach related affect predicted in H3 will be mediated by i) goal outcome expectancies and ii) perceived level of control over success, H4b that the association between levels of depression and measures of approach related striving behaviour predicted in H3 will be mediated by i) approach-related cognitive appraisals and ii) approach related affect and H5 predicts that the relationship between expectancies/control and striving behaviour will be mediated by levels of approach related affect. Again, based on previous findings, and consistent with approach systems theory H6 predicts that controlling for depression severity at baseline (T1), depression at follow-up (T2) will be predicted by approach related affect, expectancies/control and striving behaviour, with lower levels on each measure being predictive of increased levels of depression at T2. Finally, H7a predicts that more favourable goal outcome expectancies and perceived level of control over success play a causal role in determining higher levels of i) approach motivation related affect in relation to

the experimental task and ii) striving behaviour in the general population, this being informed by social/cognitive theories of striving and motivation that suggest that more positive cognitive appraisals should lead to increases in both approach related positive affect and goal directed behaviour in the general population, and H7b predicts that the predicted effect will be weaker in those with higher levels of depressive symptoms, this being informed by the consideration of BAS theories that suggest that in depression this relationship may not be as evident as approach-related affect, behaviour and cognitions are all purportedly manifestations of an underactive BAS. These hypotheses are presented pictorially in Figure 2 below. Here, although single-headed arrows are drawn in this figure because the theoretical model was causal, the current research was only able to detect correlational relationships for many of the hypotheses.

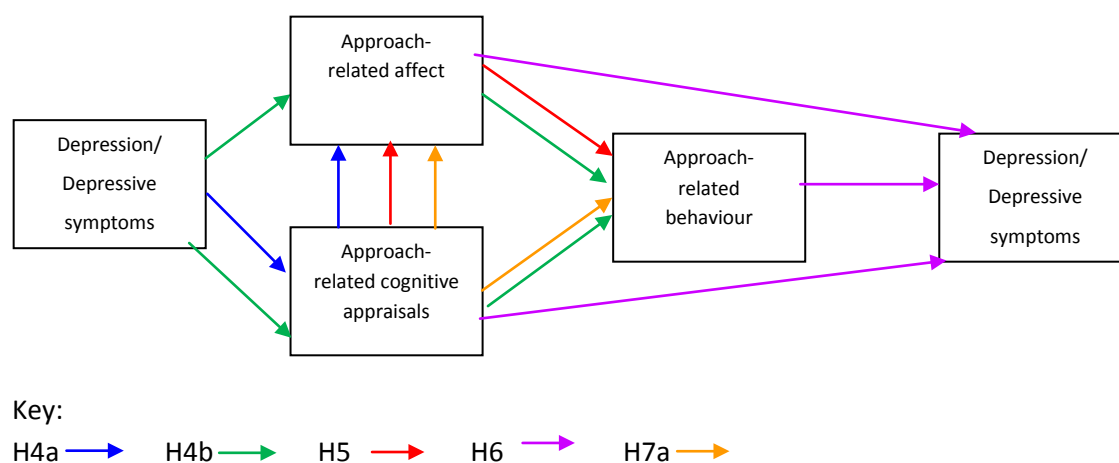


Figure 2: Colour coded model to demonstrate the hypothesised effect of depression on behavioural striving in relation to goals and/or rewards, and its subsequent effect on depression

Method

Participants³

Sixty participants took part in this study, 10 males and 50 females. Participants were found to have a mean age of 19.7 years, $SD = 0.50$, range = 18-30. This sample was recruited from the university student population via adverts aimed specifically at people experiencing low mood and depression, but also for those who were not. None of the participants were suspected of having an organic cause for their depression, or were suffering from bipolar disorder or psychotic illness. Participants were required to be aged 18+ and without current substance or dependence problems as this could have impaired their emotional responding and all were native speakers of English.

Design

The study was a prospective mixed design, with stage 1a involving questionnaires to naturalistically investigate hypotheses H1-H6 in relation to personal goals and stage 1b involving experimental manipulation of approach related cognitive appraisals prior to a computerised anagram task to investigate H7a and H7b.

Stage 2 was conducted two weeks after initial testing and involved a repeated-measures design in which the baseline measures of symptom-severity were re-measured and participants asked to rate their effort expended striving toward each personal goal over the previous 2 weeks.

³ For sample size calculations, see Appendix 3

Measures & Materials

Depressive symptoms.

Structured clinical interview for DSM-IV (SCID-I; First, Spitzer, Gibbon & Williams, 2002).

The SCID-I is a semi-structured interview in which participants are asked questions to determine whether their symptoms meet diagnostic criteria for major Axis I disorders within the past month and during their lifetime. The researcher conducted and recorded interviews with all participants following the Mood Disorders (current and past episode of depression) section of the SCID-I. These recordings were dual-rated, and inter-rater reliability was found to be good ($k = .97$). In cases where there was disagreement between the two raters ($n=2$), a consensus was reached through discussion, and this then used in the reported results. Participants were also screened for both psychosis and hypomania, and follow-up questions asked if appropriate. No participants were excluded on the basis of psychosis or hypomania.

Beck Depression Inventory (BDI-II: Beck, Steer, Ball & Ranieri, 1996).

The BDI-II is a 21-item self-report measure of current levels of depressive symptoms in both clinical and non-clinical populations. Each item consists of four statements of increasing severity relating to particular symptoms of depression, which are rated on a 0-3 scale according to how the person has felt over the last two-weeks. The BDI-II has a coefficient alpha of .92 and a test-retest reliability correlation of .93 ($p < .001$). Internal consistency of the BDI-II in the current study had an alpha coefficient of .94. The BDI-II has high construct validity and highly correlates with other measures of depression (Beck et al., 1996).

Sensitivity of the approach system.

Behavioural Inhibition System/Behavioural Activation System Scales (BIS/BAS scales: Carver & White, 1994).⁴

The BIS/BAS scales are a 20-item self-report measure that taps the behavioural activation system as well as tapping the behavioural inhibition system. Participants are asked to rate on a 4-point scale the extent to which 13 statements reflecting trait differences in BAS, and 7 statements reflecting trait differences in BIS, are representative of themselves. Subscales demonstrate adequate levels of internal consistency (α 's = .66 -.76) and test-retest reliability (r 's =.59-.69; Carver & White, 1994). Consistent with the hypotheses made in the current study, only the BAS scale was used. Here, this was found to have an internal consistency alpha coefficient of .85.

Naturalistic goals task.

⁵

Participants were asked to generate personal approach goals across the domains of health, relationships, work and hobbies, with one goal being elicited for each (Lam & Power, 1991). The prompt given to elicit approach goals was 'I am currently trying to ...'. Participants were then asked to complete a Likert scale relating to the importance they placed on achieving each of their goals (goal value) and then asked to complete Likert scales measuring expectancies of success and control over success whilst imagining striving towards those goals over the next two weeks. They were also instructed to make ratings of approach related affect via the PANAS and AMSAM (described later in this section) when thinking about striving towards their goals over the same period of time. Finally they were asked to rate the effort they think they will put into achieving these goals over the next two weeks, and at follow-up asked to complete Likert scales relating to the effort they had expended striving toward each personal goal given over the previous 2 weeks⁶.

⁴ For BIS/BAS scales, see Appendix 4

⁵ For goals task, see Appendix 5

⁶ For follow-up goals task, see Appendix 6

For each participant ratings of goal value, expectancy, control, expected effort and actual effort, as well as PANAS and AMSAM scores, were averaged across the four domains (Health, Relationships, Work, Hobbies), to obtain the overall ratings used in the analysis of results.

Experimental approach task⁷.

This task was a computerised anagram test, involving manipulations of expectancies and control. In Condition 1, participants were informed that 30% of individuals taking part would win, and that the task performance was largely dependent on natural ability. In condition 2 participants were informed that 70% of people taking part would win and that it is possible to get better at the task with practice. Prior to the main study, this manipulation was piloted in a student sample⁸, which confirmed that the manipulation had the intended effect on levels of expectancy and control. Participants were also informed that a prize of £5 would be given to those who win. Participants were randomly allocated to each condition, with those in each condition being presented with the same set of 14 anagrams to solve⁹. For each anagram participants were instructed to either enter their solution or give up and move on to the next anagram if they were unable to do so. The number of anagrams correctly solved was collected by the computer program and used in the analysis of results.

Approach-related affect.

Primary measure: Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988).¹⁰

The PANAS consists of 10 positive and 10 negative affect words which participants rate on a 5-point scale according to how they are feeling at present. The PANAS has been shown to

⁷ For experimental approach task instructions, see Appendix 7

⁸ For method and materials for pilot study, see Appendix 8

⁹ For a list of anagrams used along with correct solutions, see Appendix 9

¹⁰ For the PANAS, see Appendix 10

be internally consistent and stable over a two month period (Watson et al., 1988). It is thought to have high construct validity, and has been shown to correlate as expected with measures of depression and anxiety (Crawford & Henry, 2004). Consistent with the hypotheses of the current study, only the score relating to positive affect (PA) was used - for this the internal consistency alpha coefficient was found to be .88. In addition to evidence for construct validity, there is also evidence that the PANAS specifically measures approach-related affect (Harmon-Jones, Harmon-Jones, Abramson & Peterson, 2009). In the naturalistic goals study, the PANAS was completed by participants for each of the given goals, with the following instructions: 'I would now like you to imagine striving towards this goal over the next two weeks, and to complete the following two questionnaires in relation to how you feel whilst thinking about doing so'. In analysis of the results, PA scores were averaged across the four domains to give the final Goal PANAS (PA) score. The PANAS was also given prior to the experimental approach task, with the instructions: 'Before starting the task, please complete the following two questionnaires with respect to how you feel about working on the task'.

Secondary measure: Approach Motivation Self Assessment Manikin (AMSAM; Begley, in preparation)¹¹.

This measure consists of a single item accompanied by a nine point pictorial rating scale. Participants are asked to mark the point on the scale that best represents to extent to which they currently feel "motivated, driven and ready to strive to get what [you] want". This second measure of approach motivation was added due to the fact that the PANAS was not specifically designed as a measure of feelings of wanting to approach. The measure, currently under development, is intended as a quick, simple self report measure of felt sense of approach motivation, defined as a state of readiness to move towards an approach goal. The format is based upon the established SAM scales of arousal, valence and dominance (Bradley & Lang, 1994). As with the PANAS, the AMSAM was completed by participants for

¹¹ For the AMSAM, see Appendix 11

each of the given goals following the same instructions detailed above, with scores again averaged across the four domains to give the final Goal AMSAM score. The AMSAM was also given prior to the experimental approach task, again with the same instructions as described for the PANAS.

Approach-related behaviour.

Primary measures: self-reported expected approach related behaviour.

Participants rate how much effort they predict they will put into achieving their own personal goals or the anagram task, with 1 representing 'no effort' and 7 representing 'huge effort'.

Self-reported approach related behaviour.

Participants rate how much effort they have put into achieving their own personal goals or the approach task, 1 representing 'no effort' and 7 representing 'huge effort'.

Secondary measure: Number of anagrams completed on the computerised anagram task.

Number of anagrams completed was taken as a secondary measure of striving effort.

Approach-related cognitive appraisals.

Self-reported expectancies (Dickson et al, 2011).

Participants rate how much progress they think they will make towards achieving their own personal goals, with 1 representing 'no progress' and 7 representing 'huge progress', for the experimental task how likely they are to succeed in winning on the approach task, 1 being 'not at all' likely to happen and 7 being 'extremely' likely to happen.

Self-reported control (Dickson et al, 2011).

Participants rate how much control they perceive to have over the outcome of their goals/ the approach task, 1 representing 'no control' and 7 representing 'complete control'.

Self-reported goal value (Dickson et al, 2011).

Participants rate how important their goals and their performance on the approach task are, 1 representing 'not at all' important and 7 representing 'extremely' important.

Procedure

Ethical approval was obtained from the University of Exeter, prior to data collection¹². All participants were given an information sheet¹³ and consent form¹⁴ to sign at the beginning of the testing session and prior to taking part in the research. If risk of harm to participants was detected at any point, it was agreed that the Mood Disorders Centre risk protocol would be followed; with a qualified clinical psychologist always available to the researcher should additional input or be required.

During stage 1a participants completed the BDI and were then asked to generate personal approach goals for the naturalistic goals task as described above. Stage 1b involved experimental manipulation of outcome expectancies. Participants were given information about a computerised anagram task, as described in the previous section. Following these instructions, participants were asked to make ratings of expectancy and control (and goal value) as a manipulation check. Participants were then asked to complete measures of approach related affect via the PANAS and AMSAM with respect to how they felt about working on the task, and then started the task. Approach related behaviour was measured halfway through the task and at the end of the task using a Likert scale tapping into how hard the person perceived themselves to be trying or have tried on the task. At the end of the task, participants were given a debriefing sheet which fully explained the nature of the

¹² For ethical approval letter for main study, see Appendix 12

¹³ For information sheet, see Appendix 13

¹⁴ For consent form, see Appendix 14

manipulation used¹⁵. They were then asked to randomly select a card from a bag, of which half corresponded to the prize of £5, and half of the prize of chocolate.

Stage 2 was conducted two weeks after initial testing and involved participants completing the BDI-II and giving ratings of effort expended striving toward each personal goal given over the previous 2 weeks. This part of the procedure was conducted via email.

Data Analysis

Missing Data

Three participants were unable to generate a goal for 'hobbies' - for these participants, means were calculated across the average for the three (rather than four) completed domains. This same procedure was also used for follow-up data.

Preliminary Analysis

Variables were explored to examine normality using both graphical representations and values of kurtosis and skewness¹⁶. Z-values above 2.58 were taken to indicate an unacceptable level of skewness of kurtosis, and where appropriate, transformation methods were selected in line with the recommendations of Tabachnick and Fidell (2001), which take into account data distribution patterns. In cases where the transformation was unsuccessful, non-parametric tests were used in analysis where possible. For all analysis that involved regression, data were checked for multicollinearity, independence of errors, influential cases and plots were examined for evidence of normality, linearity and heteroscedasticity¹⁷.

¹⁵ For debriefing sheet, see Appendix 15

¹⁶ For these checks, see Appendix 16

¹⁷ For these checks, see Appendix 17

Main Analysis

To analyse the findings for Hypotheses 1-3, correlational analysis was used, and hierarchical linear regression analysis was used to investigate H4-H6. To test hypotheses about mediation (H4 & H5) bootstrapping was used to test indirect effects (Preacher & Hayes, 2004; Preacher & Hayes, 2008). Independent *t*-tests were then conducted to explore the effect of the experimental manipulation on approach related affect and striving behaviour (H7a). A series of multiple linear regression models was then conducted to explore H7b. To test the association between BDI score and the effectiveness of the experimental manipulation, and the extent to which expectancies / control predicted affect and striving behaviour regions of significance were explored (Preacher, Curran & Bauer, 2006)¹⁸. Where a-priori directional predictions were tested, one-tailed tests were used. Otherwise two-tailed tests were applied.

Results

Demographic Information and Description of the Sample

Among the sample, 10 participants were currently clinically depressed according to the SCID, and in terms of previous episodes of depression, 27 were found to have experienced at least one episode of clinical depression in their past. Participants had a mean BDI depression score of 11.2, *SD* = 10.7, range = 0-50, the standard cut-offs for the BDI and the frequency of participants falling into each category are presented in Table 1. There was no correlation between levels of depression and the value participants placed on goals, $r(58) = .02$, $p = .88$ (two-tailed test). None of the participants included in the study were currently experiencing psychosis, mania or substance abuse.

Table 1

Cut-offs for the BDI and Frequency of Participants Falling into each Category

¹⁸ For how the regions of significance were calculated, see Appendix 18

| BDI score | Category | Frequency |
|-----------|---------------------|-----------|
| 0-13 | Minimal depression | 42 |
| 14-19 | Mild depression | 8 |
| 20-28 | Moderate depression | 4 |
| 29-63 | Severe depression | 6 |

Forty participants completed follow-up questionnaires. Those who participated in the follow-up, did not differ significantly from drop-outs on the demographic variables of Age, $U = 285$, $p = .06$, BDI scores, $t(58) = -0.43$, $p = .67$, but there was a significant difference between groups in terms of Sex, $X^2(1) = 7.26$, $p < .01$, with a higher proportion of males dropping out at follow-up. Descriptive details for variables are presented in Table 2.

Table 2

Descriptive Statistics for each of the Variables

| Variable | N | Mean | SD | Minimum | Maximum |
|----------------------|----|-------|-------|---------|---------|
| Age | 60 | 19.7 | 2.37 | 18 | 30 |
| BDI | 60 | 11.2 | 10.7 | 0 | 50 |
| BAS | 60 | 39.8 | 5.9 | 23 | 52 |
| Goal Value | 60 | 5.71 | 0.60 | 4.00 | 7.00 |
| Goal PANAS (PA) | 60 | 30.62 | 5.16 | 19.75 | 42.75 |
| Goal AMSAM | 60 | 6.15 | 1.03 | 3.67 | 8.25 |
| Goal Expectancy | 60 | 4.76 | 0.75 | 2.67 | 6.25 |
| Goal Control | 60 | 5.36 | 0.80 | 3.50 | 7.00 |
| Goal Expected Effort | 60 | 5.04 | 0.79 | 3.00 | 6.75 |
| Goal Actual Effort | 40 | 4.17 | 0.94 | 1.50 | 6.25 |
| BDI Follow-up | 40 | 9.90 | 8.77 | 0 | 43 |
| Exp Value | 60 | 4.52 | 1.41 | 1 | 7 |
| Exp PANAS (PA) | 60 | 26.35 | 7.42 | 10 | 45 |
| Exp AMSAM | 60 | 5.92 | 1.634 | 2 | 9 |
| Exp Control | 60 | 3.70 | 1.62 | 1 | 7 |
| Exp Expectancy | 60 | 4.17 | 1.68 | 1 | 7 |
| Exp Actual Effort | 60 | 5.42 | 1.20 | 2 | 7 |
| Exp Effort | 60 | 4.38 | 1.22 | 2 | 6 |
| Exp Correct | 60 | 3.83 | 2.79 | 0 | 13 |

Part 1 - Naturalistic Study

H1: There will be a negative correlation between levels of depression and levels of sensitivity of the approach system.

There was found to be a trend towards a significant negative correlation between levels of depression and levels of trait approach motivation, as measured by the BIS/BAS scales, $r(58) = -.21, p = .06$ (one-tailed test).

H2: There will be positive inter-correlations between the following variables: cognitive appraisals of goal outcome expectancy and perceived level of control over success, approach motivation related affect whilst imagining striving towards an approach goal and intensity of striving behaviour.

Table 3

Pearson Correlation Matrix for Variables in the Naturalistic Study

| | Goal PANAS (PA) | Goal AMSAM | Goal Expectancy | Goal Control | Goal Expected Effort | Goal Actual Effort |
|----------------------|-----------------|------------|-----------------|--------------|----------------------|--------------------|
| Goal PANAS (PA) | - | .59** | .22* | -.13 | .44** | .28* |
| Goal AMSAM | - | - | .31** | .01 | .57** | .16 |
| Goal Expectancy | - | - | - | .33** | .73** | .51** |
| Goal Control | - | - | - | - | .12 | .19 |
| Goal Expected Effort | - | - | - | - | - | .65** |
| Goal Actual Effort | - | - | - | - | - | - |

*Note: One-tailed tests; ** $p < .01$, * $p < .05$*

As seen in Table 3, the two measures of approach-related affect were significantly positively correlated with one another, as were the two measures of approach-related cognitive appraisals, and approach related behaviour. These effects all ranged from medium to large in Cohen's (1992) terms. In terms of inter-correlations between all measures, the measures of approach-related affect were positively correlated with approach-related behaviour (with

one exception), and also with Goal Expectancy but not Control. Approach-related cognitive appraisals showed a mixed profile, with Expectancy being positively correlated with approach related-behaviour, but Control not demonstrating any significant effects.

H3: There will be negative correlations between levels of depression and i) goal outcome expectancies and perceived level of control over success ii) approach motivation related affect whilst striving towards an approach goal and iii) striving behaviour.

Table 4

Pearson Correlation Matrix for BDI scores and Variables in the Naturalistic Study

| | Goal PANAS (PA) | Goal AMSAM | Goal Expectancy | Goal Control | Goal Expected Effort | Goal Actual Effort |
|-----|-----------------|------------|-----------------|--------------|----------------------|--------------------|
| BDI | -.18 | -.24* | -.24* | -.50** | -.13 | -.24 |

*Note: One-tailed tests; ** $p < .01$, * $p < .05$, † $p < .1$*

As seen in Table 4, BDI scores at baseline are significantly negatively correlated with Goal AMSAM, Expectancy and Control, with all other correlations being in the same direction, but falling short of significance.

H4a: The association between levels of depression and measures of approach related affect predicted in H3 will be mediated by i) goal outcome expectancies and ii) perceived level of control over success.

To explore H4a, a regression was conducted with AMSAM (PA was not found to be significantly correlated with BDI score) as the outcome variable, BDI score as the predictor for step 1, and expectancy and control as the predictors for step 2.

Table 5
 Summary of Regression Analysis for H4: AMSAM

| Variable | B | SE (B) | β |
|------------|-------|--------|-------------------|
| Step 1 | | | |
| Constant | 6.75 | 0.34 | |
| BDI | -0.64 | 0.34 | -.24 [†] |
| Step 2 | | | |
| Constant | 6.38 | 1.35 | |
| BDI | -0.75 | 0.38 | -.28 [†] |
| Expectancy | 0.44 | 0.18 | .32* |
| Control | -0.30 | 0.19 | -.23 |

Note R^2 = for Step 1 ($p = .07$); ΔR^2 = for Step 2 ** $p < .01$, * $p < .05$, [†] $p < .1$

As seen in Table 5, the change in R^2 from step 1 to step 2 was significant. The BDI coefficient was not reduced in magnitude when the putative mediators were included, but Expectancy was found to significantly predict the outcome. To test the significance of any indirect effect of expectancy and control, bootstrapping was used, with 5000 re-samples. The beta value for Expectancy was 0.32, bootstrapped 95% CI [-0.50 to -0.05], and the beta value for Control was -0.23, bootstrapped 95% CI [-0.06 to 0.78]. For Expectancy, the CI did not span 0, whereas for Control it did. It can therefore be concluded that there was a significant indirect effect of BDI scores on AMSAM scores mediated through expectancy but not through control¹⁹.

H4b: The association between levels of depression and measures of approach related striving behaviour predicted in H3 will be mediated by i) approach-related cognitive appraisals and ii) approach related affect.

Due to the fact that H3 did not find a significant relationship between BDI scores and approach related striving, it was not possible to explore this hypothesis.

¹⁹ The bootstrapping analysis was also conducted on separate models for expectancy and control, with results being consistent with this conclusion

H5: The relationship between expectancies/control and striving behaviour will be mediated by levels of approach related affect.

To explore H5, a regression was conducted with Expected Effort as the outcome variable, Expectancy (Control was not found to be significantly related to striving behaviour) as the predictor for step 1, and PANAS and AMSAM as the predictors for step 2.

Table 6

Summary of Regression Analysis for H5: Expected Effort

| Variable | B | SE B | β |
|------------|-------|------|---------|
| Step 1 | | | |
| Constant | 1.36 | 0.46 | |
| Expectancy | 0.77 | 0.10 | .73** |
| Step 2 | | | |
| Constant | -0.10 | 0.50 | |
| Expectancy | 0.64 | 0.09 | .61** |
| PANAS (PA) | 0.02 | 0.01 | .14 |
| AMSAM | 0.23 | 0.08 | .30** |

Note R^2 = for Step 1 ($p < .01$); ΔR^2 = for Step 2 ($p < .01$). ** $p < .01$, * $p < .05$, † $p < .1$

As can be seen in Table 6, the change in R^2 from step 1 to step 2 was significant. There was a small reduction in the Expectancy coefficient when the putative mediators were included, with AMSAM being found to significantly predict the outcome in step 2, suggesting there may be some mediation by AMSAM. To test for the presence of any indirect effect of PANAS and AMSAM, bootstrapping was used, with 5000 re-samples. The beta value for PA was 0.14, bootstrapped 95%CI [-0.01, 0.15] and the beta value for AMSAM was 0.30, bootstrapped 95% CI [0.01, 0.24]. For AMSAM, the CI did not span 0, whereas for PANAS it did. It can therefore be concluded that there was a significant indirect effect of

Expectancy scores on Expected Effort scores mediated through AMSAM but not through PA²⁰.

The regression was then repeated, with Actual Effort as the outcome variable, and as above, Expectancy as the predictor for step 1, and PANAS and AMSAM as the predictors for step 2.

Table 7

Summary of Regression Analysis for H5: Actual Effort

| Variable | B | SE B | β |
|------------|-------|------|---------|
| Step 1 | | | |
| Constant | 1.20 | 0.82 | |
| Expectancy | 0.63 | 0.17 | .51** |
| Step 2 | | | |
| Constant | 0.44 | 1.06 | |
| Expectancy | 0.62 | 0.18 | .50** |
| PANAS (PA) | 0.05 | 0.03 | .26 |
| AMSAM | -0.10 | 0.14 | -.12 |

Note R^2 = for Step 1 ($p < .01$); ΔR^2 = for Step 2 ($p = .29$). ** $p < .01$, * $p < .05$, † $p < .1$

As can be seen in Table 7, the change in R^2 from step 1 to step 2 was insignificant. There was only a very tiny reduction in the Expectancy coefficient when the putative mediators were included, with neither PANAS nor AMSAM being found to significantly predict the outcome in step 2, suggesting that there is unlikely to be significant mediation. To test for the presence of an indirect effect of PANAS and AMSAM, bootstrapping was used, with 5000 re-samples. The beta value for PA was 0.14, bootstrapped 95% CI [-0.02, 0.28] and the beta value for AMSAM was 0.30, bootstrapped 95% CI [-0.23 to 0.04]. For both AMSAM and PA the CI spanned 0, and so it can therefore be concluded that the association between expectancy and actual effort scores was not significantly mediated by AMSAM or PA.

²⁰ The bootstrapping analysis was also conducted on the separate models, with results indicating that when PA was entered alone, it is a significant mediator, however in combination with AMSAM as seen above, it is not

H6: Controlling for depression severity at baseline (T1), depression at follow-up (T2) will be predicted by approach related affect, expectancies/control and striving behaviour, with lower levels on each measure being predictive of increased levels of depression at T2.

To explore H6, a regression was conducted with BDI Follow-up as the outcome variable, BDI as the predictor for step 1, and PANAS, AMSAM, Expectancy, Control, Expected Effort and Actual Effort as the predictors for step 2.

Table 8
Summary of Regression Analysis for H6

| Variable | B | SE B | β |
|-----------------|-------|------|---------|
| Step 1 | | | |
| Constant | 0.20 | 0.10 | |
| BDI | 0.73 | 0.10 | .77** |
| Step 2 | | | |
| Constant | 0.17 | 0.55 | |
| BDI | 0.73 | 0.13 | .77** |
| PANAS (PA) | 0.01 | 0.01 | .16 |
| AMSAM | -0.04 | 0.05 | -.12 |
| Expectancy | -0.02 | 0.08 | -.05 |
| Control | -0.03 | 0.07 | -.05 |
| Expected effort | 0.01 | 0.11 | .03 |
| Actual effort | 0.03 | 0.07 | .06 |

Note R^2 = for Step 1 ($p < .01$); ΔR^2 = for Step 2 ($p = .84$). ** $p < .01$, * $p < .05$, † $p < .1$

As can be seen in Table 8, step 1 of the model demonstrates that baseline BDI score is a significant predictor of BDI score at follow-up. The change in R^2 from step 1 to step 2 was insignificant, with none of the other variables significantly predicting BDI score at follow-up over and above that of baseline BDI score.

The simultaneous inclusion of so many overlapping predictors, however, makes the above regression a very conservative analysis. Analysis was therefore also completed for all

variables separately, with none of these significantly predicting follow-up depression scores when baseline depression scores had been controlled for²¹.

Part 2 - Experimental Study

Demographics for each of the experimental conditions.

There were 30 participants allocated to each of the two experimental conditions. The conditions HIGH Expectancy/Control vs. LOW Expectancy/Control did not differ significantly on the demographic variables of Age, $U = 446.5$, $Z = -0.06$, $p = .96$, BDI Depression, $t(58) = 0.05$, $p = .96$, BAS, $t(58) = 1.76$, $p = .08$, Sex, $\chi^2(1) = 0.00$, $p = 1.00$, SCID Current Depression, $\chi^2(1) = 0.48$, $p = .49$, and SCID Past Depression, $\chi^2(1) = 0.61$, $p = .44$. There was also no significant difference between conditions in terms of the importance participants placed on winning the experimental task, $t(58) = -1.39$, $p = .17$, and there was no correlation between levels of depression and the value placed on winning the experimental task, $r(58) = -.10$, $p = .45$ (two-tailed test). Descriptive statistics are shown in Table 9, with correlations between all variables for both conditions being displayed in the Appendices²².

²¹ For these calculations, see Appendix 19

²² For these correlations, see Appendix 20

Table 9

Descriptive Statistics for Variables Across each of the Conditions

| | LOW Expectancy/Control | | | | | HIGH Expectancy/Control | | | | |
|-------------------|------------------------|-------|------|---------|---------|-------------------------|-------|-------|---------|---------|
| | N | Mean | SD | Minimum | Maximum | N | Mean | SD | Minimum | Maximum |
| Age | 30 | 19.57 | 2.03 | 18 | 26 | 30 | 19.83 | 2.69 | 18 | 30 |
| BDI | 30 | 10.77 | 9.96 | 0 | 44 | 30 | 11.70 | 11.54 | 0 | 50 |
| BAS | 30 | 41.07 | 4.70 | 31 | 52 | 30 | 38.43 | 6.73 | 23 | 48 |
| Exp Value | 30 | 4.27 | 1.53 | 1 | 7 | 30 | 4.77 | 1.25 | 2 | 7 |
| Exp PANAS (PA) | 30 | 24.70 | 7.00 | 10 | 37 | 30 | 28.00 | 7.58 | 13 | 45 |
| Exp AMSAM | 30 | 5.67 | 1.77 | 2 | 8 | 30 | 6.17 | 1.49 | 4 | 9 |
| Exp Control | 30 | 3.53 | 1.74 | 1 | 7 | 30 | 3.87 | 1.50 | 1 | 7 |
| Exp Expectancy | 30 | 3.87 | 1.55 | 1 | 6 | 30 | 4.47 | 1.78 | 1 | 7 |
| Exp Effort | 30 | 5.20 | 1.24 | 2 | 7 | 30 | 5.63 | 1.13 | 3 | 7 |
| Exp Actual Effort | 30 | 4.37 | 1.22 | 2 | 6 | 30 | 4.40 | 1.25 | 2 | 6 |
| Exp Correct | 30 | 4.03 | 2.44 | 0 | 10 | 30 | 3.63 | 3.12 | 0 | 13 |

Manipulation check.

There were no significant differences found between the conditions of HIGH Expectancy/Control vs. LOW Expectancy/Control for both self-rated Expectancy, $t(58) = -0.80$, $p = .43$, and self-rated Control, $t(58) = -1.40$, $p = .17$. It was therefore concluded that the manipulation may have been unsuccessful. However, because self-reported expectancy and control may not be sensitive to all the effects of the manipulation and because the study also aimed to look at variables other than expectancy and control, as well as the fact that the pilot had been successful, it was decided to continue with the planned analysis.

In addition to exploring the simple manipulation check, it was also decided to look at the association between BDI scores and the success of the manipulation, as later hypotheses predict different effects at different levels of BDI scores. Thus, a multiple regression was conducted, with Expectancy as the outcome variable, Condition and BDI as the predictors for step 1, and Condition x BDI as the predictor for step 2 (see Table 10), the same then being repeated with Control as the outcome variable (see Table 11).

Table 10

Summary of Regression Analysis for Manipulation Check: Expectancy

| Variable | <i>B</i> | <i>SE B</i> | β |
|-----------------|----------|-------------|-------------------|
| Step 1 | | | |
| Constant | 4.97 | 0.56 | |
| Condition | 0.33 | 0.39 | .10 |
| BDI | -1.53 | 0.52 | -.36** |
| Step 2 | | | |
| Constant | 6.26 | 0.76 | |
| Condition | -1.93 | 1.01 | -.60 [†] |
| BDI | -2.91 | 0.76 | -.69** |
| Condition x BDI | 2.42 | 1.00 | .83* |

Note R^2 = for Step 1 ($p < .05$); ΔR^2 = for Step 2 ($p < .05$). ** $p < .01$, * $p < .05$, [†] $p < .1$

As in Table 10, the change in R^2 from step 1 to step 2 was significant, with a significant interaction between Condition and BDI being found in terms of their effect on Expectancy

scores. Tests of the region of significance in moderated multiple regression were then used to explore the regions of significance for the interactions. For expectancy, at values of 1.17 and above (BDI score ≥ 15) the effect of condition was significant (at $p < .05$), with those in the HIGH Expectancy/Control group having higher self-ratings of expectancy, than those in the LOW Expectancy/Control group, whereas below this score, the effect of condition was not significant.

Table 11

Summary of Regression Analysis for Manipulation Check: Control

| Variable | <i>B</i> | <i>SE B</i> | β |
|-----------------|----------|-------------|-------------------|
| Step 1 | | | |
| Constant | 4.86 | 0.60 | |
| Condition | 0.60 | 0.42 | .18 |
| BDI | -1.06 | 0.55 | -.24 [†] |
| Step 2 | | | |
| Constant | 6.30 | 0.80 | |
| Condition | -1.94 | 1.07 | -.58 [†] |
| BDI | -2.60 | 0.80 | -.60** |
| Condition x BDI | 2.71 | 1.062 | .89* |

Note R^2 = for Step 1 ($p = .07$); ΔR^2 = for Step 2 ($p < .05$). ** $p < .01$, * $p < .05$, [†] $p < .1$

As can be seen in Table 11, when equivalent analysis was done with control as the outcome variable, the change in R^2 from step 1 to step 2 was significant. For control, at values of 1.02 (BDI score ≥ 10) the effect of condition was significant, with those in the HIGH Expectancy/Control group having higher self-ratings of control, than those in the LOW Expectancy/Control group, whereas below this score, the effect of condition was not significant.

Thus, it appears that the manipulation may have been successful only for individuals with higher levels of depressive symptoms, corresponding approximately to the validated cut-off of BDI = 14 for mild depression (Beck et al, 1996).

Main analysis.

H7a: More favourable goal outcome expectancies and perceived level of control over success play a causal role in determining higher levels of i) approach motivation related affect in relation to the experimental task and ii) striving behaviour in the general population.

To explore H7a, independent *t*-tests were used to compare levels of Positive Affect, AMSAM, Expected Effort, Actual Effort and Anagrams Correct across the two experimental conditions.

A significant difference was found between conditions for Positive Affect, $t(58) = -1.75$, $p = .04$ (one-tailed test) with higher scores in the High Expectancy/Control group as seen in Table 9, with a trend towards a difference being found for Expected Effort, $t(58) = -0.41$, $p = .08$ (one-tailed test), again with higher scores in the High Expectancy/Control group. There were no significant differences between conditions for AMSAM, $t(58) = -1.19$, $p = .12$, Actual Effort, $t(58) = -0.12$, $p = .46$ and Anagrams Correct, $t(58) = 0.55$, $p = .29$ (all one tailed tests).

H7b: The predicted effect (H7a) will be weaker in those with higher levels of depressive symptoms

To explore H7b, five multiple linear regression models were conducted, with the dependant variables being PANAS, AMSAM, Expected Effort, Actual Effort and Anagrams Correct respectively. For each model Condition and BDI were predictors for step 1, with Condition x BDI as the predictor for step 2.

Table 12
 Summary of Regression Analysis for H7b: PANAS

| Variable | B | SE B | β |
|-----------------|--------|------|------------------|
| Step 1 | | | |
| Constant | 26.01 | 2.68 | |
| Condition | 3.29 | 1.90 | .22 ^T |
| BDI | -1.40 | 2.48 | -.07 |
| Step 2 | | | |
| Constant | 34.4 | 3.48 | |
| Condition | -11.4 | 4.64 | -.78 |
| BDI | -10.40 | 3.47 | -.54** |
| Condition x BDI | 15.76 | 4.60 | 1.17** |

Note R^2 = for Step 1 ($p = .20$); ΔR^2 = for Step 2 ($p < .01$). ** $p < .01$, * $p < .05$, ^T $p < .1$

As can be seen in Table 12, the change in R^2 from step 1 to step 2 was significant, with a significant interaction between Condition and BDI being found in terms of their effect on PANAS scores. Tests of the region of significance in moderated multiple regression were then used to explore the regions of significance for the interactions. For PA, at values of 0.29 (BDI scores of between 0 and 2) the effect of condition was significant ($p < .05$) in the direction of higher levels of PA in the LOW Expectancy/Control group, and at values of 0.97 (BDI score ≥ 9) the effect of condition was significant in the direction of lower levels of PA in the LOW Expectancy/Control group. There were no significant effects of condition found for BDI scores of between 2 and 8.

Table 13

Summary of Regression Analysis for H7b: AMSAM

| Variable | B | SE B | β |
|-----------------|-------|------|---------|
| Step 1 | | | |
| Constant | 6.37 | 0.59 | |
| Condition | 0.50 | 0.42 | .15 |
| BDI | -0.75 | 0.55 | -.02 |
| Step 2 | | | |
| Constant | 7.54 | 0.82 | |
| Condition | -1.55 | 1.09 | -.48 |
| BDI | -2.00 | 0.82 | -.47* |
| Condition x BDI | 2.19 | 1.08 | .74* |

Note R^2 = for Step 1 ($p = 0.20$); ΔR^2 = for Step 2 ($p < 0.05$). ** $p < .01$, * $p < .05$, [†] $p < .1$

As in Table 13, when equivalent analysis was done with AMSAM as the dependant variable, the change in R^2 from step 1 to step 2 was significant, with a significant interaction between Condition and BDI being found in terms of their effect on AMSAM scores. For AMSAM, at values of 1.13 (BDI scores ≥ 13) the effect of condition was significant in the direction of lower levels of AMSAM in the LOW Expectancy/Control group. There were no significant effects of condition found for BDI scores of below 13.

Table 14

Summary of Regression Analysis for H7b: Expected Effort

| Variable | B | SE B | β |
|-----------------|-------|------|---------|
| Step 1 | | | |
| Constant | 5.32 | 0.44 | |
| Condition | 0.43 | 0.31 | .18 |
| BDI | -0.13 | 0.41 | -.04 |
| Step 2 | | | |
| Constant | 6.76 | 0.56 | |
| Condition | -2.08 | 0.75 | -.88** |
| BDI | -1.67 | 0.56 | -.54** |
| Condition x BDI | 2.69 | 0.74 | 1.24** |

Note R^2 = for Step 1 ($p = 0.36$); ΔR^2 = for Step 2 ($p < .01$). ** $p < 0.01$, * $p < 0.05$, [†] $p < 0.1$

As in Table 14, the change in R^2 from step 1 to step 2 was significant, with a significant interaction between Condition and BDI being found in terms of their effect on Expected Effort scores. For Expected Effort, at values of 0.42 (BDI scores of between 0 and 3) the effect of condition was significant in the direction of higher levels of PA in the LOW Expectancy/Control group, and at values of 0.98 (BDI score ≥ 10) the effect of condition was significant in the direction of lower levels of PA in the LOW Expectancy/Control group. There were no significant effects found for BDI scores of between 3 and 10.

Table 15

Summary of Regression Analysis for H7b: Actual Effort

| Variable | <i>B</i> | <i>SE B</i> | β |
|-----------------|----------|-------------|------------------|
| Step 1 | | | |
| Constant | 4.38 | 0.46 | |
| Condition | 0.03 | 0.32 | .01 |
| BDI | -0.02 | 0.42 | -.01 |
| Step 2 | | | |
| Constant | 5.18 | 0.63 | |
| Condition | -1.36 | 0.84 | -.56 |
| BDI | -0.87 | 0.63 | -.27 |
| Condition x BDI | 1.50 | 0.83 | .68 [†] |

Note R^2 = for Step 1 ($p = 0.99$); ΔR^2 = for Step 2 ($p = .08$). ** $p < .01$, * $p < .05$, [†] $p < .1$

When equivalent analysis was done with Actual Effort as the dependant variable, despite there being a marginal effect for actual effort, this did not meet the conventional criteria and so it was decided that there was not sufficient evidence of an effect being moderated by BDI scores, and so this was not investigated further.

Table 16

Summary of Regression Analysis for H7b: Anagrams Correct

| Variable | <i>B</i> | <i>SE B</i> | β |
|-----------------|----------|-------------|---------|
| Step 1 | | | |
| Constant | 4.10 | 1.03 | |
| Condition | -0.40 | 0.73 | -.07 |
| BDI | -0.07 | 0.96 | -.01 |
| Step 2 | | | |
| Constant | 5.60 | 1.45 | |
| Condition | -3.03 | 1.93 | -.55 |
| BDI | -1.68 | 1.45 | -.23 |
| Condition x BDI | 2.81 | 1.91 | .56 |

Note R^2 = for Step 1 ($p = .86$); ΔR^2 = for Step 2 ($p = .15$). ** $p < .01$, * $p < .05$, $^{\dagger} p < .1$

When equivalent analysis was done with Anagrams Correct as the dependant variable, there was insufficient evidence of an effect being moderated by BDI scores, and this was therefore not investigated further.

Discussion

This study investigated the validity of a new model, constructed by the authors based on the literature, to explain the association between depressive symptoms on behavioural striving in relation to goals and/or rewards in the environment. In keeping with existing accounts of depression and goal-related appraisals, the model proposes that in depression, when faced with a potential reward and/or goal, people are likely to expect that they will not be able to achieve it, and also believe that they have less control over the outcome. Furthermore, it proposes that these negative cognitive appraisals, in addition to underlying depressive symptoms, impact on the level of approach-related affect (e.g. excitement and enthusiasm), that a person feels when approaching a goal and/or reward, and in combination, these then go on to impact on the level of engagement the person then puts into trying to achieve their goal, then feeding back and affecting the extent to which they feel depressed. We will now go on to describe the findings of the current study, and how these relate to the model proposed above.

Consistent with previous research (e.g. Dickson et al., 2011), no correlation was found between levels of depression and value that people placed both on their own goals in the naturalistic study, and in winning on the experimental task. This suggests, in keeping with the model, that any relationship between depression and approach related striving, relates to factors other than just that people with depression feel less motivated because they care less about achieving their goals. In relation to the main hypotheses, although the current findings did not demonstrate a significant negative association between symptoms of depression and levels of sensitivity of the approach system, as would be in keeping with previous findings, a clear trend was found for an association in this same direction.

Consistent with BAS theories that view approach related affect, cognition and behaviours as all manifestations of the same underlying approach system, as well as other theories that the

current study found positive inter-correlations between many of these variables, with the notable exception however of control, which was not found to be related to any of the variables except that of expectancy. Again, consistent with BAS theories, level of depressive symptoms were significantly negatively correlated with measures of approach related affect (AMSAM) and approach-related cognitive appraisals (Expectancy and Control), and although the other correlations did not reach significance, these were all found to be in the expected direction.

In support of the model, the relationship between levels of depression and approach related affect (as measured using the AMSAM), was found to be mediated by approach related cognitive appraisals (Expectancy). Thus, the extent to which people believed they would succeed or fail in the task, did indeed seem to have an impact on the relationship between their levels of depression and the levels of approach related affect they experienced whilst imagining to strive toward a goal. These same effects were not however observed for Control, as was predicted based on the literature review. Because levels of depression were not found to be correlated with expected or actual striving behaviour, it was not possible to explore whether this relationship was mediated by approach-related cognitive appraisals and approach related affect, as the model would predict. Again, consistent with the proposed model, the current study found that there was a significant indirect effect of Expectancy scores on Expected Effort scores mediated through approach related affect (AMSAM but not PA). Although this finding was not also found for levels of Actual Effort, this may reflect the smaller sample size at follow-up, as discussed later in this section.

In terms of the model's prediction that when controlling for depression severity at baseline, depression at follow-up would be predicted by approach related affect expectancies/control and striving behaviour, this was not supported by the results of the current study. Again, this may have been affected by the smaller sample size at follow-up, but may also have been due to the very strong relationship between depression levels at both time points.

In terms of the prediction that more favourable goal outcome expectancies and perceived level of control over success play a causal role in determining higher levels of approach motivation related affect in relation to the experimental task and striving behaviour in the general population, this was supported for Positive Affect with a trend towards a difference being found for Expected Effort, but not for any of the other variables. In relation to any effects being weaker in those with depression, as predicted by the model, conversely findings indicated that for PA, AMSAM and levels of Expected Effort on the experimental task, the predicted effect was only present in those with higher BDI scores. For PA and Expected Effort, the effect was found to be in the opposite direction as predicted for very low BDI scores, although the reliability of this effect is questionable, given the small size of these subsamples.

In summary then, the findings of this study provided mixed support for the proposed model. In terms of the pathways between depressive symptoms and a) approach-related cognitive appraisals and b) approach-related effect, these were supported by the findings that baseline BDI scores were significantly negatively correlated with measures tapping each of these variables. The strongest support was for the proposed pathway from depression to anticipatory affect via expectancies of success and control, this being supported both by the naturalistic study which found that expectancies of success, mediated the relationship between levels of depression and approach related affect, measured using the AMSAM, and the experimental study which found that making people expect less success and less control made people feel less enthusiastic about striving for the goal, but only if they were experiencing at least mild levels of depressive symptoms. Support was also found for the pathway from approach-related cognitive appraisals to striving, being mediated by approach-related affect, in the naturalistic study which found that AMSAM scores mediated the relationship between expectancy and expected effort.

Problematic for the model, however, was the finding that depression was not associated with striving, and that no variables other than depression predicted future depression, which might lead into question whether striving behaviour actually matters in depression. However, it may be that levels of depression in this sample were not high enough to detect effects. Furthermore, a third of the sample dropped out at follow-up, which is likely have compromised the analyses of follow-up BDI scores and actual striving given that power calculations indicated that approximately 64 participants would need to have been to detect an effect, and the variable of expected striving may not reflect actual striving behaviour, but rather striving intentions.

Additional limitations of the study include the fact that it was conducted with participants from a non-clinical population. Although ten of the participants did in fact meet the criteria for a current episode of depression, they made up only a small proportion of the whole sample, and taken with the fact that all participants were relatively young university of Exeter students, this opens questions in terms of the generalisability of these results to clinical populations. Another limitation was that one of the measures of approach-related affect, the AMSAM, is not yet a published and validated measure.

In terms of the naturalistic study, although participants were asked specifically to generate approach goals, the criteria for this was not strict, and a qualitative analysis of data revealed that in many cases participants had phrased some, or all of their goals, in terms of avoidance goals. Research into the subtle differences between each type of goals (Elliot & Thrash, 2002) suggest that this may have affected the results for this part of the study, in that rather than activating the approach system, the task may have activated the avoidance system for this subset of participants.

One major limitation of the experimental task was that although the manipulation was successful in the pilot study, this was not replicated in the main study. It was therefore

decided that any results should therefore be interpreted with caution. Interestingly however, the checks indicated that the manipulation may have been successful in participants with higher levels of depression. In testing the hypotheses, it was found that people low on BDI did not show a significant effect of condition upon approach-related affect or striving. This may be because the manipulation did not work for them (i.e. they are less sensitive to this sort of information about likely success and control), rather than their enthusiasm about a goal is unaffected by their expectancies of success or control, whereas those with higher levels of depression may be more susceptible to this sort of information about expectancy and control, and hence more change in enthusiasm and striving dependent upon condition. Finally, it is noteworthy that in the naturalistic study, stronger effects were found for expectancy as opposed to control. Although the reasons behind this finding are unclear, a further limitation of the experimental study was that the combine manipulation was unable to look at these variables out, thus being unable to tease causation out.

Implications

Future research using a larger sample of participants, with a wider range of depressive symptoms and including those from a clinical population, would help in further exploring the validity of this model, as well as the use of an experimental manipulation that separates out the variables of expectancy and control. Furthermore, if a large enough study were recruited to enable structural equation modelling techniques to be applied, this might be able to provide a stronger and more conclusive test of the model.

As the results stand, the evidence suggests that therapy for depression that taps into people's perceived levels of expectancy about and control over success in relation to goal orientated tasks, may be therapeutically beneficial. Although cognitive behaviour therapy does address this to a certain extent using thought challenging techniques, this tends only to be done in situations where negative appraisals arise naturally. If further supportive

evidence for the model was found, this would suggest that it may be beneficial to target these appraisals specifically prior to, for example, behavioural strategies such as activity scheduling. This could be done using thought challenging, or more novel strategies such as imagery, by for example asking people to visualise a specific time where they had succeeded in a similar goal in the past. It may also be useful to attempt to intervene at the level of approach-related affect, by for example, helping clients use strategies such as savouring, whereby they are encouraged to try and stay with any positive feeling, no matter how small, for as long as they possibly can. Finally, in terms of the finding that people with higher levels of depression seem more sensitive to external information regarding whether they are likely to succeed in a task and how much control they have, helping people become aware of this tendency, may also help them to challenge their automatic response to such information.

Conclusions²³

In conclusion, this study provided preliminary evidence to support a new model to explain the effect of depression on behavioural striving in relation to goals, and its subsequent effect on depression, with strongest evidence being for the proposed pathway from depression to anticipatory affect via expectancies of success and control, especially for those who are at least mildly depressed. Although only mixed evidence was provided, the contradictory findings may have been due to a number of limitations with the design of the current study. Future research may be able to provide more conclusive evidence. The findings as they stand however, suggest that therapy specifically tapping into perceived levels of expectancy and control, as well as approach-related affect, may be therapeutically beneficial in working with depression.

²³ For dissemination statement, see Appendix 21

Conflict of Interest

None of the authors have conflict of interests or financial disclosures.

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DOCTORATE IN CLINICAL PSYCHOLOGY

An Investigation into the Relationship between Approach-Related Affect, Cognitive Appraisals and Striving Behaviour in Depression

APPENDICES

Word Count: 6704 (excluding tables, scanned material and references)

Contents

| | |
|--|-----|
| Appendix 1: Literature Review Search Strategy | 71 |
| Appendix 2: Author Guidelines for the Journal of Affective Disorders | 72 |
| Appendix 3: Sample Size Calculations..... | 76 |
| Appendix 4: BIS/BAS Scales..... | 77 |
| Appendix 5: Goals Task | 79 |
| Appendix 6: Follow-up Goals Task..... | 84 |
| Appendix 7: Instructions for Experimental Approach Task..... | 88 |
| Appendix 8: Method and Materials for Pilot Study..... | 94 |
| Appendix 9: Anagrams used for the Experimental Approach Task | 92 |
| Appendix 10: PANAS | 100 |
| Appendix 11: AMSAM | 101 |
| Appendix 12: Ethical Approval Letter for Main Study | 102 |
| Appendix 13: Participant Information Sheet | 103 |
| Appendix 14: Consent Form..... | 105 |
| Appendix 15: Debriefing Sheet..... | 107 |
| Appendix 16: Details of Distributions of Variables and Transformations Applied to Achieve Normality | 109 |
| Appendix 17: Data Checks..... | 110 |
| Appendix 18: How the Regions of Significance were Calculated | 111 |
| Appendix 19: Additional Regression Analyses for H6 . 111n .8+[-p 0o9 6Appendix 20: Correlations between all Variables in the Experimental Study | 114 |
| Appendix 21: Dissemination Statement..... | 115 |
| References..... | 116 |

Appendix 1: Literature Review Search Strategy

Identification of Relevant Studies

To check for any relevant reviews relating to the selected topic area, the Cochrane Library was initially checked: this did not however yield any results. A systematic literature search was therefore subsequently conducted, using the PsychINFO, PubMed and Web of Science databases.

Search Terms

As the topic of the review focussed on the role of the approach system in depression, the search terms that best reflected this were selected. The search terms used were as follows: "Depression" OR "Depressive" AND "Approach Motivation" OR "Approach System" OR "Reward System" OR "Response to Reward" OR "Behavioural Engagement System" OR "Behavioural Facilitation System" OR "Behavioural Activation System".

Inclusion/Exclusion Criteria

Only those articles that were from peer-reviewed journals and written in English were selected for the review.

Review Procedure

To identify relevant papers from those returned by searches, titles and abstracts were screened, and in order to identify further relevant papers, reference lists within the identified articles were also screened.

Results of Search

In terms of numbers of papers returned following initial searches these were: 137 from Psych INFO, 70 from Web of Science and 133 from PubMed. Following the screening

process, a total of 28 relevant papers were identified from those returned through database searches. Screening of reference lists yielded a further 20 relevant papers.

Appendix 2: Author Guidelines for the Journal of Affective Disorders

Guide for Authors

Submission of a manuscript implies that it contains original work and has not been published or submitted for publication elsewhere. It also implies the transfer of the copyright from the author to the publisher. Authors should include permission to reproduce any previously published material. Any potential conflict of interest should be disclosed in the cover letter. Authors are also requested to include contact information (name, address, telephone, fax, and e-mail) for three potential peer reviewers, to be used at the Editor's discretion. The review process requires 2 to 5 months.

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The Journal primarily publishes

full-length Research Reports describing original work (4000-5000 words, excluding references and up to 6 tables/figures)

Brief Reports (1500-2000 words, excluding references and a maximum of 2 tables/figures)
evidence-based Review Articles (up to 8000 words, excluding references and up to 10 tables/figures). Reviews should be systematic and give details as to search strategy used.
Rapid Communications (1500-2000 words, excluding references and a maximum of 2 tables/figures).

Preliminary Communications (up to 3000 words, excluding references and maximum 3 tables/figures).

Books for review should be sent to the appropriate editorial office (see above). **At the discretion of the accepting Editor-in-Chief, and/or based on reviewer feedback, authors may be allowed fewer or more than these guidelines.**

Preparation of Manuscripts

Articles should be in English. The title page should appear as a separate sheet bearing title (without article type), author names and affiliations, and a footnote with the corresponding author's full contact information, including address, telephone and fax numbers, and e-mail address (failure to include an e-mail address can delay processing of the manuscript).

Papers should be divided into sections headed by a caption (e.g., Introduction, Methods, Results, Discussion). A structured abstract of no more than 250 words should appear on a separate page with the following headings and order: Background, Methods, Results, Limitations, Conclusions (which should contain a statement about the clinical relevance of the research). A list of three to six key words should appear under the abstract.

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the authors followed the guidelines for the use and care of laboratory animals of the author's institution or the National Research Council or any national law pertaining to animal research care.

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eg, Author X designed the study and wrote the protocol. Author Y managed the literature searches and analyses. Authors X and Z undertook the statistical analysis, and author W wrote the first draft of the manuscript. All authors contributed to and have approved the final manuscript.

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References should be cited in text by authors' names and year of publication (Harvard system). When referring to a work of more than two authors, the name of the first author

should be used with 'et al.'(examples: Brown, 1992; Brown and Bifulco, 1992; Brown et al., 1993, a, b).

All references cited in text should be listed at the end of the paper (double spaced) arranged in alphabetical order of first author. More than one paper from the same author in the same year should be identified by the letter (a, b, c, etc.) after the year of publication.

The reference list should contain names and initials of all authors, year, title of paper referred to, abbreviated title of periodical (per Index Medicus), volume, and inclusive page numbers. This Journal should be cited in the list of references as *J. Affect. Disord.* Periodicals, books, and multi-author titles should accord with the following examples:

Bauer, M.S., Shea, N., McBride, L., Gavin, C., 1997. Predictors of service utilization in veterans with bipolar disorder: a prospective study. *J. Affect. Disord.* 44, 159-168.

Gelenberg, A.J., Bassuk, E.L., Schoonover, S.C., 1991. *The Practitioner's Guide to Psychoactive Drugs*. Plenum Medical Book Company, New York, NY.

Willner, P., 1995. Dopaminergic mechanisms in depression and mania. In: Bloom, F.E. and Kupfer, D.J. (Eds.), *Psychopharmacology: The Fourth Generation of Progress*. Raven Press, NY, pp. 921-931.

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Tables should be numbered consecutively with Arabic numerals and must be cited in the text in sequence. Each table, with an appropriate brief legend, comprehensible without reference to the text, should be typed on a separate page and uploaded online. Tables should be kept as simple as possible and wherever possible a graphical representation used instead. Table titles should be complete but brief. Information other than that defining the data should be presented as footnotes. Please refer to the generic Elsevier artwork instructions: <http://authors.elsevier.com/artwork/jad>.

Appendix 3: Sample Size Calculations

Sample size calculations were conducted using GPower2. Based on the effect size reported in the Kasch, Rottenberg, Arnow and Gotlib (2002) study, we conservatively assumed medium effect sizes. To investigate H1-H3, a sample size of 64 participants would be required to detect a medium effect size ($r=0.3$) with power=0.8 and $\alpha=0.05$. For hypothesis H4a 68 participants would be required to detect a medium effect size ($f=0.15$) with power=0.8 and $\alpha=0.05$, and for H4b 85 participants required to detect a medium effect size ($f=0.15$) with power=0.8 and $\alpha=0.05$. For hypotheses H5, a total sample size of 68 participants would be required, and for H6 a sample of 92 participants required, to detect a medium effect size ($f=0.15$) with power=0.8 and $\alpha=0.05$. Finally for H7a a sample of 42, and for H7b a sample of 55, would be required to detect a medium effect size ($d=0.8$) with power=0.8 and $\alpha=0.05$. These calculations indicated that overall a total sample of 92 participants would need to be recruited.

Appendix 4: BIS/BAS Scales

Date _____

Each item of this questionnaire is a statement that a person may agree or disagree with. For each item, indicate how much you agree or disagree with what the item says. Please respond to **all** the items; do not leave any blank. Choose **only one** response to each statement. Please do be as accurate and honest as you can be. Respond to each item as if it were the only item. That is, don't worry about being "consistent" in your responses. Choose from the four following response options:

1 = very true for me
2 = somewhat true for me
3 = somewhat false for me
4 = very false for me

- | | | | | | |
|-----|---|---|---|---|---|
| 1. | A person's family is the most important thing in life | 1 | 2 | 3 | 4 |
| 2. | Even if something bad is about to happen to me, I rarely experience fear or nervousness | 1 | 2 | 3 | 4 |
| 3. | I go out of my way to get things I want | 1 | 2 | 3 | 4 |
| 5. | I'm always willing to try something new if I think it will be fun | 1 | 2 | 3 | 4 |
| 6. | When I'm doing well at something I love to keep at it | 1 | 2 | 3 | 4 |
| 7. | How I dress is important to me | 1 | 2 | 3 | 4 |
| 8. | When I get something I want, I feel excited and energised | 1 | 2 | 3 | 4 |
| 9. | Criticism or scolding hurts me quite a bit | 1 | 2 | 3 | 4 |
| 10. | When I want something I usually go all-out to get it | 1 | 2 | 3 | 4 |
| 11. | I will often do things for no other reason than they might be fun | 1 | 2 | 3 | 4 |
| 12. | It's hard for me to find the time to do things such as get a haircut | 1 | 2 | 3 | 4 |
| 13. | If I see a chance to get something I want I move in on it right away | 1 | 2 | 3 | 4 |
| 14. | I feel pretty worried or upset when I know somebody is angry at me | 1 | 2 | 3 | 4 |
| 15. | When I see an opportunity for something I like I get excited right away | 1 | 2 | 3 | 4 |
| 16. | I often act on the spur of the moment | 1 | 2 | 3 | 4 |
| 17. | If I think something unpleasant is going to happen I usually get pretty worked up | 1 | 2 | 3 | 4 |
| 18. | I often wonder why people act the way they do | 1 | 2 | 3 | 4 |
| 19. | When good things happen to me, it affects me strongly | 1 | 2 | 3 | 4 |

| | | | | | |
|-----|--|---|---|---|---|
| 20. | I feel worried when I think I have done poorly at something | 1 | 2 | 3 | 4 |
| 21. | I crave excitement and new sensations | 1 | 2 | 3 | 4 |
| 22. | When I go after something I use a @no holds barred@ approach | 1 | 2 | 3 | 4 |
| 23. | I have very few fears compared to my friends | 1 | 2 | 3 | 4 |
| 24. | It would excite me to win a contest | 1 | 2 | 3 | 4 |
| 25. | I worry about making mistakes | 1 | 2 | 3 | 4 |

Thank you for your help.

Appendix 5: Goals Task

PART 1

Instructions: *In this part of the task, I would like you to generate a number of personal goals across the four domains of health, relationships, work and hobbies. I will start by asking you to tell me a goal you are currently trying to achieve in terms of your health and then ask you to rate how important this goal is to you. You will then be asked to give ratings of expectancy and control over success when thinking about striving towards these goals over the next two weeks. I will then ask you to imagine striving towards this goal over the next two weeks, and to complete two short questionnaires in relation to how you feel whilst thinking about doing so. I will then go through each of the domains like this in turn.*

HEALTH

(e.g. eat more fruit and vegetables, exercise more regularly, drop a dress size)

I am currently trying to:

.....

How important is this goal to you?

1 2 3 4 5 6 7

Not at all

extremely

How much progress do you think you will make towards this goal over the next two weeks?

1 2 3 4 5 6 7

No progress

Huge progress

How much control do you feel you have over this progress?

1 2 3 4 5 6 7

No control

complete control

Over the next two weeks, how much effort do you think you will put into achieving this goal?

1 2 3 4 5 6 7

No effort

Huge effort

I would now like you to imagine striving towards this goal over the next two weeks, and to complete the following two questionnaires in relation to how you feel whilst thinking about doing so.

WORK

(e.g. complete my final year dissertation, search for a job, revise for my exams)

I am currently trying to:

.....

How important is this goal to you?

1 2 3 4 5 6 7

Not at all

extremely

How much progress do you think you will make towards this goal over the next two weeks?

1 2 3 4 5 6 7

No progress

Huge progress

How much control do you feel you have over this progress?

1 2 3 4 5 6 7

No control

complete control

Over the next two weeks, how much effort do you think you will put into achieving this goal?

1 2 3 4 5 6 7

No effort

Huge effort

I would now like you to imagine striving towards this goal over the next two weeks, and to complete the following two questionnaires in relation to how you feel whilst thinking about doing so.

HOBBIES

(e.g. be selected for the local football team, learn to play the guitar, take up a new hobby)

I am currently trying to:

.....

How important is this goal to you?

| | | | | | | |
|------------|---|---|---|---|---|-----------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Not at all | | | | | | extremely |

How much progress do you think you will make towards this goal over the next two weeks?

| | | | | | | |
|-------------|---|---|---|---|---|---------------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| No progress | | | | | | Huge progress |

How much control do you feel you have over this progress?

| | | | | | | |
|------------|---|---|---|---|---|------------------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| No control | | | | | | complete control |

Over the next two weeks, how much effort do you think you will put into achieving this goal?

| | | | | | | |
|-----------|---|---|---|---|---|-------------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| No effort | | | | | | Huge effort |

I would now like you to imagine striving towards this goal over the next two weeks, and to complete the following two questionnaires in relation to how you feel whilst thinking about doing so.

Appendix 6: Follow-up Goals Task**HEALTH**

Over the last two weeks, how much effort did you put into achieving this goal?

1 2 3 4 5 6 7

No effort

Huge effort

How much progress do you think you made towards this goal?

1 2 3 4 5 6 7

No progress
progress

Huge

How much control did you feel you had over this progress?

1 2 3 4 5 6 7

No control

complete control

How important was this goal to you?

1 2 3 4 5 6 7

Not at all

extremely

RELATIONSHIPS

Over the last two weeks, how much effort did you put into achieving this goal?

1 2 3 4 5 6 7

No effort

Huge effort

How much progress do you think you made towards this goal?

1 2 3 4 5 6 7

No progress
progress

Huge

How much control did you feel you had over this progress?

1 2 3 4 5 6 7

No control

complete control

How important was this goal to you?

1 2 3 4 5 6 7

Not at all

extremely

WORK

Over the last two weeks, how much effort did you put into achieving this goal?

1 2 3 4 5 6 7

No effort

Huge effort

How much progress do you think you made towards this goal?

1 2 3 4 5 6 7

No progress
progress

Huge

How much control did you feel you had over this progress?

1 2 3 4 5 6 7

No control

complete control

How important was this goal to you?

1 2 3 4 5 6 7

Not at all

extremely

HOBBIES

Over the last two weeks, how much effort did you put into achieving this goal?

1 2 3 4 5 6 7

No effort

Huge effort

How much progress do you think you made towards this goal?

1 2 3 4 5 6 7

No progress
progress

Huge

How much control did you feel you had over this progress?

1 2 3 4 5 6 7

No control

complete control

How important was this goal to you?

1 2 3 4 5 6 7

Not at all

extremely

Appendix 7: Instructions for Experimental Approach Task

Instructions: You are about to take part in a computerised anagram task. In this task, 30% of individuals taking part will win, and task performance is largely dependent on natural ability. There will be a £5 cash reward given to those who win.

How important for you is it that you to do well on this task?

1 2 3 4 5 6 7

Not at all
extremely

How likely to succeed in winning do you feel?

1 2 3 4 5 6 7

Not at all
extremely

How much control over the outcome of the task do you feel you have?

1 2 3 4 5 6 7

No control

complete control

How much effort do you think you will put into trying to win on this task?

1 2 3 4 5 6 7

No effort

Huge effort

Before starting the task, please complete the following two questionnaires with respect to how you feel about working on the task.

Instructions: You are about to take part in a computerised anagram task. In this task, 70% of people taking part will win and it is possible to learn to be better at the task as you work through it. There will be a £5 cash reward given to those who win.

How important for you is it that you to do well on this task?

1 2 3 4 5 6 7

Not at all
extremely

How likely to succeed in winning do you feel?

1 2 3 4 5 6 7

Not at all
extremely

How much control over the outcome of the task do you feel you have?

1 2 3 4 5 6 7

No control

complete control

How much effort do you think you will put into trying to win on this task?

1 2 3 4 5 6 7

No effort

Huge effort

Before starting the task, please complete the following two questionnaires with respect to how you feel about working on the task.

You are now halfway through the task.

How important for you is it that you to do well on this task?

1 2 3 4 5 6 7

Not at all

extremely

How likely to succeed in winning do you feel?

1 2 3 4 5 6 7

Not at all

extremely

How much control over the outcome of the task do you feel you have?

1 2 3 4 5 6 7

No control

complete control

How much effort do you feel you have put into trying to win on this task so far?

1 2 3 4 5 6 7

No effort

Huge effort

You have now completed the task.

How much effort do you feel you put into trying to win on this task?

1

2

3

4

5

6

7

No effort

Huge effort

Appendix 8: Method and Materials for Pilot Study

Appendix 8a: Method for Pilot Study

Aim.

The aim of the pilot study was to validate the experimental manipulation proposed in the main study by checking that the manipulation has the intended effect on levels of expectancy and control.

Participants.

Following approval of the study by the departmental ethics board²⁴, a sample of 40 healthy participants (eight male, thirty-two female) were recruited opportunistically from the University of Exeter. Participants were found to have a mean age of 25.8 years, SD = 4.1, range 19-34.

Materials & Procedure.

After giving informed consent²⁵, participants were randomly allocated to two conditions, given corresponding hypothetical scenarios, and then asked to make ratings of expectancy and control²⁶. Participants in Condition 1 (LOW Expectancy/Control) were informed that 30% of individuals taking part in a hypothetical computerised anagram task would win a prize of £10, and that the task performance was largely dependent on natural ability. In Condition 2 (HIGH Expectancy/Control) participants were informed that 70% of people taking part would win and that it was possible to get better at the task with practice. Age and gender of participants were also recorded. After completing the rating scales, participants were then given the debriefing form and invited to ask any questions they may have had²⁷.

²⁴ For pilot ethical approval letter, see Appendix 3

²⁵ For pilot consent form, see Appendix 4

²⁶ For pilot scenarios, see Appendix 5

²⁷ For pilot debriefing form, see Appendix 6

Analysis.

In order to check the validity of the manipulation, the mean expectancy and control scores were compared between the conditions using independent-samples *t*-tests.

Results & Conclusions.

The conditions HIGH Expectancy/Control vs. LOW Expectancy/Control did not differ significantly on the demographic variables of Age, $t(38) = -1.70$, ns or Sex, $X^2(1) = 0.63$, $p = .43$. Significant differences were found between the conditions of HIGH Expectancy/Control vs. LOW Expectancy/Control for both self-rated Expectancy, $t(38) = 4.90$, $p < .001$, and self-rated Control, $t(38) = 4.00$, $p < .01$, with the HIGH condition being related to greater levels of Expectancy, $M = 5.10$, $SD = 0.81$, and Control, $M = 4.90$, $SD = 0.99$, than the LOW condition, Expectancy: $M = 3.80$, $SD = 0.85$; Control: $M = 3.50$, $SD = 1.15$.

It was therefore concluded that the manipulation had been successful, and so it was decided to use this manipulation for the main experimental study.

Appendix 8b: Pilot Ethical Approval Letter for Pilot Study

Psychology Research Ethics
Committee

Psychology, College of Life &
Environmental Sciences

Washington Singer Laboratories
Perry Road
Exeter
EX4 4QG

Telephone +44 (0)1392 724611
Fax +44 (0)1392 724623
Email Marilyn.evans@exeter.ac.uk

To: Kerry Wingfield Digby
From: Cris Burgess
CC: Kim Wright & Nick Moberly
Re: Application 2011/575 Ethics Committee
Date: February 23, 2012

The School of Psychology Ethics Committee has now discussed your application, **2011/575 – Pilot study: An investigation into the relationship between Approach-Related Affect, Cognition and Behaviour in Depression**. The project has been approved in principle for the duration of your study.

The agreement of the Committee is subject to your compliance with the British Psychological Society Code of Conduct and the University of Exeter procedures for data protection (<http://www.ex.ac.uk/admin/academic/datapro/>). In any correspondence with the Ethics Committee about this application, please quote the reference number above.

I wish you every success with your research.

A handwritten signature in black ink, appearing to read 'Cris Burgess', with a horizontal line underneath.

Cris Burgess

Chair of Psychology Research Ethics Committee

Appendix 8c: Pilot Information Sheet and Consent Form

INFORMATION SHEET AND CONSENT FORM

PILOT STUDY: GOAL STRIVING AND COGNITIVE APPRAISALS

Nature of study: This pilot study investigates the relationship between task instructions and cognitive appraisals of expectancy and control. It will involve reading a hypothetical scenario about a computerised anagram task, and then being asked to make ratings of your perceived control over task outcome, and how confident you think you would feel about winning. The task will take no longer than 5 minutes. Your participation is voluntary, and you may discontinue at any time, without prejudice. Any data collected will be kept strictly confidential.

Consent:

I give my informed consent to participate in this pilot study of goal striving and cognitive appraisals. I have read and understand the consent form.

Signature:

.....

Appendix 8d: Hypothetical Scenarios for Pilot Study

Condition 1

Your age Your Gender: M F (please circle as appropriate)

Imagine that you are about to take part in a computerised anagram task as part of an experiment that you have volunteered for.

Before starting the task, you are informed that 30% of individuals taking part in the task will win, and that the task performance is largely dependent on natural ability. There is a £10 cash reward offered to those who win.

In this situation:

How likely to succeed in winning do you think you would feel?

| | | | | | | |
|------------|---|---|---|---|---|-----------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Not at all | | | | | | extremely |

How much control over the outcome of the task do you think you would feel?

| | | | | | | |
|------------|---|---|---|---|---|------------------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| No control | | | | | | complete control |

Condition 2

Your age Your Gender: M F (please circle as appropriate)

Imagine that you are about to take part in a computerised anagram task as part of an experiment that you have volunteered for.

Before starting the task, you are informed that 70% of people taking part will win and that it is possible to learn to be better at the task as you work through it. There is a £10 cash reward offered to those who win.

In this situation:

How likely to succeed in winning do you think you would feel?

| | | | | | | |
|------------|---|---|---|---|---|-----------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Not at all | | | | | | extremely |

How much control over the outcome of the task do you think you would feel?

| | | | | | | |
|------------|---|---|---|---|---|------------------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| No control | | | | | | complete control |

Appendix 8e: Pilot Debriefing Form

Debriefing Sheet: Goal Striving and Cognitive Appraisals

Thank you for your participation in this pilot study.

The task was designed to investigate the relationship between task instructions and cognitive appraisals of expectancy and control, and forms part of a larger study looking into goal striving, cognitive appraisals and mood.

In this pilot study, half of all participants were given the hypothetical instructions that 30% of individuals taking part in the task will win, and that the task performance is largely dependent on natural ability, and half were told that 70% of people taking part will win and that it is possible to learn to be better at the task as you work through it.

If you would like to discuss any aspect of the study or your response to it please speak to the researcher, or contact her on the following email address: kfk201@exeter.ac.uk. You can also contact the research supervisor (Dr Kim Wright) on 01392 725227 or K.A.Wright@exeter.ac.uk.

Appendix 9: Anagrams used for the Experimental Approach Task

| Anagram | Correct Answer |
|----------------|-----------------------|
| Oldme | Model |
| Hroab | Abhor |
| Datir | Triad |
| Tinga | Giant |
| Aewtk | Tweak |
| Dgrou | Gourd |
| Tanbo | Baton |
| Aitop | Patio |
| Mgeon | Gnome |
| Rigon | Groin |
| Malby | Balmy |
| Rcoha | Roach |
| Arfyo | Foray |
| Glaei | Agile |

Appendix 10: PANAS

This scale consists of a number of words that describe different feelings and emotions. Read each item and then circle the appropriate answer next to that word. Indicate to what extent you feel this way right now, that is, at the present moment.

Use the following scale to record your answers.

- (1) = very slightly or not at all
 (2) = A little
 (3) = Moderately
 (4) = Quite a bit
 (5) = Extremely

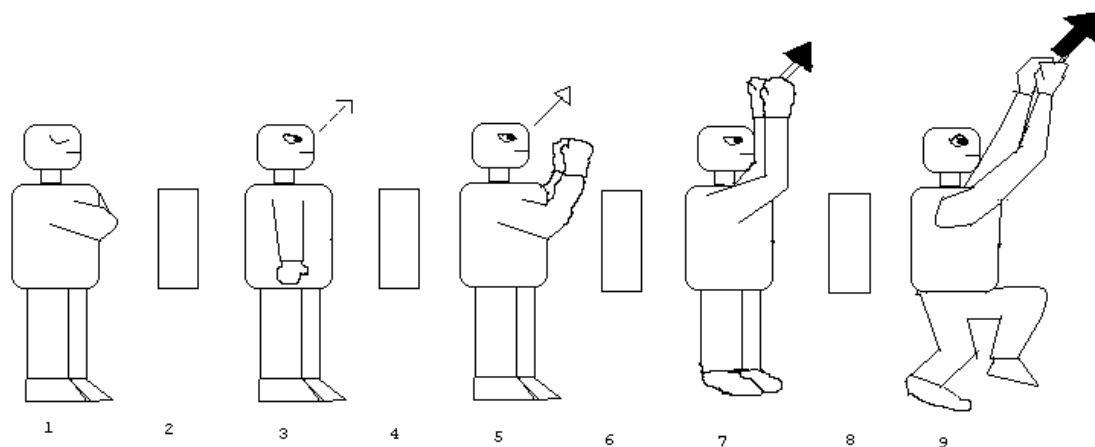
| | Very slightly or not at all | A little | Moderately | Quite a bit | Extremely |
|-----------------|-----------------------------------|----------|------------|-------------|-----------|
| 1. Interested | 1 | 2 | 3 | 4 | 5 |
| 2. Distressed | 1 | 2 | 3 | 4 | 5 |
| 3. Excited | 1 | 2 | 3 | 4 | 5 |
| 4. Upset | 1 | 2 | 3 | 4 | 5 |
| 5. Strong | 1 | 2 | 3 | 4 | 5 |
| 6. Guilty | 1 | 2 | 3 | 4 | 5 |
| 7. Scared | 1 | 2 | 3 | 4 | 5 |
| 8. Hostile | 1 | 2 | 3 | 4 | 5 |
| 9. Enthusiastic | 1 | 2 | 3 | 4 | 5 |
| 10. Proud | 1 | 2 | 3 | 4 | 5 |
| 11. Irritable | 1 | 2 | 3 | 4 | 5 |
| 12. Alert | 1 | 2 | 3 | 4 | 5 |
| 13. Ashamed | 1 | 2 | 3 | 4 | 5 |
| 14. Inspired | 1 | 2 | 3 | 4 | 5 |
| 15. Nervous | 1 | 2 | 3 | 4 | 5 |
| 16. Determined | 1 | 2 | 3 | 4 | 5 |
| 17. Attentive | 1 | 2 | 3 | 4 | 5 |
| 18. Jittery | 1 | 2 | 3 | 4 | 5 |
| 19. Active | 1 | 2 | 3 | 4 | 5 |
| 20. Afraid | 1 | 2 | 3 | 4 | 5 |

Appendix 11: AMSAM

There are times when we feel motivated, driven and ready to strive to get what we want. Sometimes we feel this way when we are in the middle of working towards a goal that is important to us, but we might also feel this way when we are not actively working towards anything.

Please use the scale below to indicate how much you feel this way right now. Remember that we are not asking you to tell us whether you are actually working towards a goal right now. Instead we would like you to indicate how much you feel an internal sense of motivation, drive, and readiness to strive.

At one extreme end of the scale you do not feel motivated, driven, striving. At the other end of the scale you feel completely motivated, driven, striving. Circle a number which corresponds to the picture which best how you feel now. Note that some numbers fall between the two pictures.



Appendix 12: Ethical Approval Letter for Main Study

Psychology Research Ethics
Committee

Psychology, College of Life &
Environmental Sciences

Washington Singer Laboratories
Perry Road
Exeter
EX4 4QG

Telephone +44 (0)1392 724611
Fax +44 (0)1392 724623
Email Marilyn.evans@exeter.ac.uk

To: Kerry Wingfield Digby
From: Cris Burgess
CC: Kim Wright & Nick Moberly
Re: Application 2011/539 to Ethics Committee
Date: 19 January 2012

The School of Psychology Ethics Committee met on 18/01/12 and your proposal was discussed. The Committee raised a number of conditions of agreement to this application being accepted. You would be expected to address these before beginning the research but sight of the evidence is not required by the Committee and the project has been approved in principle for the duration of your study.

The conditions are as follows:

- Please provide a statement describing how a severely depressed participant would be managed throughout the experimental process

In any correspondence with the Ethics Committee about this application, please quote the reference number above or decisions may be delayed.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'Cris Burgess', with a horizontal line underneath.

Cris Burgess

Chair of School Ethics Committee

Appendix 13: Participant Information Sheet

PARTICIPANT INFORMATION SHEET

An Investigation into the Relationship between Approach-Related Affect, Cognition and Behaviour in Depression

Researchers: Kerry Wingfield Digby; DClin Psychology, University of Exeter

Dr. Kim Wright; Senior lecturer in Clinical Psychology, University of Exeter

Dr. Nick Moberly; Senior research Fellow, University of Exeter

What is the study about?

The study aims to investigate how people feel, think and behave whilst they are striving to achieve a goal, and how these processes are affected in depression.

What will I be asked to do?

If you agree to participate in the study, you will first be asked to provide contact details, your address and details of your GP. You will then be asked to complete a number of short questionnaires, to generate a number of personal goals and to complete a short computerised anagram task. Two weeks later we will contact you via email and ask you to complete some further questionnaires.

Why do I need to provide details about my GP?

We ask you to provide contact details for your GP as we may need to contact him/her if we are concerned about your wellbeing or if there is any risk of harm to you or someone else. If this happened, we would need to inform your GP of this to ensure you are receiving the correct help and support. We will tell you if we feel we need to do this.

What will happen to the information I provide?

All information you provide will be confidential and anonymous. At the start of this study you will be allocated a code number. This number will be on the questionnaires you complete so that your name is not needed or linked to data you provide. All data you provide will be stored in a locked cabinet and only the researchers involved in the study will be able to see it. No identifiable information, e.g. your name, address etc., will be included in the write up of the study.

What if I change my mind about participating in the study?

Taking part in the study is completely voluntary. You are free to withdraw from the study at any time and for any reason. If you decide to withdraw, any information you have provided will be removed from the study.

Where can I find out more information about the study?

You are free to ask questions about the study at any time before, during or after you participate. You can contact the research team via email: kfk201@exeter.ac.uk

Appendix 14: Consent Form**CONSENT FORM****An Investigation into the Relationship between Approach-Related Affect, Cognition and Behaviour in Depression**

Researchers: Kerry Wingfield Digby; DClin Psychology, University of Exeter

Dr. Kim Wright; Senior lecturer in Clinical Psychology, University of Exeter

Dr. Nick Moberly; Senior research Fellow, University of Exeter

- I agree to take part in the above research. I have read the Participant Information Sheet, which is attached to this form. I understand what my role will be in this research and all my questions have been answered to my satisfaction.
- I understand that taking part is voluntary and I am free to withdraw myself from the research at any time, for any reason.
- I have been informed that the confidentiality of the information I provide will be maintained.
- I am free to ask any questions at any time throughout the study.
- I agree to the audio recording of the initial screening interview: Yes / No (please delete as appropriate)
- Data Protection: I agree to the University processing personal data that I have supplied. I agree to the processing of such data for any purposes connected with the Research Project as outlined to me.

Signed:

Name:

(Please print clearly)

Date:

APPROVED BY THE UNIVERSITY OF EXETER AND NHS ETHICS COMMITTEE

Please provide the following details about yourself.

Your age: Your Gender: M F (*please circle as appropriate*)

Your GP's name and contact details:

.....

Your email address:

Your phone number:

Appendix 15: Debriefing Sheet

Debriefing Sheet

The purpose of this sheet is to inform you of the purpose of the study that you have participated in, and to give you information about potential sources of support should you think these would be helpful.

This study aims to look at how people feel, think and behave whilst they are striving to achieve a goal, and how these processes are affected in depression. This is being investigated in relation to personal goals and an experimental reward task (the anagrams task).

In order to experimentally test whether how well we think we can do and how much control we have over this affects how much we engage in a task, deception was required in the anagram task. Here we randomly allocated you to one of two conditions. If you were in condition one, you were informed that 30% of individuals taking part would win, and that task performance was largely dependent on natural ability. If you were in condition 2, you were told that 70% of people taking part would win and that it is possible to get better at the task with practice. People in both conditions were told that a prize of £5 would be given to those who win. In actual fact, people in both conditions took part in exactly the same task and all prizes were randomly allocated rather than performance based.

Having completed this part of the study should you experience distress or upset in connection with it, or with issues highlighted by it, there are a number of sources of support and advice that you may access (listed below). In addition to this, you can contact the experimenter (Kerry Wingfield Digby) to discuss any aspect of the study or your response to it. She can be contacted on 01392 269227 (office hours) or kfk201@exeter.ac.uk.

Thank you for your participation in the study.

Contacting health professionals:

A number of health professionals are able to offer help and advice to people troubled by extreme mood states or distressing thoughts and feelings. These include:

- **Your GP.** You can contact your GP to arrange an appointment, or in an emergency: most GP surgeries will connect you to an out-of-hours service if you call outside of office hours needing help. As a student you can contact Exeter University Student Health Centre, whether or not you are currently registered there:

Streatham Campus

Student Health Centre, Reed Mews

(01392) 676606 or x 4414

At other times during vacation contact the St Thomas Health Centre

(01392) 676676

St Luke's Campus

Heavitree Health Practice, Heavitree Health Centre

(01392) 211511

- **Student Counselling Service.** The Student Counselling Service is open from 9.30 – 1.00pm and 2.00 - 5.00pm during term. You can call to arrange an appointment. Their contact details are:

Student Counselling Service

Reed Hall, Hailey Wing

Streatham Drive

Exeter EX4 4PD

Tel: (01392) 264381

For further information see their webpages at:

<http://www.services.ex.ac.uk/counselling/contacting.html>

Other sources of support / information:

- **Voice** (University of Exeter). Voice is a student listening and information service run by students for students at Exeter University. If you are experiencing personal difficulties or are feeling sad, stressed, lost or worried and would like to talk to someone you can contact them on:

01392 275284 (8pm – 8am)

- **Samaritans:** Samaritans provides confidential emotional support 24 hours a day. You can telephone them at any time or visit them in person between the hours given below.

24 hour helpline: 08457 909090

Email help service: jo@samaritans.org

Address: 10 Richmond Road, Exeter, EX4 4JA (08.30 – 21.30)

Website: <http://www.samaritans.org>

- **MIND** provides information about many topics related to mental distress. They can be contacted on 0845 766 0163
- The **Depression Alliance.** Information and advice about depression: www.depressionalliance.org.uk

**Appendix 16: Details of Distributions of Variables and Transformations
Applied to Achieve Normality**

| Variable | Skewness z score | Kurtosis z score | Transformation appropriate?²⁸ | Transformation applied?²⁹ |
|----------------------|-------------------------|-------------------------|---|---|
| Age | 2.16 | 10.70 | Yes | Unsuccessful ³⁰ |
| BDI | 5.65 | 5.23 | Yes | Logarithm |
| BAS | -2.32 | 0.85 | No | |
| Goal Value | -0.25 | 0.08 | No | |
| Goal PANAS (PA) | -0.15 | -0.64 | No | |
| Goal AMSAM | -0.70 | -0.48 | No | |
| Goal Expectancy | -2.39 | 1.04 | No | |
| Goal Control | -1.60 | -0.74 | No | |
| Goal Expected Effort | -2.03 | 0.97 | No | |
| Goal Actual Effort | -1.33 | 1.40 | No | |
| BDI Follow-up | 4.73 | 5.99 | Yes | Logarithm |
| Exp Value | -1.39 | 0.07 | No | |
| Exp PANAS (PA) | 0.50 | -1.08 | No | |
| Exp AMSAM | -0.63 | -0.82 | No | |
| Exp Control | -0.59 | -1.35 | No | |
| Exp Expectancy | -0.12 | -1.45 | No | |
| Exp Effort | -2.0 | 0.01 | No | |
| Exp Actual Effort | -1.24 | -1.29 | No | |
| Exp Correct | 3.80 | 2.58 | Yes | Logarithm |

²⁸Normality of distributions was determined by examining normality plots in combination with skewness and kurtosis z-values for each distribution. Z-values above 2.58 were taken to indicate an unacceptable level of skewness or kurtosis.

²⁹ Appropriate transformation methods were selected in line with the recommendations of Tabachnik and Fidell (2001), which take into account data distribution patterns.

³⁰Transformation unsuccessful, non-parametric tests used for this variable in analysis.

Appendix 17: Data Checks

| | Multicollinearity | Independent errors | Influential cases | Normality, linearity and heteroscedasticity plots | Outcome of Checks |
|----------------------------|--|---------------------------------------|--|--|--|
| Hypothesis 4a: | VIF values < 10 Tolerance statistics > 0.2. | Durbin-Watson values between 1 and 3. | 2 cases outside of limits (would expect 3), 1 case of which lies outside +/- 2.5 (would expect 0.6). But neither residuals greater than 3. Appears to conform to what one would expect for fairly accurate model. | No evidence found to suspect non-normality, non-linearity or homoscedasticity. | No action needed |
| Hypothesis 5: | VIF values < 10 Tolerance statistics > 0.2. | Durbin-Watson values between 1 and 3. | Goal Effort: 5 cases outside of limits (would expect 3), 2 cases of which lie outside +/- 2.5 (would expect 0.6). But none of the residuals greater than 3. Appears to conform fairly well to what one would expect for fairly accurate model, Goal FU Effort: 1 case is outside of limits (would expect 2), no cases of which lie outside +/- 2.5 (would expect 0.4). None of residuals greater than 3. Appears to conform well to what one would expect for fairly accurate model. | No evidence found to suspect non-normality, non-linearity or homoscedasticity | No action needed |
| Hypothesis 6: | VIF values < 10 Tolerance statistics > 0.2. | Durbin-Watson values between 1 and 3. | 2 cases outside of limits (would expect 2), no cases of which lie outside +/- 2.5 (would expect 0.4). None of the residuals greater than 3. Appears to conform well to what one would expect for fairly accurate model. | No evidence found to suspect non-normality, non-linearity or homoscedasticity | No action needed |
| Manipulation check: | VIF values < 10, Tolerance < 0.2 for Condition and BDI x Condition: potential problem (Menard, 1995). | Durbin-Watson values between 1 and 3. | Exp Expectancy: 2 cases outside of limits (would expect 3), no cases of which lie outside +/- 2.5 (would expect 0.6). Two residuals are greater than 3. Appears to conform to what one would expect for fairly accurate model, but cases 19 and 40 worth exploring further. Investigation of these cases - Cooks distance < 1, average leverage < 0.2, malhalanobis distance < 10 = little cause for concern, fairly reliable model. Exp Control: 1 case outside of limits (would expect 3), which does not lie outside +/- 2.5 (would expect 0.6). One residual greater than 3. Appears to conform to what one would expect for fairly accurate model, but case 45 worth exploring further. Investigation of these cases - Cooks distance < 1, average leverage < 0.2, malhalanobis distance < 10 = little cause for concern, fairly reliable model. | No evidence found to suspect non-normality, non-linearity or homoscedasticity | Potential problem with tolerance but overall model conforms to assumptions; no action needed |
| Hypothesis 7b: | VIF values < 10, Tolerance < 0.2 for Condition and BDI x Condition: potential problem (Menard, 1995). | Durbin-Watson values between 1 and 3. | Exp PA: 1 case outside of limits (would expect 3), no cases of which lie outside +/- 2.5 (would expect 0.6). None of the residuals greater than 3. Appears to conform to what one would expect for fairly accurate model. Exp AMSAM and Exp Effort: 1 case outside of limits (would expect 3), 1 case of which lie outside +/- 2.5 (would expect 0.6). None of the residuals greater than 3. Appears to conform to what one would expect for fairly accurate model Exp Actual Effort: 2 cases outside of limits (would expect 3), no cases of which lie outside +/- 2.5 (would expect 0.6). None of the residuals greater than 3. Appears to conform to what one would expect for fairly accurate model. Exp Correct: 4 cases outside of limits (would expect 3), 1 case of which lies outside +/- 2.5 (would expect 0.6). One residual is greater than 3. Appears to conform to what one would expect for fairly accurate model, but case 41 worth exploring further. Investigation of this case - Cooks distance < 1, average leverage < 0.2, malhalanobis distance < 10 = little cause for concern, fairly reliable model. | No evidence found to suspect non-normality, non-linearity or homoscedasticity | Potential problem with tolerance but overall model conforms to assumptions; no action needed |

Appendix 18: How the Regions of Significance were Calculated

The Johnson-Neyman technique is a statistical method used to define the regions in the area defined by two predictor variables in which the expected values of a criterion variable for two groups differ significantly (Hayes and Matthes, 2009). This approach was used via the MODPROBE macro downloaded and run on SPSS, which calculates a t-score and associated p-value to test group differences in the outcome at various values of the moderator. The critical values of the moderator generated, were then converted back to into the original scale by adding the mean of the moderator variable.

Appendix 19: Additional Regression Analyses for H6

| Variable | <i>B</i> | <i>SE B</i> | β |
|------------|----------|-------------|---------|
| Step 1 | | | |
| Constant | 0.20 | 0.10 | |
| BDI | 0.73 | 0.10 | .77** |
| Step 2 | | | |
| Constant | -0.10 | 0.27 | |
| BDI | 0.76 | 0.10 | .80** |
| PANAS (PA) | 0.01 | 0.01 | .13 |

Note R^2 = for Step 1 ($p < .01$); ΔR^2 = for Step 2 ($p = .24$). ** $p < .01$, * $p < .05$, † $p < .1$

| Variable | <i>B</i> | <i>SE B</i> | β |
|----------|----------|-------------|---------|
| Step 1 | | | |
| Constant | 0.20 | 0.10 | |
| BDI | 0.73 | 0.10 | .77** |
| Step 2 | | | |
| Constant | 0.27 | 0.27 | |
| BDI | 0.72 | 0.10 | .77 |
| AMSAM | -0.01 | 0.04 | -.03 |

Note R^2 = for Step 1 ($p < .01$); ΔR^2 = for Step 2 ($p = .80$). ** $p < .01$, * $p < .05$, † $p < .1$

| Variable | <i>B</i> | <i>SE B</i> | β |
|------------|----------|-------------|---------|
| Step 1 | | | |
| Constant | 0.20 | 0.10 | |
| BDI | 0.73 | 0.10 | .77** |
| Step 2 | | | |
| Constant | 0.24 | 0.28 | |
| BDI | 0.73 | 0.10 | .77** |
| Expectancy | -0.01 | 0.05 | -.01 |

Note R^2 = for Step 1 ($p < .01$); ΔR^2 = for Step 2 ($p = .90$). ** $p < .01$, * $p < .05$, † $p < .1$

| Variable | <i>B</i> | <i>SE B</i> | β |
|----------|----------|-------------|---------|
| Step 1 | | | |
| Constant | 0.20 | 0.10 | |
| BDI | 0.73 | 0.10 | .77** |
| Step 2 | | | |
| Constant | 0.42 | 0.39 | |
| BDI | 0.70 | 0.11 | .75** |

| | | | |
|---------|-------|------|------|
| Control | -0.04 | 0.06 | -.07 |
|---------|-------|------|------|

Note R^2 = for Step 1 ($p < .01$); ΔR^2 = for Step 2 ($p = .56$). ** $p < .01$, * $p < .05$, † $p < .1$

| Variable | <i>B</i> | <i>SE B</i> | β |
|-----------------|----------|-------------|---------|
| Step 1 | | | |
| Constant | 0.20 | 0.10 | |
| BDI | 0.73 | 0.10 | .77** |
| Step 2 | | | |
| Constant | 0.14 | 0.29 | |
| BDI | 0.73 | 0.10 | .78** |
| Expected Effort | 0.01 | 0.05 | .02 |

Note R^2 = for Step 1 ($p < .01$); ΔR^2 = for Step 2 ($p = .82$). ** $p < .01$, * $p < .05$, † $p < .1$

| Variable | <i>B</i> | <i>SE B</i> | β |
|---------------|----------|-------------|---------|
| Step 1 | | | |
| Constant | 0.20 | 0.10 | |
| BDI | 0.73 | 0.10 | .77** |
| Step 2 | | | |
| Constant | 0.05 | 0.223 | |
| BDI | 0.75 | 0.10 | .79** |
| Actual Effort | 0.03 | 0.04 | .08 |

Note R^2 = for Step 1 ($p < .01$); ΔR^2 = for Step 2 ($p = .46$). ** $p < 0.01$, * $p < 0.05$, † $p < 0.1$

Appendix 20: Correlations between all Variables in the Experimental Study

| Low Exp/ High Control | Exp PANAS (PA) | Exp AMSAM | Exp Expectancy | Exp Control | Exp Expected Effort | Exp Actual Effort | Exp Correct | BDI |
|--------------------------|----------------------|-----------|-------------------|------------------|------------------------|----------------------|------------------|-------------------|
| Exp/Control | | | | | | | | |
| Exp PANAS (PA) | | .69** | .60** | .55** | .74** | .65** | .57** | -.54** |
| Exp AMSAM | .61** | | .35* | .46** | .61** | .49** | .27 ^t | -.401* |
| Exp Expectancy | .30 ^t | .10 | | .50** | .67** | .35* | .32* | -.60** |
| Exp Control | .18 | .10 | .59** | | .39* | .47** | .47** | -.61** |
| Exp Expected Effort | .71** | .47** | .50** | .36* | | .54** | .40* | -.48** |
| Exp Actual Effort | .37* | -.06 | .36* | .19 | .57** | | .62** | -.26 ^t |
| Exp Correct | -.04 | -.34* | .32* | .25 ^t | .24 ^t | .46** | | -.31* |
| BDI | .29 ^t | .05 | -.14 | .03 | .38* | .21 | .16 | |

One-tailed tests; ** $p < 0.01$, * $p < 0.05$, ^t $p < 0.1$

Appendix 21: Dissemination Statement

In order to ensure that the research findings are disseminated, it is hoped that a paper will be submitted to the Journal of Affective Disorders. A back-up plan is to submit it to another journal should it not be accepted (e.g. Behaviour Research and Therapy). It is also hoped that the findings will be presented at a BABCP conference on affective disorders. Finally, a lay summary of the findings will also be emailed out to the lived experience group at the Mood Disorders Centre.

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