Positive Emotion Reactivity in Mild to Moderate Depression

Sarah A. Howley

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Thesis declaration form

I confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

Signature:

Name: Sarah Howley

Date: 21/06/13

Overview

This thesis focuses on abnormalities in positive emotional reactivity associated with depression. Part 1 is a literature review, which aimed to summarise recent research on the efficacy of positive psychological interventions for depression. A systematic search of the recent literature identified 16 papers that met the basic criteria of being empirical controlled studies assessing the efficacy of a positive psychology intervention for depressive symptoms. The review also aimed to examine proposed mechanisms underlying the reported efficacy of these interventions. Results indicated the overall efficacy of positive psychological interventions in the treatment of depression; however there was a dearth of research exploring causative mechanisms of these interventions.

Part 2 describes an empirical study. Based on the theories of over-general memory and emotion context insensitivity in depression, the study examined whether guided elaboration of personal memories and daily events elaborated emotional reactivity in adults with varying levels of depression. Participants recalled positive and negative personal memories in both control and elaborated conditions; emotional reactivity was measured by subjective affect ratings and electrodermal activity. They then completed elaborated and non-elaborated positive daily event logs for six days. Results indicated that elaboration increased negative affect but not positive affect and was associated with higher depression scores. These findings were discussed with reference to current theories of emotion regulation in depression.

Finally, Part 3 consists of a critical appraisal of the research process. Decisions relating to research design and methodology are discussed, along with additional scientific and clinical implications of the research findings.

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Part 1: Literature Review

Positive Psychological Interventions for Depression: Efficacy and Mechanisms of Action

Abstract

Aims: This review paper examines the recent literature on the efficacy of positive psychological interventions (PPIs) at treating low mood and increasing positive affect for adults with dysphoric mood. Potential mechanisms underlying these interventions are also explored. *Methods*: A systematic literature search was conducted to identify studies which empirically tested the efficacy of PPIs. Inclusion criteria were papers reporting empirical studies of specific PPIs compared to a control group with pre- and post- measures of negative and positive affect. *Results*: 16 studies met the inclusion criteria. Overall, PPIs were efficacious in alleviating dysphoric mood and enhancing positive affect. Moderating and mediating factors were also identified, including personality traits, participant goals and motivations, clinical versus non-clinical samples and format of intervention delivery. There was some evidence that specific PPIs do not perform better than non-specific positive skills tasks. *Conclusions*: PPIs may enhance positive affect through a non-specific mechanism involving the activation of positive representations of self and others. Recently developed positive cognitive interventions hypothesised specific mechanisms of action relating to "broaden and build" theory (Frederickson et al., 1998, 2002) and competitive memory retrieval (Brewin, 2006). However it is still unclear whether there are different treatment responses to PPIs in non-clinical versus clinical samples that may relate to different ways of processing self-referent information.

Introduction

The gold standard treatments for depression, such as Cognitive Behaviour Therapy (CBT) and pharmacotherapy (NICE, 2010), have focused on alleviating the negative affect associated with low mood. Clinical research on depression has also emphasised the delineation of cognitive biases and deficits associated with the disorder which are thought to exacerbate the experience of negative affect (Gotlib & Joormann, 2010). While it is certainly important to understand and treat the distress associated with depression, the more or less exclusive focus on distress belies the fact that one of the core diagnostic features of depression is anhedonia, or blunted positivity - a reduced ability to experience pleasure (DSM-IV; APA, 1994). Therefore, depression is understood as a disorder involving the experience of distress and an absence of positivity or wellbeing and at the present time, there is an increasing interest and research on understanding and developing interventions for the latter.

Wellbeing and depression: Theoretical approaches and clinical research

Wellbeing as defined in the scientific literature includes hedonia (happiness or pleasure) and eudaimonia, or meaning and mastery (Waterman, Schwartz, & Conti, 2008). Hedonia refers to what people generally think of as "happiness" or pleasure – the presence of positive affect and the relative absence of negative affect (Waterman et al., 2008). Eudaimonia is described as fulfilling one's potential and living in accordance to one's inherent virtues, or being the best person one can be (Deci & Ryan, 2006). To date, scientific research on subjective wellbeing, or the individual's sense of wellness has been more closely aligned with the hedonistic tradition (Deci & Ryan, 2008). However, research on well-being suggests that there is a significant overlap between hedonic and eudaimonic experiences (see Waterman et al., 2008) and the consensus in the field is that eudaimonia is necessary for a

more fully rounded understanding of wellbeing (for a detailed discussion and comparison of hedonic and eudaimonic traditions, see Deci & Ryan, 2008).

The majority of theoretical work in affective science has focused on negative emotions and associated action tendencies which tend to be narrow and restrictive; for example, fear leads to escape or avoidance behaviour and anger leads to behaviours designed to remove goal obstruction (Fridja, 1986; Levenson, 1994; Tooby & Cosmides, 1990). The broaden-and-build theory of positive emotions (Fredrickson, 1998, 2001) has been influential in providing a theoretical framework for why positive emotions are important and adaptive. The theory proposes that, unlike threat-focused emotions such as anger and fear, positive emotions are associated with broadened thought-action repertoires which are more conducive to creativity and social bonding than the more narrow repertoires associated with threat avoidance. Fredrickson's (1998, 2001) theory also proposes that positive emotions build up personal resources over time, including resilience and social skills.

The clinical research literature on anhedonia and depression supports the hypothesis that increasing positivity in depressed individuals improves mood in the short term and builds resilience to negative experiences over the longer term. For example, anhedonia has been found to be predictive of poor prognosis in major depression (Morris, Bylsma, & Rottenberg, 2009; Peeters, Berkhof, Rottenberg, & Nicolson, 2010; Rottenberg, Kasch, Gross, & Gotlib, 2002; Wood & Joseph, 2010). Indeed, to some extent, positivity deficits predict subsequent distress independently of heightened negativity (Wood, Joseph, & Maltby, 2009) and recovery from depression is more robustly linked to the ability to experience reward than with reduced stress sensitivity in day to day life (Wichers, Kenis, Mengelers, Derom, Vlietinck, & Van Os, 2008) . In terms of treatment outcomes, recent research evidence indicates that improvement in anhedonia symptoms predicts treatment outcome, specifically response to anti-depressant medication (Geschwind, Peeters, Drukker, van Os, & Wichers,

2011). There is also emerging evidence that the ability to experience positive emotions can protect against depression in those of a high genetic vulnerability (Wichers et al., 2008). Current research also highlights that the absence of negative affect does not necessarily mean the presence of positive affect (see Dunn, 2012). Therefore, recent developments in clinical psychology have focused on increasing positive affect in individuals with low mood (Korrelboom, de Jong, Huijbrechts, & Daansen, 2009; Korrelboom, Maarsingh, & Huijbrechts, 2012; Korrelboom, Marissen, & van Assendelft, 2011; Seligman & Csikszentmihalyi, 2000; Seligman, Rashid, & Parks, 2006; Seligman, Schulman, & Tryon, 2007; Tarrier, 2010).

The positive psychology movement

The so-called "positive psychology movement" was brought into focus by Seligman & Csikszentmihalyi (2000), although they stated that they were simply bringing together a range of well-established ideas from areas such as humanistic psychology. Seligman and his colleagues proposed the science of positive psychology as "the study of positive emotions, character traits and enabling institutions" (Seligman, Steen, Park & Peterson, 2005, p.410). Although the idea of studying and promoting positivity had existed prior to this, the positive psychology movement was an attempt to bring together the disparate strains of research and theory about positivity (Peterson & Park, 2003). Seligman and colleagues aimed to develop an evidence-based practice of increasing happiness and providing enduring states of happiness in parallel with clinical psychological approaches to mental distress. In other words, the positive psychology movement as conceptualised by Seligman and his colleagues was not designed to replace the current *modus operandi* of clinical psychologists in treating mental illness; rather it was viewed as a separate but parallel endeavour to promote a more "balanced psychology" (Seligman et al., 2004, p. 1380).

In order to provide a template for empirical research into positivity, Peterson & Seligman (2004) developed the Character Strengths and Virtues: A Handbook and Classification (CSV), which classifies a series of virtues and character strengths analogous to the classification of psychiatric disorders in the DSM-IV (Seligman et al., 2005). In brief, six main "virtues" and 24 "character strengths" were developed and validated cross-culturally (see Peterson & Seligman, 2004). Based on this research, Seligman and colleagues developed a series of five positive psychology interventions designed to increase happiness, focusing on gratitude, identifying and using personal strengths and noticing positive events in everyday life. Happiness, in this context, was defined as increased positive emotion/pleasure, increased engagement and increased meaning in life (Seligman, 2002) and in this way, Seligman and colleagues encompassed both hedonic and eudaimonic concepts of wellbeing.

In order to measure this construct, Seligman and colleagues developed the Sheen Happiness Index (SHI), modelled on the Beck Depression Inventory (BDI; Beck, Ward, Mendelson, Mock, & Erbaugh, 1961) but rating aspects of pleasure, meaning and engagement rather than symptoms of depression (Seligman et al., 2005). Several large randomized controlled trials (RCTs) conducted through Seligman's website (http://www.authentichappiness.sas.upenn.edu/Default.aspx) have since reported the efficacy of these positive psychology interventions and a relatively recent meta-analysis of positive psychological interventions concluded that they were effective at reducing depressive symptoms and increasing positive affect across the age range (Sin & Lyubomirsky, 2009). However, positive psychology has been criticised for using ill-defined concepts and unjustified generalisations about what it means to be "happy" (e.g. Miller, 2008). Furthermore, the most recent research examining the efficacy of these exercises in samples with moderate depression is questioning whether or not they are any more effective than "positive placebo" tasks, such as recalling positive personal memories (Mongrain &

Anselmo-Matthews, 2012). The absence of explanatory mechanisms for the effectiveness of these exercises makes it difficult to address this question.

Mechanisms of action in positive interventions

The broader psychotherapy research literature abounds with studies demonstrating efficacy or effectiveness of a particular therapy but there is as yet little known about how these therapies actually produce change i.e. their underlying mechanisms. Mediators, or variables that explain the relationship between treatment choice and outcome, are important interim steps in identifying underlying mechanisms of change (Kazdin, 2007).While PPIs are proving to be efficacious in RCTs, the underlying mechanisms of how these interventions work has yet to be tested systematically.

PPIs are broadly based on the "broaden and build" theory of positive emotions (Fredrickson, 1998, 2001; Fredrickson & Losada, 2005), as described above. However, mediator variables have yet to be identified in PPI research. The positive cognitive therapy approaches, such as Broad Minded Affective Coping (BMAC; Tarrier, 2010) and Competitive Memory Training (COMET; Korrelboom et al., 2009), are promising in terms of identifying mediators and mechanisms of change as they are explicitly guided by cognitive scientific theories, including the "broaden and build" theory of positive emotions, and the competitive memory retrieval account (Brewin, 2006). The latter proposes that the salience of representations in long term storage determines their retrievability i.e. the more salient representations are more easily retrieved. BMAC and COMET purportedly work by identifying and strengthening positive self-referent information, such as autobiographical memories and self-concept, and have been shown to be effective in treating groups with Post Traumatic Stress Disorder (PTSD), eating and personality disorders and depression (Johnson, Gooding, Wood, Fair, & Tarrier, 2012; Korrelboom, de Jong, et al. 2009; Korrelboom,

Maarsingh, et al., 2012; Korrelboom, Marissen, et al., 2011; Pangioti, Gooding, & Tarrier, 2012). It is plausible, therefore, that changes in the processing and retrievability of positive self-referent information mediates response to these interventions. However, it is unclear whether BMAC and COMET are addressing cognitive biases or deficits in individuals with psychological difficulties which prevent them from processing positive self-referent information in the same way as non-distressed individuals or whether they are merely boosting or upregulating this function. This question has not been satisfactorily addressed in the extant literature.

The current review

The current review will examine recent research in the field of positive psychological interventions which aim to increase positive affect and reduce symptoms of depression in adults of working age. For the purposes of this review, the term "positive psychological interventions" encompasses any psychological intervention with the primary aim of increasing positive affect, including but not limited to well-being, life satisfaction, self-esteem, optimism, gratitude and quality of life. Although behavioural activation fits these criteria, studies only examining behavioural activation will not be included in this review, as two recent reviews have examined the effectiveness of behavioural activation in treating depression and increasing well-being (Dimidjian, Barrera, Martell, Munoz, & Lewinsohn, 2011; Mazzucchelli, Kane, & Rees, 2010).

Because a comprehensive meta-analysis of PPIs for well-being and depression was published in 2009 (Sin & Lyubomirsky, 2009), this review will focus on research published between 2009 and 2012. Sin & Lyubomirsky (2009) conducted a meta-analysis covering 51 studies (involving a total of 4,266 participants) investigating PPIs conducted between 1977 and 2008, and found that PPIs overall produced significant improvements in both wellbeing

and symptoms of depression. They also explored potential moderating factors, namely depression severity, self-selection, age, duration of intervention and type of comparison group. They found that the interventions were especially effective among depressed and motivated participants of an older age group (36–59 years of age) and that individually administered PPIs tended to be more beneficial than group interventions. They also recommended extending the length of PPIs.

The current review aims to provide an update to Sin & Lyubomirsky (2009) in terms of the efficacy of PPIs, with the additional aim of exploring potential mechanisms underlying these treatments (mediating factors), as the literature so far has not satisfactorily addressed this question. In other words, what are the mechanisms underlying reduced positivity in depression and how do positive psychological interventions alter these mechanisms? Because this review is concerned with the question of mechanism and mediator variables as well as the efficacy of PPIs, a narrative format was chosen over meta-analytic techniques.

The following questions will be examined:

1. Are PPIs effective at treating low mood and increasing positive affect in adults with mild to moderate symptoms of depression?
2. What are the mechanisms of change underlying positive psychological interventions?

An additional clinically relevant question is whether PPIs are effective at protecting against the development of low mood over the long term. However there was a dearth of studies investigating the longitudinal impact of PPIs, therefore the question could not be systematically addressed in the current review.

Methods

Inclusion criteria

Due to the pervasiveness of depression, the inclusion criteria were deliberately broad in order to increase the generalizability of results across different populations i.e. dysphoric but not clinically diagnosed populations, populations with specific psychiatric disorders and populations with physical/medical conditions. The following inclusion criteria were used:

1. Empirical quantitative studies of psychological interventions with the primary aim of increasing positive affect.
2. RCT and case-control designs reporting pre- and post-intervention measures of depression symptoms and positive affect.
3. Interventions tested on adults of working age with mild to moderate symptoms of depression.
4. Interventions carried out in clinical and non-clinical settings.
5. Publication in a peer-reviewed journal between 2009 and 2012.

Search strategies

Studies were identified during a series of searches conducted on online databases with systematic search strategies, as well as from the reference lists of relevant review and empirical papers identified in the search. Additional studies were identified by searching journals specialising in the publication of positive psychology research. Searches were conducted on the Science Direct, PsychINFO, PubMed and Web of Science databases initially and the search was then broadened to include JSTOR, Ovid, Wiley Science and Cambridge Online Journals. In order to encompass as many relevant studies as possible, recent review papers in this area were examined for optimal key words (Sin & Lyubomirsky,

2009; Dunn, 2012) as well as key words in empirical papers identified during the initial scoping search. The initial scoping search was carried out across multiple databases using the following key words as search terms: *positive psycho** OR *positive clinical psychology* AND *depress**. The use of truncated search terms was necessary to encompass any variations of the key words, such as positive *psychology* and positive *psychotherapy*. Additional key words were identified in empirical papers arising from the initial search and further searches utilised combinations of the following search string: *dysphori** OR *affective disorder* OR *mood disorder* OR *depress** AND *positive psycho** OR *positive intervention* OR *wellbeing* OR *resilience* OR *positivity*.

Fifty-two papers were identified using a combination of the above search terms. A further two papers were identified in a Special Issue of the journal *Clinical Psychology and Psychotherapy* dedicated to positive psychology. The titles and abstracts of these 54 papers were scanned for relevance to the research questions and compliance to the inclusion criteria. A final total of 38 papers were selected to be rigorously appraised against the inclusion criteria and were therefore read in full. Out of the 38 papers identified, 16 met the above criteria for inclusion in the systematic review.

Results

Overview of study characteristics

The 16 studies included in this review are summarised in Table 1. Ten tested PPIs developed by Seligman and colleagues or variations of these interventions; four tested "positive cognitive interventions" i.e. interventions developed within a cognitive therapy framework with the principal aim of increasing an index of positive affect (Korrelboom, de Jong, et al. 2009; Korrelboom, Maarsingh, et al., 2012; Korrelboom, Marissen, et al., 2011; Pangioti,

Gooding, & Tarrier, 2012); and four studies tested other interventions designed to increase positive affect or skills (Cohn & Fredrickson, 2010; Coote & MacLeod, 2012; Crawford & Caltabiano, 2012; Giannopoulos & Vella-Broderick, 2011). All interventions are summarised in Table 2.

All studies reviewed employed a cross-sectional design and a randomisation procedure, either computerised or manual, when allocating participants to control or intervention groups. Six out of 16 studies used a placebo control group and the remainder used active, waiting list or assessment only control groups. All carried out within- and between-groups analyses at baseline and post-intervention and ten out of 16 studies carried out further analyses at follow up ranging in length from one month to 15 months. Duration, intensity and format of the interventions, as well as sample characteristics (including mental health status), are described in Tables 1 and 2.

Sample size ranged from 26 (Huffman et al., 2011) to 1,598 (Gander et al. 2012) with a median of 83. The mean age of study samples ranged from 19 to 57 with a median across studies of 36. Across studies, the majority of samples were predominantly female (mean = 79%). Eight RCTs reported attrition data for post-intervention and follow-up. Attrition rates ranged from 8% (Senf & Liau, 2012) to 83% (Mitchell et al. 2009) with an average attrition rate of 51% across the eight studies. The largest attrition rates were observed at three or six-month follow up phases of the larger RCTs (Gander et al. 2012; Mitchell et al. 2009; Mongrain & Anselmo-Matthews, 2012; Sergeant & Mongrain, 2011; Shapira & Mongrain, 2010). Trials with smaller samples reported no attrition rates post-intervention (Crawford & Caltabiano, 2011) or much lower rates than the average (Senf & Liau, 2012).

Study Quality

The Downs & Black (1998) checklist was used to assess the quality of all studies included in this review. Each study was given a score out of 27 on items relating to clarity, design, randomisation procedure and statistical analysis. Scores ranged from 8 (Huffman et al., 2011) to 22 (Korrelboom et al., 2009) and the mean score across all studies was 16.2. The spread of scores indicates the variation in methodological quality across studies. The positive cognitive intervention studies (n = 5) tended to score higher on the checklist and, taken together, they had a higher average score (19.3) than those studies testing traditional PPIs (15.1). However, the more recent studies of traditional PPIs, such as Gander et al. (2012), Mongrain & Anselmo-Matthews (2012) and Senf & Liau (2012) were large RCTs which scored higher on the checklist than older studies.

Are PPIs effective at treating depression and enhancing positive affect in adults?

The majority of the 16 studies (n = 13) reported reductions in depressive symptoms or negative affect regardless of the type of PPI, mode of delivery or duration of the intervention. Fourteen studies used gold-standard measures of depression, namely the Centre for Epidemiological Studies Depression Scale, CES-D (Radloff, 1977) or the Beck Depression Inventory I/ II – BDI I/II (Beck, Steer, Ball, & Ranieri, 1996; Beck et al., 1961) and ten out of these 14 reported reductions in scores on these measures in groups receiving a PPI compared to control groups. Six studies reported that these gains were maintained at 3-month or 6-month follow up.

Table 1

Studies investigating the efficacy of positive psychology interventions

Study	Intervention(s)	Measures	Design/Sample	Comparison group	Main findings
Crawford & Caltabiano (2012)	Humour skills programme: 8 week manualised group treatment	PSS DASS-22 PANAS LOT (Pre, Post, 6m follow-up)	N = 55 (67% female), mixed levels of depression (25% in clinical range); Mean age = 35, no attrition	Social group (active control) No intervention control group	Humour group demonstrated greater increase in positive affect and greater decrease in depression scores.
Cohn & Frederickson (2010)	Loving Kindness Meditation (15 month follow up, initial study: Fredrickson et al. 2008) Admin: Individual Duration: Daily meditation for 9 weeks	Modified DES SBI SWLS	Longitudinal follow up of original RCT (Frederickson et al., 2008) N = 95 (61% female) with mild depressive symptoms; Mean age = 41 years	Waiting list control	Participants who continued to meditate maintained increased positive emotions and personal resources and decreased negative emotions.
Coote & MacLeod (2012)	Goal-setting and Planning (GAP) Admin: Individual Duration: 1 session per week for 5 weeks	CES-D PANAS SWLS (Pre, Post, 10 week follow up)	RCT N = 55 (71% female) with mild to moderate clinical depression; Mean age = 52 years	Waiting list control	GAP group showed lower negative affect scores compared to controls. Improvements remained significant at 10 weeks

Study	Intervention(s)	Measures	Design/Sample	Comparison group	Main findings
Gander et al. (2012)	Gratitude visit 3 good/funny things Signature strengths Counting kindness Gifts of time One door closes Combinations of pairs of above Admin: Online Duration: 10mins/day for 1 week	CES-D SHI *(*Pre-, post-, 1m follow up*)*	RCT 1598 (94% female) healthy volunteers with mild depression; Mean age = 45; 33% and 61% attrition and post and follow-up	Placebo control group (early memories)	Eight of the nine interventions increased happiness; depression was decreased in all groups.
Giannopoulos & Vella-Brodrick (2011)	Pleasure record Engagement record Meaning record Combination of above Admin: Online Duration: daily for 1 week	OTH MHC-Short Form (Pre-, Post- and follow-up)	RCT N = 218 (66% female) recruited online; Mean age = 33, range = 18-64	Daily events placebo control No intervention control	Increases in wellbeing in PPI groups were larger than those in the control groups. Orientation to happiness was a significant mediator.
Huffman et al. (2011)	Three Good Things Gratitude letter Three Acts of Kindness Admin: Individual Duration: Exercises once a week for 8 weeks	CES-D SHI (Pre, Post)	Case-control non-randomised design. N = 26 patients with cardiovascular disease and mild depressive symptoms; age and gender information not provided	Active control (Relaxation) Attentional Control (Recollection) Other interventions	No significant results but non-significant trends toward greater improvement in the PPI group were also noted for happiness and symptoms of depression.

Study	Intervention(s)	Measures	Design/Sample	Comparison group	Main findings
Hurley & Kwon (2011)	Savouring the Moment Admin: Group Duration: Exercise once a week for 2 weeks	PANAS BDI-II (*Pre and Post*)	RCT N = 315 (69% female) non-depressed sample; Mean age = 19; low attrition	Assessment only control	PPI group had significantly lower levels of negative affect and depressive symptoms but no significant differences in positive affect
Korrelboom, Maarsingh, et al. (2012)	COMET + TAU Admin: Group Duration: group intervention once a week for 8 weeks	SCID BDI-II RSES SRS (Pre, Post, 3m and 6m follow up)	RCT N = 61 (74% female) with a diagnosis of MDD or dysthymia; Mean age = 40.9; 13% attrition at 3m follow up	TAU (psychotherapy and antidepressants)	COMET group had better outcomes than TAU group on all measures. 29% patients in COMET group had clinically significant change in self -esteem, vs. 7% of TAU group; maintained at follow up.
Korrelboom, Marissen, et al. (2011)	Competitive Memory Training (COMET) + TAU Admin: Group Duration: once a week for 8 weeks	BDI-II RSES (Pre, Post, 3 & 6 month follow up)	RCT N = 76 (84% female) with borderline personality disorder and moderate depression; Mean age = 36 years	Treatment as usual (TAU) group	COMET group had better scores on measures of self-esteem and depression. 24% of COMET group made a clinically significant change during treatment, compared to 4% in the control group.

Study	Intervention(s)	Measures	Design/Sample	Comparison group	Main findings
Lyubomirsky et al. (2011)	Expressing optimism (visualising ideal self) Expressing gratitude (gratitude letter) Admin: Online Duration: 15 min/week for 8 weeks	Unpleasant and pleasant affect (Feldman Barrett & Russell, 1998) SWLS SHS (Pre, post, 6m follow up)	RCT N = 330 (71% female) college students; mean age = 19.66	Active control task (record events of the week in detail)	Self-selected participants in PPI groups reported greater well-being than non-self-selected participants and controls at post and follow up. No differences in wellbeing between the PPI and control groups.
Mitchell et al. (2009)	Strengths intervention Admin: Online Duration: 1 session per week for 3 weeks	PANAS DASS-21 PWBI-A SWLS OTH Scale (Pre, Post, 1m, 3m f-up)	RCT N = 160 (83% female); mild to moderate levels of depression; Mean age: 37; 83% attrition at 3m follow-up.	Active (problem-solving) control group Placebo control group (abbreviated version of active group)	Only PPI group showed increase in wellbeing from post- to follow up. There were no group differences in depression symptoms.
Mongrain & Anselmo-Matthews (2012)	Three Good Things Signature strengths Admin: Online Duration: 10mins/day for 1 week	CES-D SHI (Pre, Post, 1m, 3m, 6m follow-up)	RCT N = 344 (83% female) healthy volunteers with moderate levels of depression; Mean age: 33; 76% attrition at 6m follow-up.	Expectancy control (early memories) Positive placebo (positive early memories)	No differences between PPI and placebo control groups. Conclusion: PPIs work through general mechanism rather than intervention-specific mechanism.

Study	Intervention(s)	Measures	Design/Sample	Comparison group	Main findings
Panagioti, Gooding & Tarrier (2012)	Broad Minded Affective Coping Admin: Individual Duration: Single session of approx. 20 mins	BDI-II SBQ-R PDS VAS (hope, happiness) (Pre, Post, 2 hour and 2 day follow-up)	RCT N = 50 (86% female) with PTSD and borderline to mild depressive symptoms; Mean age = 29.5	Active control group (positive memory recall)	Participants in BMAC group reported higher levels of positive emotions and lower levels of negative emotions compared to controls.
Shapira & Mongrain (2010)	Self-compassion letter Optimism letter Admin: Online Duration: Daily exercise for 1 week	CES-D DEQ SHI (Pre, Post, 1m, 3m, 6m follow up)	RCT N = 1002 (81% female), healthy volunteers with moderate levels of depression; Mean age = 34; 80% attrition at 6m follow-up	Placebo control group (early memories)	Both active interventions resulted in significant increases in happiness observable at 6 months and significant decreases in depression sustained up to 3 months.
Senf & Liau (2012)	Gratitude task Strengths focused task Admin: Online Duration: Daily exercise for 1 week	CES-D SHI Personality Inventory (Pre, Post, 1m follow up)	RCT N = 122 (70% female) healthy volunteers with mild levels of depression; Mean age = 20; 8% attrition at 1m follow up	No-intervention control group	No difference in depressive symptoms at post or follow-up. Extraversion was found to moderate depressive symptoms in both PPI groups. The strengths group had higher happiness levels than control group at follow up.

Study	Intervention(s)	Measures	Design/Sample	Comparison group	Main findings
Sergeant & Mongrain (2011)	Gratitude exercise Uplifting music exercise Admin: Online Duration: Daily exercise for 1 week	CES-D DEQ SHI RSES (Pre, Post, 3m and 6m follow-up)	RCT N = 772 (81% female), healthy volunteers with moderate levels of depression; mean age = 34; 64% attrition at 6m follow up	Placebo control group (early memories)	PPI groups reported greater increases in happiness but no improvement in depression. This was mediated by levels of being self-critical and needy.

AHI = Authentic Happiness Inventory; BDI = Beck Depression Inventory; CES-D = Centre for Epidemiological Studies – Depression Scale; DASS = Depression Anxiety and Stress Scales; DEQ = Depressive Experiences Questionnaire; LOT = Life Orientation Test; MHC = Mental Health Continuum; OTHQ = Orientation to Happiness Questionnaire; PANAS = Positive and Negative Affect Schedule; PDS = Posttraumatic Stress Diagnostic Scale; PSS = Perceived Stress Scale; PWI-A = Personal Wellbeing Index – Adult; RSES = Rosenberg Self Esteem Scale; RSS = Rumination on Sadness Scale; SBI = Savouring Beliefs Inventory; SBQ-R = Suicide Behaviours Questionnaire – Revised; SCID = Structured Clinical Interview for DSM-IV Disorders; SHI = Steen Happiness Index; SHS = Subjective Happiness Scale; SRS = Self Esteem Rating Scale; SWLS = Satisfaction with Life Scale

Table 2

Positive psychology interventions (PPIs) in reviewed studies

Intervention	Description	Studies
Acts of Kindness/Counting Kindness	Participants keep count and report on acts of kindness they perform daily for 1 week. Another variation is participants performing three acts of kindness in a day or other specified time.	Huffman et al. (2011) Gander et al. (2012)
Broad Minded Affective Coping (BMAC)	A 20 minute mood induction procedure – participants identify a recent positive memory and are guided by the researcher in recalling a very detailed and rich version of the memory with emphasis on multisensory description and naming of emotions experienced.	Panagioti, Gooding & Tarrier (2012)
Competitive Memory Training (COMET)	Participants are guided in building a positive self-image that competes with negative images by writing self-referent stories focusing on positive self-characteristics and associated with positive posture, imagery and emotional salience (e.g. through selected music).	Korrelboom, Marissen, et al. (2011) Korrelboom, Maarsingh, et al. (2012)

Introduction	Description	Studies
Goal setting and planning (GAP)	Developed as manualised intervention to teach goal setting and planning skills to people with depression; aim is to develop positive, realistic self-concordant goals that increase well-being and planning for the attainment of these goals.	Coote & MacLeod (2012)
Gratitude exercises	Aim to encourage participants to feel gratitude by visiting someone they would like to thank or writing a letter of gratitude.	Gander et al. (2012) Huffman et al. (2011) Sergeant & Mongrain (2011) Senf & Liau (2012)
Humour Skills	8-week training workshop designed to enhance sense of humour by encouraging participants to notice humorous events in their day and encouraging a "playful attitude". Based on the programme developed by McGhee (1999).	Crawford & Caltabiano (2011)
Loving Kindness Meditation	7-week workshop of LKM - involved teaching participants to elicit love, compassion and contentment towards themselves and others during meditative states. Aim is to increase positive emotions and therefore resilience over long term.	Cohn & Fredrickson (2010)

Intervention	Description	Studies
Optimism exercises	Optimism exercises include writing a detailed description of one's future self that is modelled on the ideal self in various areas e.g. work, family.	Huffman et al. (2011) Lyubomirsky et al. (2011) Shapiro & Mongrain (2010)
Pleasure/meaning/engagement records	One week intervention: record 3 pleasurable, engaging or meaningful events/activities every day or one of each activity.	Giannopoulos & Vella-Brodrick (2011)
Problem-solving skills training	Based on a cognitive-behavioural approach – six-stage model of problem-solving presented and then participants work on solving real life problems using model.	Mitchell et al. (2009)
Self-compassion	Participants are asked to write a letter to themselves describing themselves in a compassionate way.	Shapiro & Mongrain (2010)
Three Good Things/Counting Blessings	Participants list three positive things that happened to them that day/week and sometimes also expand on why they happened (tying in with strengths or gratitude exercises).	Huffman et al. (2011) Gander et al. (2012) Mongrain & Anselmo-Matthews (2012)
Uplifting music exercise	Participants listen to 3 or 4 uplifting songs of their choosing each day for 7 days.	Sergeant & Mongrain (2011)

These results suggest that relatively brief PPIs can produce change in depression symptoms that can be maintained for up to six months. Studies that did not administer the BDI or CES-D used other measures of depressive symptoms and/or negative affect, including the Positive and Negative Affect Schedule (PANAS; Watson, Clark & Tellegen, 1988), the Depression Anxiety Stress Scales – 21 item (DASS-21; Lovibond & Lovibond, 1995), the Modified Differential Emotions Scale (M-DES; Fredrickson, Tugade, Waugh, & Larkin, 2003) and the Mental Health Continuum – Short Form (MHC-SF; Keyes, 2002, 2005a). These measures were reported to be satisfactory in terms of reliability and validity in the four studies that used them and all with the exception of Mitchell et al. (2009), reported significant reductions in negative affect in the group receiving a PPI.

Five studies reported no significant effect of a PPI in reducing depressive symptoms (Mitchell et al., 2009; Huffman et al., 2011; Gander et al., 2012; Mongrain & Anselmo-Matthews, 2012; Senf & Liau, 2012). These studies did not differ from studies finding positive effects in terms of duration or delivery of the intervention assessed. One of the studies (Huffman et al., 2009) was of poor methodological quality, however the other four studies obtained a range of quality scores similar to that observed across all 16 studies and had a slightly higher average score of 17.8 (compared to an overall average of 16.2). All five studies tested PPIs described by Seligman et al., (2005); namely, signature strengths, gratitude exercises, acts of kindness, optimism exercises and noticing positive events exercises ("three good things", "counting kindness"). Mitchell et al. (2009), Gander et al. (2012) and Mongrain & Anselmo-Matthews (2012) all reported that the PPI groups showed a reduction in depressive symptoms but this did not differ from that observed in the placebo control groups. These results were observed at post intervention and at three-

or six-month follow up in all three studies, which suggests that, even given time, the PPIs do not alter depressive symptoms over and above the effects of a placebo exercise.

It is not clear why these trials produced non-significant effects in terms of reducing depression symptoms, as other trials reporting significant effects also compared the treatment group to a placebo control group. However three of the five negative trials used a placebo control group alongside an alternative *active* control group designed to provide a positive skill, such as problem-solving (Mitchell et al, 2009) or relaxation (Huffman et al, 2011) or to increase positive affect in a less structured way, such as positive personal memory recall (Mongrain & Anselmo-Matthews, 2012). It is notable that Gander et al. (2012) conducted the largest relatively high quality trial of all those reviewed here with 1,598 participants; they tested seven PPIs either individually or in combinations to assess the effects of individual PPIs on individuals and their results did not support the effectiveness of PPIs in reducing symptoms of depression over and above the placebo control task. However their sample was reported to have mild depressive symptoms, therefore it is possible that a sample with more severe symptoms may have benefitted more from the PPIs, as other RCTs included in this review did find significant effects in samples with moderate depression.

The results reported by Mongrain & Anselmo-Matthews (2012) suggest that PPIs are not effective at reducing depressive symptoms beyond placebo. Their RCT was designed to replicate the original proof of principle trial carried out by Seligman et al. (2005) which demonstrated the effectiveness of PPIs at reducing depressive symptoms in individuals with mild to moderate depression. However the authors explicitly identified problems in the original design, specifically the absence of

appropriate control for positive placebo effects i.e. effects as a result of engaging in any activity that may increase positive affect. To control for this, Mongrain & Anselmo-Matthews (2012) included a *positive* placebo control group, as well as a standard placebo control group for expectancy effects. The former group were asked to recall positive personal memories and the latter were asked to recall any early personal memory. They reported overall reductions in depressive symptoms in all groups with no significant differences observed between groups; this supports their contention that PPIs work through a general mechanism involving increased positive affect, rather than an intervention-specific effect.

This position is somewhat supported by the success of brief positive cognitive interventions designed to enhance positive affect, such as BMAC and COMET, both of which focus on elaborating on the positive details of personal memories and imagery (see Table 2). The results described above suggest that the PPIs described by Seligman et al. (2005) are effective at reducing mild to moderate symptoms of depression but there is some ambiguity as to whether they are any more effective than other active tasks or activities that generally boost positive affect, such as recalling positive memories or learning problem-solving skills. Interestingly, an analogous argument has taken place in the literature on antidepressant efficacy, with meta-analyses conducted over the last fifteen years suggesting that antidepressant medication has no clinically significant effect beyond placebo (Kirsch, Moore, Scoboria, & Nicholls, 2002; Kirsch & Sapirstein, 1998). Similarly, there has been a debate around the issue of whether antidepressants are effective for individuals with moderate to severe depression; however there is little evidence to support the view that antidepressant efficacy increases with symptom severity (see Moncrieff & Kirsch, 2005).

In terms of PPIs enhancing positivity in depressed adults, all but four studies (Coote & MacLeod, 2012; Huffman et al., 2011; Hurley & Kwon, 2011; Mongrain & Anselmo-Matthews, 2012) reported increases in groups receiving PPIs compared to control groups. However, more diversity was observed in the measures of positive affect utilised across studies. This may be because measures of positive affect are not as well established as measures of negative affect; also positive affect can refer to multiple concepts, such as happiness, life satisfaction, subjective wellbeing and optimism. Therefore, the greater diversity in measures is not surprising but it does make results more difficult to interpret. Six studies used the Steen Happiness Index (SHI), also known as the Authentic Happiness Inventory (Seligman et al., 2005). The SHI is designed to measure positive affect experienced by the participant over the previous week and has been found to have good validity and reliability (Seligman et al., 2005). A further four studies used the Positive Affect scale of the PANAS as a primary measure of positive affect and one study used visual analogue scales (VAS) of hope and happiness (Panagioti, Gooding & Tarrier). Three studies (Korrelboom et al., 2009, 2010, 2012) hypothesised that a positive intervention would decrease depression and increase self-esteem, therefore they used a specific measure of self-esteem (Rosenberg Self Esteem Scale; Rosenberg, 1965). The remaining three studies used the M-DES and MHC-SF to measure positive emotions and emotional wellbeing, respectively.

Out of the 11 studies testing the PPIs described by Seligman et al. (2005, 2006), eight reported an increase in positive affect in the intervention group compared to placebo-control or assessment-only control groups which remained significant at three- or six-month follow-up. Three studies (Huffman et al., 2011; Hurley & Kwon, 2011; Mongrain & Anselmo-Matthews, 2012) testing gratitude,

kindness and savouring exercises reported no significant increase in positive affect in the intervention groups compared to control groups. Mongrain & Anselmo-Matthews (2012) employed a positive placebo control group, as described in the previous section, and Huffman et al. (2011) used active and attentional control groups, which may have diluted the significance of the PPI effects. Both Huffman et al. (2011) and Mongrain & Anselmo-Matthews (2012) also reported an equivalent reduction in depressive symptoms in the intervention and control groups, which indicates that the lack of difference between groups generalises to both negative and positive affect scores.

All four studies testing positive cognitive interventions reported significant increases in positive affect in the intervention groups compared to TAU or active control groups. The three COMET studies reported that increases in self-esteem were maintained at 3- or 6-month follow up and also reported a larger proportion of clinically significant changes in self-esteem in the COMET groups. All the studies testing other PPIs reported increases in positive affect in the intervention groups compared to control groups, with the exception of one study which reported non-significant trends towards improved positive affect scores (Coote & McLeod, 2012; goal planning and setting intervention). Two of these studies reported that gains were maintained at 6- and 15-month follow up (Cohen & Fredrickson, 2010; Crawford & Caltabiano, 2011).

The overall impression from these results is that the traditional PPIs as developed by Seligman and his colleagues are effective at increasing a disparate range of positive affect, from hedonic measures of happiness to more eudemonic measures of life satisfaction and optimism. However, as observed when examining the previous question, it is possible that these effects do not consistently exceed that

of a positive placebo task involving recall of positive autobiographical memories (Mongrain & Anselmo-Matthews, 2012). When interpreted in the light of other results from positive cognitive interventions described above (BMAC and COMET), this is perhaps not surprising, as these interventions are based on the so-called "placebo" task of encouraging individuals to elaborate on positive self-referent information. In fact, BMAC and COMET were found to increase positive affect to a greater extent than treatment as usual (Korrelboom, Maarsingh, et al., 2012; Korrelboom, Marissen, et al., 2011) or other active treatments such as unguided recall of positive memories (Panagioti, Gooding & Tarrier, 2012). Therefore, the validity of the "placebo" tasks in some PPI research is questionable, when other interventions consider such techniques to be active agents of change.

What are the mechanisms of change underlying positive psychological interventions?

The mechanisms underlying blunted positivity in depression are as yet poorly understood. Identifying treatment mediators in PPI efficacy studies would shed light on this question, however most research to date has focused on either establishing the efficacy of PPIs or identifying moderator variables that influence, rather than explain, treatment outcome e.g. personality traits. In other words, there is a dearth of research examining mediating factors that would explain why a PPI is effective and thereby shed light on the positivity deficits associated with depression. There is an important distinction to be made between mediator and moderator variables, as originally outlined in Baron & Kenny (1986) and there has been considerable misuse of these terms in psychological outcome research (Kraemer, Wilson, Fairburn, & Agras, 2002). Moderator variables influence the strength and/or direction of the relationship between two variables, whereas mediator variables explain the relationship between two variables. In efficacy research, mediator variables can

speak to the underlying mechanisms of change (e.g. therapeutic alliance mediates treatment response to CBT), whereas moderators only predict variability in response to a particular intervention (e.g. age may moderate response to computerised CBT). Building on Baron & Kenny's (1986) work, Kraemer et al. (2002) outlined criteria for distinguishing between moderator and mediator variables in RCTs, including time relation to treatment onset and correlation with treatment choice. The former refers to the assumption that moderators are present prior to treatment choice (e.g. gender) whereas mediators are observed during treatment (e.g. therapeutic alliance). The latter refers to the assumption that correlation with treatment choice is observed for mediators but not for moderators. Kraemer et al. (2002) conclude that RCTs should routinely include analyses of mediator and moderator variables in order to determine how and under what conditions the treatment or intervention is most effective. They then propose that further experimental research should build on the results of such RCTs by testing *a priori* hypotheses generated by the RCT findings, such as for example, including a strong moderator as a stratification variable in the next RCT or systematically manipulating mediators to assess the effect on treatment outcome.

The most recent meta-analysis in this area (Sin & Lyubomirsky, 2009) identified some factors which appeared to moderate the effectiveness of PPIs, such as age, duration of intervention, format of delivery and motivation to engage with the intervention. Their results showed that longer interventions delivered individually were more likely to be effective. Building on these findings to some degree, the papers included in the current review tested *a priori* hypotheses about treatment moderators for PPIs. Two studies (Senf & Liau, 2012; Sergeant & Mongrain, 2011) investigated whether personality traits moderate the effectiveness of gratitude and

strengths-based interventions. Sergeant & Mongrain (2011) hypothesised that self-critical individuals would respond well to gratitude tasks designed to increase awareness of their positive traits and their results confirmed that highly self-critical individuals experienced the greatest improvement to their subjective happiness and self-esteem when they practised gratitude exercises. They also hypothesised that needy individuals would benefit most from uplifting music exercises designed to improve self-soothing skills. However, participants who scored high in neediness showed greater decreases in reported self-esteem and no improvement in symptom severity over time compared to active and placebo control groups. The authors concluded that being self-critical or needy moderated participants' response to the PPIs in very important ways. They concluded that uplifting music and gratitude PPIs may actually be detrimental to individuals with particularly high levels of neediness. This is a unique finding in the positive psychology literature which generally has concluded that PPIs have either positive effects or no effects at all. Furthermore, it highlights the importance of matching the task to the individual's goals and motivations.

Senf and Liau (2012) investigated participants' response to gratitude and strengths-focused tasks and found that extraversion had a significant moderating effect on depressive symptoms in both PPI groups. Participants scoring higher on extraversion tended to respond better to the PPIs than those with lower scores. These results are consistent with the well-established connection between happiness and extraversion (Costa & McCrae, 1980; Furnham & Christoforou, 2007; Lucas & Fujita, 2000; Strack, Argyle, & Schwarz, 1991). These are the only studies to investigate whether PPIs are moderated by personality traits and their results

highlight the importance of understanding how these interventions work so they are not inappropriately applied to groups that will not derive any benefit from them.

As stated above, there is a dearth of studies explicitly and systematically investigating mediators of treatment response to PPIs. Similarly, two studies included in the current review tested a wide range of PPIs in the same trial in an attempt to assess whether there is any difference among them in terms of effectiveness (Gander et al., 2012; Schueller & Parks, 2012), which may in turn speak to differences in mechanism. Results indicated that all interventions increased happiness and reduced depressive symptoms, with the exception of the "three good things" intervention. Participants who voluntarily carried on with this exercise after the prescribed one week period were observed to benefit more from it. The authors suggest that PPIs may be less effective if they become routine for participants, thus increasing boredom and decreasing motivation with the task. Another concern they raised was the ways in which participants completed the tasks; as this study was conducted online, the authors had no way of knowing exactly what the participants did with their exercises. Therefore it is difficult to know the circumstances under which these PPIs could be most effective, which again highlights the dearth of systematic hypothesis-driven research on mediators in this area.

In terms of searching for mechanism of action, the studies testing COMET and BMAC interventions included in this review are more explicit in linking these interventions to cognitive scientific models, namely the competitive memory retrieval account (Brewin, 2006) and "broaden and build" theory (Fredrickson, 1998, 2001; Fredrickson & Losada, 2005), as described above. These papers propose that differences in the way positive self-referent information is processed is key to understanding what causes reduced positivity in individuals with symptoms of

depression, as well as the mechanism through which these interventions are effective. COMET has been found to enhance positive images of self and reduce depressive symptoms in groups with various mental health problems, including eating disorders (Korrelboom, de Jong, et al., 2009), personality disorders (Korrelboom, Marissen, et al., 2011) and depression (Korrelboom, Maarsingh, et al., 2012). Similarly, BMAC has been found to be effective in increasing positive affect in a depressed patient group (Pangiotti et al., 2012). The generalizability of these techniques supports the proposed causal mechanisms for effectiveness, namely the enhancement of positive and functional representations in long term memory through the elicitation of detailed and multisensory imagery. However, it is not clear whether individuals who benefit from such interventions were previously processing self-referent information in a different way from non-distressed individuals or whether the interventions simply boost a pre-existing function. In the absence of hypothesis-driven systematic research, it remains to be tested whether changes in information processing, such as retrieval of functional versus dysfunctional memory representations, account for the observed treatment response.

Discussion

The main finding of this review is that a variety of PPIs are effective at increasing positive affect and alleviating symptoms of depression in adults of working age. These PPIs included gratitude, strengths-based and "noticing positive events" exercises as initially described by Seligman and colleagues, CBT-based positive interventions, such as BMAC and COMET and an array of other exercises designed to increase positive skills such as goal setting and humour skills. This broadly supports the findings of the most recent meta-analysis conducted by Sin & Lyubomirsky (2009); however, the results of more recent studies included in this

review cast doubt over whether certain PPIs are more effective than so-called "positive placebo" control tasks. The current review also highlights the disparate nature of PPIs being tested and the control tasks to which they are compared, as well as the diverse measures of positive affect employed across studies, all of which make it difficult to form a clear consensual understanding from the literature of how PPIs actually work.

Design and methodological issues

Research design and methodological issues associated with outcomes were the mode of delivery of the intervention and type of control group used. Additionally, the diversity of measures of positive affect used across studies make overall comparisons of different interventions difficult. Contrary to the findings of Sin and Lyubomorsky (2009), there were no apparent differences in the success of PPIs administered in a group versus individually (although this should be interpreted cautiously due to the smaller scope of the current review). However, as described in the previous section, the online studies reported much larger attrition rates compared to non-web based studies. Sergeant & Mongrain (2011), who carried out a large online RCT of gratitude and uplifting music exercises, also commented on the high rates of attrition across internet studies in general and specifically in their study (64% at 6-month follow up) compared to non-internet studies with similar methodology. They remarked on the impersonal nature of PPI delivery and consequent reduction in motivation as possible reasons for high attrition rates in internet studies. In addition to this, online studies can only recruit individuals with a particular level of technological ability and access to computers, which may result in the exclusion of older adults or people from lower socio-economic groups from these studies. Despite these reservations, the effectiveness of the internet as a medium for studying PPIs (or

any amenable psychological intervention) is undeniable, given the sample sizes that can be recruited in a relatively short time and with little expense.

Another advantage of online delivery of interventions is the potential for these exercises to act as preventatives for groups at risk of developing mood disorders, as demonstrated by Seligman et al. (2007). Arguably, completing interventions online rather than having to visit a mental health clinic or see a mental health clinician would be normalising, particularly for younger people. However, the markedly high attrition rates observed in internet studies needs to be addressed and potential safeguards against drop-outs should be considered. For example, the delivery of online PPIs in group forums may increase adherence through improved social contact and bonding amongst individuals with similar difficulties. Alternatively, measures assessing motivation and expectations could be administered prior to selection in the trial.

The type of control task used appeared to influence the magnitude of effect of specific PPIs across studies, namely gratitude, compassion and strength-based exercises. Specifically, studies comparing a PPI to a non-specific "active task" designed to increase positive affect such as problem-solving, relaxation or recalling early memories were less likely to report significant differences in depressive symptoms between the PPI and control groups (Gander et al., 2012; Huffman et al., 2011; Mitchell et al., 2009; Mongrain & Anselmo-Matthews, 2012; Sergeant & Mongrain, 2011). Mongrain & Anselmo-Matthews (2012) explicitly attempted to control for this "positive placebo" effect by comparing groups receiving specific PPIs to a positive placebo control group (recalling *positive* early memories) and an expectancy control group (recalling early memories) and found no differences between the placebo group and the groups receiving a PPI. This suggests that the

PPIs in this study were no more effective than encouraging participants to focus on positive personal events, which has significant implications for understanding the mechanisms underlying these positive interventions.

However, in contrast to the above results, studies of positive CBT-based interventions, BMAC and COMET, report significant effects beyond those of standard treatments (Korrelboom, Maarsingh, et al., 2012; Korrelboom, Marissen, et al., 2011) and active positive tasks such as unguided recall of positive autobiographical memories (Pangiotti et al., 2012). Trials of humour skills training (Crawford & Caltabiano, 2011) and pleasure/engagement/meaning records (Giannopoulos & Vella-Brodrick, 2011) also reported superiority of the active interventions compared to active control or placebo tasks. It is possible that these interventions are more effective or they work in a different way; however the BMAC and COMET studies used samples of individuals with clinical diagnoses of mental health disorders. Therefore, it is possible that the baseline levels of positive and negative affect were significantly different in these samples compared to the samples in the trials reporting non-significant effects, which were all recruited from the general population. The large effect sizes reported in most studies using clinical samples may reflect the efficacy of the intervention, however it may equally reflect the greater room for spontaneous improvement present in a distressed sample i.e. regression to the mean in a distressed sample would result in greater movement on an outcome measure.

The variation in measures used also makes it difficult to compare different interventions across studies. The studies testing PPIs arising from the work of Seligman and colleagues tend to be large RCTs with similar methodologies and measures used (CES-D for depression and SHI for happiness). However studies

testing other interventions have used a variety of measures of positive affect, including visual analogue scales of positive emotions such as happiness and hope and positive constructs such as optimism, self-esteem, life satisfaction and the more nebulous concept of "wellbeing". Seligman et al. (2005) remark that the aim of developing the SHI was to provide the research community with a more standardised measure of happiness that could be seen as analogous to the CES-D or BDI measures of depression. While it is highly questionable whether a single measure of positive emotion or "happiness" could encompass all facets of positivity, such as wellbeing, satisfaction, optimism etc., it would potentially increase the generalizability and comparability of study findings in this relatively early stage of positive psychology intervention research. The current plethora of positivity measures is hampering the effort to understand how these interventions work.

Mechanisms underlying positive psychology interventions

Large trials of PPIs arising from the work of Seligman et al. (2005) have recently begun to look beyond determining efficacy and are now exploring moderating factors in the success of these interventions (e.g. Senf & Liau, 2012; Sergeant & Mongrain, 2011). Results indicate that personality type, motivation and matching of tasks to the individual's goals are important moderating factors in the effectiveness of gratitude, strengths-based and counting positive events exercises. This hypothesis-driven approach produced unexpected but very useful results and thus future studies of PPIs should adopt a more targeted approach to determining the effectiveness and causal mechanisms of these interventions. The BMAC and COMET interventions are explicit in identifying the proposed causal mechanisms underlying the interventions; namely, increasing the salience of functional representations in long term memory and broadening of thought-action repertoires

(Korrelboom, Marissen, et al., 2011; Korrelboom, Maarsingh et al., 2012; Tarrier, 2010). However, this hypothesis remains to be systematically tested under controlled experimental conditions and the question remains whether this procedure is something that people need to be taught how to do or whether people with mental health problems are more likely to fail at this than those who are not distressed. It is plausible that the PPIs described by Seligman (2005) and the positive cognitive interventions work through similar mechanisms of increasing the salience and retrievability of positive representations through enhancing self-esteem and perceived self-efficacy, as well as encouraging social bonding. The success of these myriad interventions suggests that the underlying mechanism may be common to all. This is supported by the absence of a significant effect in studies which compared a specific PPI to a non-specific "placebo task" designed to increase positive affect such as problem-solving or relaxation. Therefore, utility of the term "placebo" in this context is debatable.

It may be the case that individual differences in engagement with, or response to, PPIs may be linked to cognitive deficits associated with depression, such as over-general memory and inability to inhibit negative information, which have been thought to contribute to the maintenance of low mood (e.g. Gotlib & Joorman, 2010; Williams et al., 2007). Furthermore, other well-established information processing biases in people with depression may hamper the effects of PPIs, such as dampening of positive emotions and experiential avoidance (Kashdan, Barrios, Forsyth, & Steger, 2006; Quoidbach, Berry, Hansenne, & Mikolajczak, 2010). Therefore, people with more depressive symptoms may not engage as well with interventions designed to increase attention to positive events in the day or positive personal memories. Addressing this question by explicitly testing *a priori* hypotheses regarding

purported mechanisms underlying positivity deficits, such as dampening positive emotions or over-general memory, would substantially improve our understanding of how these positive interventions work.

Limitations of the review

The current review was relatively small in scope, including only sixteen studies carried out over the last three years. Furthermore, it did not distinguish between studies investigating depressive symptoms versus studies measuring types of negative affect; there was also no way to operationalize the various measures of positivity across studies. Therefore, while the effectiveness of PPIs can be inferred from the overall results, the review can conclude very little about underlying mechanisms of action of these interventions, which was one of the main stated aims of the review. Results that speak to this issue could be described as preliminary, as further research is needed to determine the efficacy of these techniques compared to positive skills training and other types of "active" positive tasks in both clinical and non-clinical groups.

Another limitation of this review is the narrow definition of what counts as "positive psychological intervention", which resulted in the exclusion of other interventions that focus heavily on increasing positive affect, such as behavioural activation and the "third-wave" CBT approaches e.g. Mindfulness, Compassion-focused CBT or any intervention that relies on the use of positive mental imagery. However, the literature on each of these techniques is extensive and would involve the integration of several different concepts of well-being into an already disparate literature. Therefore, it was decided that this was beyond the scope of the current review.

Finally, the use of a narrative approach rather than meta-analytic techniques means that the question of efficacy of PPIs is addressed in a less systematic way. It also precludes a direct comparison between this review and the most recent meta-analysis by Sin & Lyubomirsky (2009). However, because the efficacy of PPIs has been reasonably well-established and this review was intended as an update of the most recent literature in the area, rather than an exhaustive review of all efficacy studies, it was decided that a narrative systematic review was sufficient. More importantly, because the core question of this review pertained to mechanisms underlying the efficacy of PPIs, a narrative approach facilitated a fuller discussion of this question.

Conclusions

There is a growing body of evidence showing that a variety of positive psychology interventions are effective at reducing depressive symptoms and increasing positive affect in both clinical and non-clinical populations. However, the current literature is not yet able to offer a coherent explanation as to why these interventions are effective. This has implications for the clinical use of PPIs. Proponents of positive cognitive interventions see the use of these treatments as an adjunct to more traditional therapeutic approaches; this would seem to be a sensible approach, as a number of studies report increased positive affect but no difference in depressive symptoms. Furthermore, without a clear understanding or coherent hypothesis of how these interventions work, it is perhaps not yet advisable to recommend them in routine clinical use.

In conclusion, there is still a gap in our knowledge in terms of individual differences in response to these treatments and this may be attributable to cognitive biases or deficits associated with low mood or personality difficulties. Future studies

should focus on understanding how PPIs work by investigating specific mechanisms that may underlie treatment response, such as attention, inhibitory control and memory processes. On the positive side, the BMAC and COMET literature offers a plausible theoretical framework based on cognitive models proposed by Frederickson and colleagues (1998, 2002) and Brewin (2006) and the results of trials testing these interventions appear to be promising. It is plausible that mechanisms underlying the success of these interventions can be attributed to other PPIs also. Further research on mechanism could potentially allow clinicians to identify the most appropriate interventions for their clients as well as allowing targeted preventative programmes for individuals at risk of developing mood disorder in the general population.

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Part 2: Empirical Paper

Affective Reactivity to Elaborated Idiographic Stimuli in Mild to Moderate Depression

Abstract

There is increasing evidence that depression is associated with both positive and negative emotional attenuation, although the causative mechanisms underlying this are poorly understood. One possible mechanism is over-general autobiographical memory, which has been targeted in recent clinical developments. *Aims*: This study examines whether guided elaboration of idiographic stimuli enhances emotional reactivity in adults with a range of depression scores. *Methods*: Fifty adults with a range of depression symptoms completed an experimental task during which they recalled positive, neutral and negative personal memories in non-elaborated and elaborated recall conditions. Two measures of emotional reactivity were used to assess emotional response during memory recall: subjective affect ratings and electrodermal activity (EDA). Participants also completed non-elaborated and elaborated positive event logs for six days. *Results*: There were no differences in affect ratings during elaborated compared to control positive memories or events. However, depression score was positively associated with greater emotional reactivity during recall of elaborated negative memories. Contrary to hypotheses, depression score was not associated with positive affect ratings or EDA during control or elaborated positive memories. *Conclusions*: These results do not support a generalised attenuation of emotional reactivity in depression and suggest that elaboration techniques should be used with caution as they may enhance negativity in depressed clients. Further research is needed to explore ways of enhancing positive affect in daily life for individuals with depression.

Introduction

Depression is characterised by two core diagnostic features, low mood and anhedonia, the loss of pleasure or interest in things previously found to be enjoyable (DSM-IV; American Psychiatric Association, 1994). However, despite anhedonia being a core symptom of depression, the majority of clinical research and treatment of depression has focused mainly on ameliorating low mood, i.e. the negative affective disturbance associated with the condition; anhedonic symptoms, or positivity deficits, have been largely neglected (Dunn, 2012). Gold-standard treatments for depression, such as cognitive behaviour therapy (NICE, 2010), focus primarily on reducing negative affective experiences such as sadness and fear by correcting cognitive biases associated with depression. Similarly, clinical research has emphasised the delineation of negative information processing biases and cognitive deficits contributing to negative affect in depressed populations (for reviews see Mineka, Rafaeli & Yovel, 2002 and Gotlib & Joorman, 2010). However, research based on the tripartite model of depression and anxiety disorders (Clark & Watson, 1991) has shown that, unlike negative affect, positivity deficits are relatively specific to depression rather than being observed generally across clinical disorders (Mineka, Watson, & Clark, 1998; Watson & Naragon-Gainey, 2010). Therefore, investigating positivity deficits in depression may allow for a greater understanding of the aetiology of the disorder and the development of more successful treatments.

Emotional reactivity disturbances in depression

There is increasing evidence that depression is fundamentally a disorder of emotion regulation, i.e. the processes individuals use to influence how they experience and express their emotions (Gross, 1998). Research has shown that

depressed individuals tend to use more maladaptive emotion regulation strategies (Gross, 1999; Werner-Seidler, Banks, Dunn, & Moulds, 2013). Specifically, there is preliminary evidence showing a relationship between depression and the use of maladaptive strategies for regulating positive emotions, such as dampening positive affect (Werner-Seidler et al., 2013). This is part of an increasing evidence base for the centrality and specificity of positive affect disturbance as a diagnostic indicator of depression. Recent research has shown that reduced positivity has also been found to be predictive of prognosis in major depressive disorder, or MDD (Morris, Bylsma, & Rottenberg, 2009; Peeters, Berkhof, Rottenberg, & Nicholson, 2010; Rottenberg, Kasch, Gross, & Gotlib, 2002; Wood, Joseph, & Maltby 2009). It has also been found to predict subsequent distress independently of heightened negative affect (Wood et al., 2009) and recovery from depression is more robustly linked to the ability to experience reward than with reduced stress sensitivity in day to day life (Wichers, Myin-Germeys, Jacobs, Peeters, Kenis, Derom, et al., 2008). Increased positivity may also predict a better response to anti-depressant medication (Geschwind, Peeters, Drukker, van Os, & Wichers, 2011) and there is emerging evidence that the ability to experience positive emotions can protect against depression in those of a high genetic vulnerability (Wichers, Aguilera, Kenis, Krabbendam, Myin-Germeys, Jacobs, et al., 2007). This is thought to be related to the association between positive affect and resilience (Tugade & Fredrickson, 2004), which may also explain the resilience effects of anti-depressants (Stassen, Angst, Hell, Scharfetter, & Szegedi, 2007).

Overall, there is robust evidence of blunted positivity in depression (e.g. Bylsma, Morris & Rottenberg, 2008), which supports the core role of anhedonic symptoms in the maintenance of the disorder. However, depression is also thought to

be associated with negative potentiation, or elaborated negative affect, such as sadness and guilt (Beck, 1967; Beck, Rush, Shaw, & Emery, 1979). Indeed, the foundation of cognitive therapy for depression is the idea that maladaptive cognitive schemas result in a negative bias in emotion processing (Beck et al., 1979; Bower, 1981). It is therefore surprising that there is limited evidence demonstrating increased negative affect in depression. One study found increased electrodermal activity during negative social scenarios in depressed participants (Sigmon & Nelson-Gray, 1992), while other studies have shown that increased negative reactivity is more likely to be found in dysphoric samples (Golin, Hartman, Klatt, Munz, & Wolfgang, 1977; Lewinsohn, Lobitz, & Wilson, 1973) and may not generalise to MDD (Gotlib, 1984). However, other research has shown no differences in negative reactivity between depressed and control groups (Dunn, Dalgleish, Lawrence, Cusack, & Ogilvie, 2004; Sloan, Strauss, & Wisner, 2001). This mixed evidence base for negative potentiation in depression supports the more recent emotion context insensitivity (ECI) hypothesis (Rottenberg, Gross, & Gotlib, 2005; Rottenberg et al., 2002), which posits a more generalised attenuation of emotional response in depression. In other words, according to the ECI hypothesis, depressed individuals experience both positive and negative emotional blunting and a significant number of laboratory studies have reported findings in support of this (reviewed in Bylsma et al., 2008). Therefore, given that depression is associated with generalised emotional blunting, clinical treatments for depression may require a greater focus on generally increasing emotional reactivity.

There is some evidence that the type of emotional stimulus used can influence outcome in studies of emotional reactivity in depression. For example, it has been shown that depressed groups exhibit stronger reactivity to negative

idiographic (personally salient) stimuli, such as autobiographical memories, compared to normative (standardised) stimuli, such as sad/amusing film clips (Rottenberg, Gross, & Gotlib 2005). Blunted reactivity to idiographic stimuli has also been found to predict depression severity after one year (Rottenberg, Joormann, Brozovich, & Gotlib, 2005). However, the majority of extant research in this area has been carried out in the laboratory, which precludes making any inferences about the relationship between depression and emotional reactivity to events in everyday life. In summary, the effect of increased reactivity to personally salient stimuli has been observed in depressed samples under controlled laboratory settings but the ecological validity of this effect has not yet been established. This requires further investigation as it may contribute to the development of more effective clinical techniques for the management of emotion dysregulation in depression.

Causes of positivity deficits in depression

In the search for causative factors, it has been proposed that cognitive deficits or biases relating to memory, attentional and inhibitory processes may underlie blunted emotional reactivity in depression (for a comprehensive review, see Gotlib & Joorman, 2010). One potential mechanism is a deficit in the elaboration of emotional information, particularly self-referential (autobiographical) information. This under-elaboration of autobiographical information in depressed individuals has been termed over-general memory (Williams, 1996; Williams, Barnhofer, Crane, Herman, Raes, Watkins, et al. 2007) and is understood as the recall of generic memories despite instructions to recall specific events. Over-general memory has also been linked to post-traumatic stress disorder and Williams (1996) proposed that the under-elaboration of autobiographical memories in these conditions is an emotion

regulation strategy - by retrieving memories in a less specific way the depressed or traumatised individual minimizes exposure to negative and distressing information.

Over-general memories have been linked to difficulties with problem-solving and with longer durations of depressive episodes (Raes, Hermans, de Decker, Eelen, & Williams, 2003). It has also been found that over-general recall of autobiographical memories, particularly for positive memories, predicted less complete recovery from major depression at a seven-month follow-up assessment (Brittlebank, Scott, Williams & Ferrier, 1993; but see also Brewin, Reynolds, & Tata, 1999). Therefore, arguably, over-general memory in depression represents an important cognitive marker for remission and recovery. Recent clinical research has shown that the over-general memory bias can be addressed by providing participants with an explicit strategy for recalling more detailed information, specifically the Method of Loci mnemonic device (Dalgleish et al., 2013). However, there has been very little research on how memory content influences subsequent affective experience. Investigating the effect of memory content on experienced emotion would help to clarify whether over-general memory is related to blunted affect in depression; if this is the case, then such research would provide useful insights into the development of more effective clinical treatments.

Addressing positivity deficits in depression treatments

Current treatments for depression, such as CBT, are at best only partially effective and report significant relapse rates (over 50%; Vittengl, Clark, Dunn & Jarrett, 2007; Vittengl, Clark & Jarrett, 2010). This is potentially due to the relative neglect of positive emotions in these therapies. However, emerging treatments for depression based on cognitive behavioural approaches are beginning to emphasise the guided development of elaborated multi-sensory representations of positive self-

referent material in order to combat anhedonic features of the disorder. For example, Competitive Memory Training (COMET; e.g. Korrelboom, Maarsingh, & Huijbrechts, 2012) and Broad Minded Affective Coping (BMAC; Tarrier, 2010; Johnson, Gooding, Wood, Fair, & Tarrier, 2012) purportedly work by identifying and strengthening positive self-referent information through eliciting detailed multisensory representations of positive memories and attributes. The elicitation of rich multisensory descriptions theoretically makes the representation more salient in long-term memory and increases the likelihood of these representations being retrieved. This process increases positive affect over the longer term and thus promotes resilience.

Both COMET and BMAC have been found to be effective treatments for major depression (Johnson, Gooding, Wood, Fair, & Tarrier, 2012; Korrelboom, Maarsingh, et al., 2012) as well as other psychological disorders relating to low self-esteem or altered self-image, including eating disorders and PTSD (Korrelboom, de Jong, et al., 2009; Pangioti, Gooding, & Tarrier, 2012). These approaches are based on cognitive scientific models of memory retrieval and attention, such as the retrieval competition account (Brewin, 2006) and the "broaden and build" theory of positive emotions (Fredrickson, 1998, 2001; Fredrickson & Losada, 2005). The former proposes that the salience of representations in long term memory storage determines their retrievability i.e. the more salient representations are more easily retrieved. The "broaden and build" theory proposes that positive emotions are associated with broadened thought-action repertoires which are more conducive to creativity, social bonding and resilience than the more narrow repertoires associated with negative emotions and threat avoidance.

Although there are theoretical and conceptual reasons for the apparent efficacy of these treatments, the central hypothesis that the elaboration of positive self-referent information enhances subjective emotional experience remains to be systematically tested. It is also likely that the response to such techniques would be moderated by depression severity. It is plausible that increased depression severity would be related to increased response to elaboration, as depressed individuals presumably have a lower affective baseline due to emotional blunting and would therefore have more to gain from the intervention. This suggests that elaboration techniques may work less well for milder presentations, in which the affective baseline is closer to normal. It is also possible that response to elaboration interventions will be different in depressed compared to healthy individuals. A recent study found that suppression of distressing memories reduced negative affect in healthy individuals but caused increased negativity in depressed individuals (Dalgleish, Yiend, Schweizer, & Dunn, 2009). This may be due to underlying cognitive biases in depression, such as difficulty inhibiting negative emotional material (e.g. Joorman, 2004). This bias could also influence response to elaborated personal information by increasing negative reactivity in depressed clients, which would not be a desired outcome in clinical interventions.

Reactivity to positive elaborated information may also be hampered in depressed clients due to other cognitive biases, such as increased mind wandering (e.g. Smallwood & Schooler, 2006) and rumination (Watkins, 2008) during recall. Maladaptive emotion regulation strategies, such as positive appraisal dampening (Werner-Seidler et al., 2013) may also impact on the magnitude of response to positive elaboration. Research investigating the effect of elaboration on experienced emotion across a range of depression severity will, therefore, be necessary to inform

the development of appropriate clinical interventions. The tripartite model of mood disorders (Clark & Watson, 1991) suggests that depression should be viewed dimensionally rather than categorically in order to more sensitively examine idiosyncratic information processing styles associated with the development of the disorder. Therefore, continuous analyses in samples with a range of depression scores would provide the most sensitive measure of differential responding as a function of depression severity (Dunn, Stefanovitch, Buchan, Lawrence, & Dalgleish, 2009).

The current study

Despite mounting evidence that elaboration of positive self-referent information is beneficial for treating depression, it remains to be systematically tested whether elaboration produces stronger emotional reactivity when compared directly to non-elaborated information and whether depression severity is associated with this effect. There is some preliminary evidence that the elaboration of autobiographical memories enhances affective responses in depressed individuals (Dunn, Stewart, Rosseli, Howard, Edwards, Moulds, et al., in preparation). In this study, participants with a current depressive disorder and a never-depressed control group provided details of two of their positive, neutral and negative personal memories. They were then asked to listen to elaborated audio scripts of these memories prepared by the experimenters and to rate their happiness and sadness levels afterwards. Contrary to the attenuation hypothesis, depressed participants in this study showed a stronger affective response (relative to baseline) to both positive and negative autobiographical memory scripts compared to never-depressed controls. However, because Dunn and colleagues did not include a non-elaboration control

condition in their study, it is uncertain whether elaboration was the main cause of the normalisation of affective responses in the depressed group.

Addressing this question would facilitate further discussion about the mechanisms underlying differences in emotional reactivity associated with depression. The present study attempted to address this issue by firstly examining whether guided elaboration of positive, neutral and negative autobiographical memories in a laboratory setting elicited greater emotional reactivity than non-elaborated memories. Neutral memories were included in the experimental design in order to control for baseline emotional reactivity. It was predicted that positive and negative emotional reactivity would be larger for elaborated versus non-elaborated material. It was also predicted that this effect would vary with depression severity, with higher severity associated with stronger responses to elaborated memories due to lower baseline emotional reactivity in more depressed individuals. Emotional reactivity was assessed by subjective affect ratings and a physiological measure of arousal, electrodermal activity (EDA). This dual measurement of emotional reactivity was done in order to control for demand effects associated with subjective reports. Secondly, in order to establish ecological validity and clinical relevance, the study also examined whether elaborated recording of daily positive events would elicit higher subjective mood ratings compared to non-elaborated recording and whether this varied as a function of depression severity.

Methodology

Participants

Participants were fifty adults with varying levels of depression symptoms severity recruited from the UCL Psychology Subject Pool (see Table 1).

Table 1

Sample demographic characteristics and mean depression score

Demographic/questionnaire variable	Full sample (N = 50)
Mean age in years (*SD*; range)	28.44 (11.12; 18 – 62)
Sex, n (%) female	31 (62%)
Mean IQ (*SD*; range)	110.78 (9.23; 74 – 126)
Mean BDI-II score (*SD*; range) % moderate/severe (total score >17)	10.42 (9.28; 0 – 36) 30% (n = 15)

Fifteen participants (30%) had moderate to severe symptoms of depression as defined by a score greater than seventeen on a self-report depression symptom questionnaire (BDI-II). The mean estimated IQ for the group was in the high average range (mean = 110.8, *SD* = 9.2). Inclusion criteria included fluency in English and being aged between eighteen and sixty-five years. Participants were screened for dyslexia, vision and hearing impairments, of which none were reported. They were paid £12 for their time. The participant information sheet and consent form can be viewed in Appendix A.

Previous studies using similar methods in groups with affective disorders have found significant effects in sample sizes of 25 – 40 (e.g. Dunn et al., in prep; Dalgleish, Yiend, Schweizer & Dunn, 2009; Schartau, Dalgleish, & Dunn, 2009). G*Power software was used to determine the required sample for a medium to large effect size (Cohen's d = 0.6 and 0.8, respectively) when alpha was set to 0.05. The result of this analysis was a required sample size of 23 (large effect size) to 39 (medium effect size), which confirmed the impression from the extant literature. Due

to a lower than expected rate of depression severity as recruitment progressed, a sample size of 50 participants was recruited to ensure sufficient power.

Measures

Beck Depression Inventory-II (BDI-II; Beck, Steer, Ball, & Ranieri, 1996). The BDI-II is a well-established self-report measure of depression severity. It contains 21 items relating to depressive symptoms such as sadness, loss of pleasure, pessimism and changes in sleep/appetite patterns. Scores for each item range from 0 to 3 and higher scores indicate greater depression symptom severity. Scores are classified in terms of severity as follows: 0-16 (low); 17-30 (moderate) and 31-40 (severe). The BDI-II has demonstrated good validity and reliability (Beck, Steer, et al., 1996).

Wechsler Test of Adult Reading (WTAR; Holdnack, 2001). The WTAR provides an estimate of general intellectual function. Participants are instructed to read a series of 50 irregularly spelled words and receive one point for each word pronounced correctly (based on phonetic and audio tape guidance provided) with a maximum raw score of 50. The raw score is then standardised by age and compared to scores predicted for the person's demographic classification. WTAR scores have been shown to correlate highly with verbal IQ, verbal comprehension and full-scale IQ and have good test-retest reliability (Strauss, Sherman, & Spreen, 2006).

Experimental memory task

A bespoke task was developed to elicit recall of elaborated and non-elaborated autobiographical memories. The task was developed in Visual Basic (VB) and presented on a PC running Windows XP. The task required participants to recall

six autobiographical memories – two positive, two neutral and two negative memories. They identified a cue word for each memory and the resulting six cue words were entered into the program prior to starting the task. The cue words were then randomised to either non-elaboration (control) or elaboration conditions with three cue words per condition. The control condition always preceded the elaboration condition in order to reduce the risk of practice effects.

Prior to beginning the task, participants rated their current levels of happiness, sadness, fear, anger and disgust on a visual analogue scale (VAS) from 0 (not at all) to 100 (extremely) ("RIGHT NOW, how much are you feeling the following emotions?"). They were then presented with one cue word at a time on the screen and were prompted to write down the positive, negative or neutral memory associated with that cue word in a time limit of three minutes. The cue words for the three memories were presented in random order. The program presented a warning sound using the PC speaker when there was 20 seconds remaining in the recall period. After recall of each memory, participants were instructed to rate their emotion levels during recall of the memory on the same VAS ("WHILE RECALLING YOUR MEMORY, on average how much did you feel the following emotions?"). After recalling the three memories in the control condition, participants viewed a 5-minute video clip about a scientific experiment and then rated emotions felt during the video. This was designed to act as a neutral wash-out task before participants began the elaboration condition. Following this, they viewed additional instructions onscreen prior to beginning the elaboration condition, as follows:

"Now you will be asked to write down one of your memories following a series of prompts:

1. Describe the situation in detail. (What was happening? Where were you? When did this happen? Who else was with you?).
2. Describe the thoughts running through your mind.
3. Describe the emotions that you felt at the time
4. Describe the senses you were aware of (what could you hear, taste, touch, smell etc.?)
5. What body sensations did you notice? (E.g. How fast or slow your heart was beating, whether you had tension or relaxation in particular muscles, what your posture was like, what your facial expression was like)."

They recalled a different set of three memories in the elaboration condition, during which a cue word was presented on screen, as in the control condition, but alongside abbreviated versions of the above prompts, as follows:

1. Describe the situation – what/where/when/who?
2. What were you thinking?
3. What emotions were you feeling?
4. What senses did you notice (taste/touch/smell etc.)?
5. What body sensations did you notice (e.g. posture, muscle tension)?

Psychophysiology recording

During each memory, participants' electrodermal activity (EDA) was monitored as an additional measure of emotional response that is less subject to demand effects. EDA was continuously measured via the BIOPAC Student Lab 3.7.7 system connected to a separate computer running AcqKnowledge software (BIOPAC, 1997-2010). To measure EDA, two disposable EDA (isotonic gel)

electrodes were secured ventrally on the distal index and middle finger of the non-dominant hand. All electrodes had clip-on shielded leads attached. Prior to attachment, the electrode sites were cleaned with alcohol wipes. Participants were asked to remove any jewellery or watches and instructed to move as little as possible during each trial to help minimise movement artefact. The EDA was transformed into micro-Siemens (mS) units before being analysed. Data were acquired at a rate of 200 samples per second. Data points more than the three standard deviations from the mean were excluded as outliers in all cases. Choice of electrode attachment site was based on published research guidelines for EDA (Fowles, Christie, Edelberg, Grings, Lykken, & Venables, 1981).

Positive Data Logs

After participants completed the memory elaboration task, they were given two positive event logs with an instruction sheet (see Appendix B), which they completed over a period of six days following the laboratory study. On the control log, participants described one positive event per day; they wrote a description of the event and how it made them feel and then rated their happiness levels from 0 (not at all) to 100 (extremely). On the elaborated log, participants also recorded one positive event per day and wrote a description of the event, this time following a series of prompts: "What happened? Where did it happen? Who was there? How long did it last?" They then described how the event made them feel by answering the following prompts: "how did this make you feel (emotions)? What sensations could you feel in your body? What could you see / hear / taste / smell / touch? Please answer all questions as part of your description". They then rated their happiness levels from 0 (not at all) to 100 (extremely). Participants were asked to complete each log for three days and were assigned to begin with either the control or elaborated log in order to

reduce the potentially confounding effect of completion order. This was done by alternating the order of log completion for each participant. Having completed each log for three days, participants were instructed to return both logs to the researcher via email.

The aim of this part of the study was to assess whether any effect of elaborated memories observed in the laboratory could be generalised to a real-life setting. The standard log was based on positive data logs used in cognitive behaviour therapy on which positive events/activities are recorded along with the date/time, description of emotions and mood rating. The elaborated log was an elaborated version of the standard log based on Tarrier's (2010) broad-minded affective coping model, therefore more detail was elicited in the Event/activity and Feelings fields, as described above.

Procedure

The study was advertised on the UCL Psychology Subject Pool, an electronic forum which allows registered users to view and sign up for active studies. Individuals who signed up for the study received the participant information sheet (see Appendix A) via email and were invited to attend a two-hour testing session in the Department of Psychology. Before coming to the testing session, participants received an additional email in which they were asked to identify their six personal memories and cue words.

On arrival at the testing session, informed consent was obtained from participants, prior to which they were given the chance to ask questions about the study. They were then seated in front of the PC running the memory task and were asked to input the cue words for each of their six memories into the program. Once

they were ready to begin the task, the electrodes were attached to measure electrodermal activity (EDA) as described above. After completing the memory task, participants completed the BDI-II and the WTAR (along with other questionnaires which are not reported here). Having completed the laboratory tasks and questionnaires, participants were shown the control and elaborated positive event logs (described in the previous section), along with a detailed instruction sheet (see Appendix C). A copy of each was then emailed to the participant once they had indicated that they understood what was required.

Ethics

The study was approved by the UCL Research Department of Clinical, Educational and Health Psychology Ethics board (Reference number: CEHP/2012/013).

Statistical analysis

Data were analysed using SPSS v.21. All variables were checked for normality and variables which did not conform to the normal distribution underwent square root or logarithmic transformation. Happiness ratings post-recall were taken as a measure of positive affect; sadness, fear, anger and disgust ratings post-recall were collapsed into a single variable representing a measure of negative affect. This was done in order to reduce the number of variables in the analysis and hence facilitate interpretation of the data and reduce the risk of Type I error. Depressive symptom severity as measured on the BDI-II was conceptualised as continuous and all analyses were repeated-measures analyses of variance (ANOVA) with depression symptom severity added as a mean-centred covariate. Pairwise comparisons with Bonferroni adjustment for multiple comparisons were carried out to compare affect

ratings for positive, negative and neutral memories. EDA data were collected during each memory recall and baseline recording (10 seconds of recording prior to memory recall) was subtracted from the total recall period to create EDA measures for each memory in each condition. These variables were normalised by log transformation and the exclusion of 10 data points which were deemed to be significant outliers (> 3 *SD* from the mean). EDA data were therefore analysed for 30 participants (60% of the total sample). Finally, mean happiness ratings were calculated for each positive data log by summing the ratings for each event and dividing by the number of events recorded.

Results

To rule out the possibility of confounding associations between demographic variables and depression scores, Pearson product-moment correlations were run on mean BDI-II score, age, gender and IQ variables. There were no significant associations observed between the BDI-II score and age (r = -.04, p > .05) or estimated IQ (r = -.08, p > .05) and a Spearman rho correlation showed no significant association between BDI-II score and sex, ϱ = -.05, p > .05. An independent t test confirmed no significant differences in BDI-II scores between males and females, t = .22, df = 48, p > .05.

Study 1: Affective responses to control and elaborated memories

To assess whether elaborated memories elicited greater affective responses from participants, repeated measures analyses of variance (ANOVA) were conducted with recall condition (control versus elaboration) and memory valence (positive, negative, neutral) as dependent variables and subjective affect ratings and EDA as independent variables. The effect of depression symptom severity was also assessed

by adding mean-centred BDI-II mean score as a covariate to the analysis. For happiness ratings, there was no interaction effect between recall condition and memory valence, $F(1, 49) = 0.23$, $p > .05$, nor was there a main effect of recall condition, although this approached statistical significance in the opposite direction to the hypothesis (i.e. happiness ratings tended to be higher for control happy memories, $F(1, 49) = 3.92$, $p = .053$). As expected, there was a main effect of memory valence on happiness ratings, $F(2, 48) = 280.89$, $p < .0001$, $\eta\rho^2 = 0.85$, with positive memories eliciting higher happiness ratings from participants compared to both negative memories (mean difference = 61.21, *S.E.* = 3.65, $p < .0001$) and neutral memories (mean difference = 38.99, *S.E.* = 3.86, $p < .0001$). When added to the model as a covariate, mean depression score did not interact with recall condition, $F(1, 48) = .01$, $p > .05$, or memory valence, $F(1, 48) = .07$, $p > .05$, and there was no main effect of depression score on happiness ratings, $F(1, 48) = 2.36$, $p > .05$.

For negative affect ratings, there was an interaction effect between recall condition and memory valence, $F(1, 49) = 3.58$, $p = .036$, $\eta\rho^2 = .13$. Negative memories were associated with higher negative affect ratings in the elaboration condition compared to the control condition, $F(1, 49) = 6.67$, $p = 0.013$, $\eta\rho^2 = .12$ (see Tables 2 and 3). Again, as expected, there was a significant effect of memory valence; participants gave higher ratings of negative affect for negative memories compared to both positive memories (mean difference = 28.11, *S.E.* = 2.62, $p < .0001$) and neutral memories (mean difference = 28.15, *S.E.* = 2.72, $p < .0001$). Mean depression score interacted with memory valence, $F(1, 56) = 4.83$, $p = .027$, $\eta\rho^2 = .09$, and was positively associated with higher negative affect ratings following recall of

Table 2

Affect ratings for memories in across conditions

Memory type	Happy	Sad	Neutral
Happiness ratings			
Control	73.3 (20.7)	11.2 (18.1)	34.2 (24.9)
Elaboration	69.3 (23.0)	9.0 (16.0)	30.4 (27.5)
Negative affect ratings			
Control	3.9 (7.7)	28.9 (18.9)	3.2 (5.2)
Elaboration	4.2 (6.8)	35.4 (25.3)	4.9 (6.5)

negative, relative to neutral, memories. However, this was not related to elaboration of negative memories, as mean depression score did not interact with recall condition, $F(1, 48) = .96$, $p > .05$. Mean affect rating scores for each condition can be found in Table 2.

For EDA activity (see Table 3), there was an interaction between condition and memory valence, $F(2, 28) = 32.82$, $p < .0001$, $\eta\rho^2 = .69$, with higher EDA activity during negative compared to positive memories (mean difference = .21, *S.E.* = .03, $p < .0001$) and neutral memories (mean difference = .07, *S.E.* = .01, $p < .0001$) in the elaboration condition. However, due to the relatively large amount of error apparent in the EDA measure for the positive control memory (see Table 3), the analysis was repeated including only negative and neutral memories. An interaction effect was again observed between condition and memory valence, $F(1, 34) = 12.51$, $p = .001$, $\eta\rho^2 = .27$, with higher EDA activity for negative compared to neutral memories in the elaboration condition. Depression symptom score was positively associated with

greater EDA during negative memories overall, $F(1, 33) = 5.69$, $p = .023$, $\eta\rho^2 = .15$, but this was not related to recall condition, $F(1, 33) = .15$, $p > .05$.

Table 3

Electrodermal activity (EDA) during memory recall across conditions

	Electrodermal activity (EDA): Mean (*SD*)		
Memory valence	Positive	Negative	Neutral
Condition:			
Control	0.05 (0.31)	0.38 (0.13)	0.36 (0.91)
Elaboration	0.70 (0.05)	0.70 (0.06)	0.59 (0.08)

Study 2: Affective response to control and elaborated positive data logs

27 participants (54%) completed and returned both control and elaborated positive data logs. There were sex differences between the returner and non-returner groups, with a higher proportion of females in the returner group, $\chi^2 = 6.20$, $p = .013$, Cramer's $V = .35$. There were no differences between the two groups in age ($t = .59$, $df = 48$, $p > .05$), IQ ($t = 1.35$, $df = 48$, $p > .05$) or depression symptoms ($t = .50$, $df = 48$, $p > .05$). 15 participants (30%) completed the standard log first, followed by the elaborated log and the remaining 12 participants (24%) completed their logs in the reverse order. There were no differences in mood ratings between the two groups on either the control log, $F(1, 26) = .03$, $p > .05$, or the elaborated log, $F(1, 26) = .02$, $p > .05$. Participants' mood ratings did not differ whether positive events were recorded on a standard log or an elaborated log, $F(1, 26) = .25$, $p > .05$. However,

depression symptom score had an overall effect on happiness ratings, $F(1, 25) = 5.18$, $p = .032$, $\eta\rho^2 = .17$.

Discussion

Overview of results

Although blunted positivity in depression has been well-established as a core feature of the disorder, the causative mechanisms underlying it remain unclear. Over-general memory is one of the plausible causative mechanisms; however there is a dearth of research examining the central hypothesis that increased elaboration of personal information impacts significantly on subjective emotional states. This study examined emotional reactivity to elaborated and non-elaborated self-referent stimuli, in both laboratory and naturalistic settings, in adults with a range of depression symptom severity. It was hypothesised that (i) the elaboration of autobiographical memories and positive daily events would elicit stronger emotional reactivity compared to non-elaborated memories/events and (ii) that stronger emotional reactivity to elaborated stimuli would be associated with higher depression symptom severity. These hypotheses were confirmed only for negative autobiographical memories; significantly higher subjective negative affect ratings and increased electrodermal activity (EDA) were observed during elaborated compared to non-elaborated negative memories. This suggests that participants with higher depression severity scores reacted more strongly in terms of both affective experience and autonomic arousal during negative memories. However, there was no observed association between depression symptom severity and greater reactivity to elaborated recall.

The results for positive memories were more mixed and suggested a differential response to memory recall in the laboratory compared to positive event recording in daily life. Contrary to hypotheses, subjective happiness ratings were not significantly different for control and elaborated positive memories, although there was a significant increase in EDA during elaborated compared to control positive memory recall. Further contradicting the study hypotheses, higher depression symptom severity was not associated with reduced positive reactivity during positive memories, as measured by happiness ratings and EDA. In other words, participants with higher depression scores did not differ from those with lower depression scores in terms of their positive affective responses to positive memories. However, an attenuated response to positive daily events was found to be associated with higher depression scores and this was observed on both control and elaborated positive event logs. This result is in accordance with reports of positive emotion attenuation in depression but does not support the hypothesis that elaboration of positive events normalises positive affective response in those with symptoms of depression.

In summary, participants with higher depression scores had a stronger negative response to negative memories overall but elaborated negative memories elicited stronger negative reactivity from the sample as a whole. Across all participants, elaborated positive memories in the laboratory elicited a greater autonomic response but this did not relate to subjective experience of positive emotion or higher depression scores. On the other hand, higher depression scores were associated with less positive reactivity to daily positive event recording across control and elaboration conditions. These findings are discussed in reference to current models of emotion reactivity in depression and clinical implications for treatments targeting blunted emotional reactivity in depressed populations.

Differential effects of positive and negative elaboration

The finding that depression scores were associated with increased negative reactivity to negative autobiographical memories is at odds with the emotion context insensitivity (ECI) account of emotional reactivity in depression (Rottenberg, Gross & Gotlib, 2005). The ECI account proposes that depressed individuals exhibit a generalised attenuation in their response to positive and negative emotional stimuli. The results of the present study are more closely aligned with a negative potentiation view of depression i.e. depression is associated with increased negative reactivity to negative stimuli (e.g. Beck, 1967; Beck, Rush, Shaw, & Emery, 1979). However, personally salient stimuli such as autobiographical memories have been found to differentially activate cognitive schemas regarding social relationships or achievement, which tend to be associated with negative perceptions, cognitions and affect in depressed individuals (Beck, 1983; Blatt, Quinlan, Chevron, McDonald, & Zuroff, 1982). This is in contrast to non-personally relevant standardised stimuli, which are commonly used in studies whose findings lend support to the ECI account, as shown in a recent meta-analysis (Bylsma et al., 2008). Therefore, it is perhaps not surprising that emotional reactivity increased in individuals with higher levels of self-reported depression when negative personal information was recalled.

These findings also suggest that ECI in depression may not be a constant feature of the disorder but may vary according to situation and context. For example, ECI may be observed to a lesser extent in everyday life when events are personally relevant and negative events have longer-term consequences for the individual that may reinforce their low mood (e.g. being unable to find a job, failing an exam). However, it is also noteworthy that the ECI account has emerged from research on individuals with clinically significant major depressive disorder (MDD; e.g.

Rottenberg, Gross, et al., 2005; Rottenberg, Joorman, et al., 2005), whereas the present study did not have a clinically depressed sample. The BDI-II mean score for this sample was in the mild range and there is some evidence that dysphoric samples are more likely to show negative potentiation (e.g. Golin et al., 1977), which may not generalise to MDD (Gotlib, 1984).

It is also possible that other cognitive biases associated with depression, such as rumination and poor inhibitory control of negative information (Joorman, 2004; Watkins, 2008), played a role in the increased negative reactivity to negative memories associated with higher depression scores. In support of this, there is evidence that directly addressing these biases through specially designed exercises can reduce symptoms of depression. For example, concreteness training (mental exercises designed to encourage more concrete and specific thinking about emotional events) has been shown to improve dysphoria (Watkins & Moberly, 2009).

The absence of an association between higher depression symptom scores and positive attenuation to positive memories in the laboratory setting was a surprising result, given the well-established finding that depression is associated with blunted positive affect (e.g. Allen, Trinder, & Brennen, 1999; Clark & Watson, 1991; Rottenberg, Kasch, Gross, & Gotlib, 2002; Sloan, Strauss, & Wisner, 2001). It was predicted that participants with higher depression scores would show blunted response to non-elaborated positive memories and a normalised response to elaborated positive memories. Instead, however, a ceiling effect in the emotional reactivity to positive memories was observed in the sample as a whole. In other words, non-elaborated positive memories elicited a sufficiently robust subjective emotional change that any increased reactivity to elaborated memories was negligible. It is possible that the absence of a positive attenuation effect in more

symptomatic participants could be due to their happy memories promoting a sense of mastery, self-worth or pride in achievements that combats more negative or depressogenic self-representations, as hypothesised by proponents of positive CBT techniques such as competitive memory training (COMET; Korrelboom, de Jong, et al., 2009). It also suggests that the recall of positive memories without elaboration may be sufficient to substantially increase positive affect in participants with sub-clinical depression symptoms. If this were the case, it would also contradict research findings suggesting that dysphoric individuals are unable to use positive memories to repair low mood (Joormann & Siemer, 2004).

Despite the absence of a positive attenuation effect in the laboratory and consistent with the current evidence base, higher depression scores were associated with lower mood ratings overall on the daily positive event logs. This result suggests that the elaborated event log failed to enhance positive reactivity in those with higher depression scores. This could be related to the relationship between low mood and experiential or behavioural avoidance (e.g. Cribb, Moulds, & Carter, 2006; Ferster, 1973). In other words, participants with more depression symptoms may have had less access to positive experiences, or perhaps struggled to identify positive events, in their daily lives. It could also be related to other depression-related biases, such as mind-wandering (Smallwood & Schooler, 2006), inhibition of negative affect (Joorman, 2004) or maladaptive regulation strategies such as positive affect dampening (Werner-Seidler et al., 2013), which may have curtailed positive reactivity to pleasant daily events. Cognitive biases involving attention to positive events and inhibition of negative information could be particularly problematic in the context of a self-directed task with limited external support or guidance. The fact that positive attenuation was not observed during positive memory recall in the laboratory

lends support to the theory that structure and guidance during elaboration may facilitate increased positive reactivity to elaborated material. The absence of an elaboration effect could also be due to the relatively short time period over which participants recorded their daily positive events (six days). Positive affect is thought to be associated with broad thought-action repertoires that facilitate creativity, social bonding and resilience over time (Fredrickson, 2001; Fredrickson & Losada, 2005). Therefore, it is plausible that longer time spans for positive event recording may produce changes in positive reactivity in individuals with attenuated positive affect.

Elaboration across emotional response domains

Subjective affect ratings and autonomic arousal, as measured by EDA, provided slightly different pictures of emotional reactivity in this study. EDA and subjective affect ratings for negative memories were broadly consistent, showing increased emotional reactivity to elaborated versus control negative memories. However, these measures were inconsistent for positive memories. In contrast to participants' subjective happiness ratings, EDA actually increased during elaborated compared to control positive memories, which suggests increased emotional reactivity on a physiological level. This outcome is not unusual in the extant literature in this area; emotional reactivity involves change across subjective experience, behaviour and physiological domains, which do not always correspond to one another (e.g., Berenbaum & Oltmanns, 1992; Gehricke & Shapiro, 2000; Rottenberg et al., 2002). As such, it is possible that elaborated positive memories elicited a stronger emotional response as measured physiologically but this did not translate to conscious experience of positive affect. This could be due to task-related factors, such as retrospectively rating emotions felt during a relatively brief recall period. As some emotional responses may have lasted only very brief periods of

time, it is possible that retrospective affective ratings were not sensitive enough to identify quick changes in emotional experience. Alternatively, increased EDA during positive elaboration could be due to non-specific factors, such as increased effort; this is relatively plausible, as elaborated neutral memories were also associated with increased EDA. Therefore, the disparity in emotional reactivity measures for positive stimuli could represent a generalised response characteristic of positive emotion experience, regardless of depression scores, or it could be due to an incidental increase in effort during elaboration conditions.

Clinical implications

The results of the present study are broadly consistent with the reported success of clinical techniques designed to increase positive affect through the recall of positive self-referent information in depressed individuals (e.g. Johnson et al., 2012; Korrelboom, Maarsingh, et al., 2012). However, based on these results, the use of elaboration in clinical settings should be approached with caution, as it was observed to potentiate negative affect in the present study. The use of elaboration techniques could therefore be detrimental to depressed clients. Results also indicate that depressed clients may require additional structure and guidance in order to benefit from recalling positive idiographic stimuli, based on differential responses to positive memory recall in the structured laboratory setting and positive event recording at home.

Because participants with higher depression scores reacted more strongly to negative memories than those with lower scores, the current findings support the hypothesis that over-general memory is a valid emotional regulation strategy designed to protect the individual from aversive emotional experiences (Williams et al., 2007). The absence of an association between depression symptom score and

positive attenuation to happy memories was surprising and it is unclear whether elaborated idiographic material would normalise positive reactivity in a sample with more marked anhedonic features.

The findings of this study and other recent research (Dunn et al., in prep) suggest that blunted reactivity to positive memories may not be a universal feature of dysphoric mood or even clinical depression and that encouraging positive memory recall may indeed be a useful clinical technique. However, the present study was unable to support the hypothesis that guided elaboration of positive memories is necessary for the normalisation of positive affective response in those with symptoms of depression. This is consistent with the results of a recent study examining positive psychological interventions for groups with mild to moderate depression compared to "placebo" tasks, such as positive memory recall (Mongrain & Anselmo-Matthews, 2012). This study reported no differences between the "active" tasks and positive memory recall. It remains to be seen whether these results can be generalised to groups with clinical levels of depression.

The present study did observe blunted positive reactivity to positive event recording and that elaboration of events did not remedy this. There are numerous reasons why this may be the case, such as the short time span of event recording and non-specific motivational factors, such as lack of feedback from the experimenter. However, in clinical terms, the current findings suggest that normal positive affect can be evoked in the laboratory using structured tasks, whereas this is not the case in a naturalistic setting. In other words, the present study failed to support the use of elaboration exercises for enhancing positive affect in daily life. Therefore, further research is needed to explore ways to increase the day to day experience of positive

emotions in depressed individuals, such as longer periods of practice and more detailed guidance and feedback.

Limitations of the study

The main limitation of this study was the lack of a clinically depressed sample, which reduces its clinical relevance (only 5 individuals met criteria for MDD and the mean BDI-II score was in the mild range – 10.8). Furthermore, although participants were screened for current depressive symptoms, they were not screened for previous episodes of depression. There is preliminary evidence that previously depressed individuals exhibit maladaptive emotion regulation strategies in a similar manner to currently depressed individuals (Ehring, Fischer, Schnulle, Bosterling, & Tuschen-Caffier, 2008; Ehring, Tuschen-Caffier, Schnulle, Fischer, & Gross, 2010), which has implications for the interpretation of these results; however other studies have found no differences between previously-depressed and never-depressed groups (e.g. Rottenberg, Gross, et al., 2005).

Secondly, the positive event log study, although designed to increase ecological validity of the findings, was not well-controlled as the researcher was unable to ensure that participants followed instructions for completion of the logs, specifically rating mood directly after completing the log. In addition, there was a significant non-return rate for the event logs (20%) and there were significant sex differences between those who returned the positive event log and those who did not, with significantly more females in the former group and more males in the latter. Again this makes generalizability of the findings more difficult.

Another limitation of the study concerns measurement of emotional reactivity. Firstly, the subjective measure of positive affect was simply "happiness" while the negative affect rating was composed of ratings of fear, anger, disgust and

sadness. Therefore, arguably, the negative affect rating was more representative of a range of emotional experiences that an individual may have to negative stimuli, whereas happiness is just one possible component of positive affect. The inclusion of further measures, such as joy, pleasantness, gratitude, excitement and surprise, may have made the measure more sensitive to changes in positivity from control to elaboration conditions. Furthermore, the inclusion of a second marker of autonomic arousal or emotional response, such as heart rate or respiration, which would have made the psychophysiology measurement more robust; the EDA data must therefore be interpreted cautiously as a stand-alone measure of autonomic arousal.

Finally, although participants were instructed to recall their "most positive" and "most negative" memories, it is difficult to ascertain whether all participants actually did this. It is plausible that some participants may have opted for less salient memories as a strategy to avoid intense or unpleasant feelings (see Williams, 2007). The method of recalling memories (writing them down on paper) might also have had a dampening or distancing effect on the recall experience. Other similar studies have videotaped participants recalling emotionally charged personally relevant material and then measured emotional reactivity while participants subsequently viewed the tape (Rottenberg, Gross, et al., 2005); arguably this would allow for greater savouring of a positive memory and thus elaboration effects may have been more apparent using this paradigm.

Future directions in research

Firstly, it would be informative to repeat the study with a clinically depressed sample. This would allow for clarification of whether the normal positive reactivity during positive memory recall in the current study is representative of the more severe end of the depression symptom range. It would also be interesting to examine

whether an elaboration effect for negative memories would be observed in a sample with more severe depression, thereby speaking further to the issue of ECI boundaries.

Secondly, future elaboration studies should attempt to account for other cognitive biases associated with depression, such as mind wandering (McVay & Kane, 2010; Smallwood & Schooler, 2006), inhibitory deficits (Joormann, 2004) and rumination (Watkins, 2008; Watkins & Moberly, 2009), by including measures of these cognitive processes as covariates in their analyses. In doing so, it may be possible to identify interactions between elaboration, affective experience and other cognitive biases and when elaboration techniques work best, or are contra-indicated for clients. For example, it is plausible that elaboration techniques for positive stimuli may work less well in individuals who also show high levels of mind wandering and poor inhibitory control of negative information. Furthermore, elaboration may inadvertently increase negative affect in these individuals.

Thirdly, future studies should examine the effects of positive elaboration of events in daily life over more extended periods of time than was possible in the present study. It is likely that this technique requires greater repetition and longer time frames over which to elicit lasting changes in experienced affect and behaviours. This is supported by results of a recent meta-analysis of positive psychology interventions, which reported that longer interventions were more effective (Sin & Lyubomirsky, 2009) and by prominent theoretical models such as the broaden and build theory of positive emotions (Fredrickson, 2001; Fredrickson & Losada, 2005), which emphasises the link between positive affect and attributes such as sociability and creativity that presumably require longer to emerge. This line of

research is also very clinically relevant, as it relates to current techniques used in CBT, such as positive event logs and activity scheduling.

Conclusions

This study demonstrated that the recall of autobiographical memories has a differential impact on negative emotional reactivity and this is more marked with increasing depression symptom scores. The findings support previous research with depressed or dysphoric adults, which showed increased negative reactivity to personally relevant stimuli compared to normative stimuli (Rottenberg, Gross, et al., 2005; Rottenberg, Joormann, et al., 2005) and positive attenuation to positive self-referent information (Rottenberg, Gross, et al., 2005), as observed on the daily event logs in the present study. The findings suggest that positive memory recall is effective at eliciting positive affect regardless of depression severity; they also suggest that elaborating positive memories is associated with changes in autonomic arousal but not in subjective experience of emotion, which is likely due to a ceiling effect in positive reactivity. Because the present study did not recruit participants with MDD, it is possible that a positive elaboration effect may be observed with more severely depressed groups with lower baseline reactivity levels. The depression-related positive attenuation observed on the daily event logs suggests that bringing about significant changes in experiential positive affect in daily life may require longer time frames of elaborated event recording with support and guidance from a clinician and in the context of a broader treatment protocol.

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Part 3: Critical Appraisal

The critical appraisal begins with a description of why I chose to become involved in this area of research and a personal reflection on the process of developing the research design and methodology. This is followed by an extended discussion of the scientific and clinical implications of the findings.

Choice of research area

This project was in the early stages of development prior to my involvement, as it was one of a number of research studies investigating affective abnormalities in mood and personality disorders in the MRC Cognition and Brain Sciences Unit at Cambridge. Fundamentally, it aimed to examine whether over-general memory in depression curtails emotional reactivity to idiographic stimuli such as autobiographical memories. Therefore, the main research question already existed: Does guided elaboration of autobiographical memories counteract over-general memory in depressed persons and thereby enhance emotional reactivity to memory recall? There was also an additional question regarding the ecological validity and clinical relevance of the posited elaboration effect, which resulted in the inclusion of the positive event logs due to their frequent use in CBT for depression. I was attracted to this topic because of a long-standing interest in cognitive neuropsychology and how brain function relates to behaviour and personality. In addition, the naturalistic component of the project (use of positive daily event logs) appealed strongly to my emerging interest in the cognitive biases associated with common mental health problems, such as depression and anxiety, and translational research in mental health more generally, i.e. the application of basic science findings from the laboratory to clinical practice.

Methodological and design issues

Measurement of depression symptoms

The only aspect of the study design over which I was hesitant was the measurement of depression as a continuous variable, rather than a categorical variable. There was both a conceptual and practical reason for doing this. Conceptually, there is currently better evidence for depression to be viewed as a dimensional rather than a categorical construct as dimensional constructs have been found to better predict outcomes (e.g. Prisciandaro & Roberts, 2009). However, previous depression research has emphasised the use of diagnostic terms such as MDD and this taxonomic approach also allows for comparisons between depressed and never-depressed samples, which is important as individuals who have been previously depressed respond have similar response styles to currently depressed individuals (e.g. Ehring, Tuschen-Caffier, Schnulle, Fischer, & Gross, 2010). However, this has not been observed in all studies (e.g. Rottenberg, Gross, & Gotlib, 2005).

In practical terms, I was unable to recruit enough participants with moderate or severe depression who met criteria for a current major depressive disorder (MDD). Instead I had recruited participants with a range of low to moderate levels of depression on the Beck Depression Inventory-II (BDI-II), which is itself a continuous measure of depression severity. At the time, I considered applying for ethical approval to recruit participants from NHS psychological services who met the criteria for MDD but this was far too time-consuming and precarious in relation to the project's timeline. In addition, I was unable to systematically screen all participants for a previous MDD using a structured diagnostic interview (SCID-I); this was due to constraints on the amount of time the testing lab was available for a

single session. Therefore, my study was unable to compare participants with a clinically significant depression to those who had never been depressed. As a result, my sample was probably a mix of individuals with low BDI-II scores who had never been depressed, those with low BDI-II scores who had previously been depressed and those with moderate to high BDI-II scores who at the time had significant levels of depression. This potentially undefined group in my sample (low scorers with previous MDD episodes) may have skewed the results of the study. However, the replication of this study with a group of clinically depressed and never-depressed participant should help to clarify whether the results are representative of both ends of the depression continuum (no symptoms to severe symptoms).

Memory recall procedure

My background in neuropsychological research was both an asset and a hindrance to the development of the study design and methods. My previous research focused on differentiating discrete components of cognitive functions in individuals with altered brain structure, which was theoretically important but not clinically relevant. It required a particular "box and arrows" approach to understanding cognition i.e., one begins with a super-ordinate construct, such as memory, and then carves it into its discrete components based on neurocognitive models of brain function. When I began to work on this study, with its focus on autobiographical memory and recall strategies, I slipped back into my pre-clinical training mind set to some extent. While this was beneficial in terms of applying pre-existing skills in designing and carrying out research projects, it also had some less beneficial effects on my thinking about the current study. I think this was most apparent in my decision to have participants recall the memories themselves, rather than having the memories scripted and presented to them in audio format. This decision was based on my

understanding that the act of recalling a memory activates different neural networks than those involved in listening to a memory script. Furthermore, I was aware of the literature around mind-wandering and negative attentional biases in depression and I was sympathetic to the theory that this reflected a deficit in executive function (e.g. Smallwood & Schooler, 2006). Therefore, I felt that these potential deficits in depressed participants would be best counteracted by having them actively recalling their memories rather than passively listening to scripts. However, there is an alternative point of view which suggests that mind-wandering in depression may reflect a chosen emotion regulation strategy rather than an "executive failure" (e.g. McVay & Kane, 2010), so my initial conclusions about executive dysfunction in depression were based on one side of a debate. It did not occur to me that mind-wandering may be a chosen strategy to avoid aversive feelings rather than a deficit arising from an underlying pathology. Again, my background in neuropsychology and brain disorders almost certainly influenced the way in which I interpreted the literature.

In hindsight, having reflected on my initial choices regarding the study design, I think I deviated somewhat from the main aim of the study – we were primarily interested in how the *content* of autobiographical memory influences subsequent emotional experience, so the question of *how* the memory content was derived by participants was not hugely relevant. This is not very relevant in a clinical context either, as it would be relatively easy and perhaps even preferable to script memories for a client. I suspect the act of writing the memories down may have further removed participants from the experience of recalling the memories (e.g. coming up with words to describe their feelings, worrying about appropriate phrasing) and may have facilitated a pre-existing bias towards avoiding emotional

content in more depressed individuals. I first began to consider this when, during the testing phase, two participants remarked to me that the memories seemed abstract to them and they felt the associated emotions were vague and hard to define. It is interesting to consider whether these issues would be more apparent for individuals with depression symptoms, who, as hypothesised, may be using emotion regulation strategies to avoid emotive content in their thoughts. All this being said, it would appear that the active recall elaboration did work (albeit only for negative memories) so I am not prepared to conclude that the choice of memory recall procedure was significantly detrimental to the aims of the study. Moreover, active recall also mirrors current clinical techniques which involve the client recording their own positive events and thoughts. However, I think it would be very interesting to compare methodologies in examining elaboration techniques, such as actively recalling memories (as in the present study) versus listening to pre-prepared memory scripts, which could add further insight into how depressed individuals process and organise self-referent information when they actively produce it versus passively listening to it.

Affect ratings

As briefly described in the empirical paper, the positive and negative affect ratings used were not entirely comparable. Negative affect was a richer construct, a composite of sadness, fear, anger and disgust ratings. Positive affect, on the other hand, was simply a measure of "happiness". As previously discussed in Parts 1 and 2 of this thesis, "happiness" is a very broad concept consisting of hedonic experience (traditional concept of happiness relating to positive emotions such as pleasure) and eudemonic experience (relating to contentment, mastery and life satisfaction). Therefore, happiness ratings in the present study may have meant different things to

different participants or may have only captured a small facet of positive emotional experience. In addition, different positive and negative emotions induce different levels of physiological arousal, which further underlines the complexity of emotional experience. For example, circumplex models of emotions (e.g. Russell, 1980; Plutchik, 1997; Posner, Russell, & Bradley, 2005) posit high- and low-arousal states for both positive and negative emotions. According to this model, high-arousal positive emotions include alertness, excitement, elation and happiness and low-arousal positive emotions include contentment, serenity and calmness. The corresponding spectrum of negative affect includes anxiety, stress, anger and tension on the high-arousal end and sadness, depression, boredom and fatigue on the low-arousal end. In the present study, the negative affect composite spanned both ends of this arousal spectrum (e.g. anger and fear versus sadness) whereas the positive affect rating encompassed only the high-arousal end (i.e. happiness). Interestingly, participants in the present study showed a marked elevated autonomic response to elaborated positive memories, which suggests that their positive memories were eliciting high-arousal positive emotions such as happiness and excitement. It would be interesting for future studies to examine whether the inclusion of low-arousal positive emotions would alter the pattern of results observed in the present study.

Clinical and scientific implications

One of the most important findings in the current study was that higher depression scores were associated with lower mood ratings on the positive event logs, even though this blunted positive reactivity was not observed to positive memory recall in the laboratory. Moreover, elaboration of the positive event logs was not found to impact on the relationship between depression scores and event log ratings, suggesting that elaboration did not impact on the attenuated positivity

observed in the more depressed participants. Recall of negative memories in the laboratory was also found to differentially enhance negative reactivity in those with higher depression scores and elaborated negative memories elicited more negative reactivity in the sample as a whole. In clinical terms, this suggests that a note of caution is required in the use of elaboration techniques with depressed clients, as well as demonstrating that the use of positive event logs or similar techniques to treat depressed clients may be less effective than previously thought. This supports the view that psychological treatments are not sufficiently targeting anhedonic features of depression (e.g. Dunn, 2012) and other methods of enhancing positivity in this group need to be explored.

The failure of the elaborated positive event log to induce positive mood may be related to the important distinction between mood and emotion and the different temporal dynamics of each. In contemporary affective science, mood is conceptualised as a diffuse, slow-moving feeling state that is weakly related to some stimulus or elicitor in the environment, whereas an emotion is a much more rapid response directly related to a meaningful stimulus (e.g., Ekman, 1992; Watson, 2000). Emotional responses have been found to last for seconds or minutes and have their most obvious effect on behaviour and physiological responses (Keltner & Gross, 1999), whereas moods can last for hours or days and impact more on feelings and cognitions, rather than behaviour and physiology (Rottenberg, Gross, & Gotlib, 2005). Therefore, moods can stay relatively stable even if emotional responses change in response to environmental stimuli; however moods are also thought to extend the experience of matching emotions e.g. low mood produces a more negative response to aversive stimuli (Rosenberg, 1998).

In terms of clinical interventions for anhedonic features of depression, these findings suggest that it may be possible to elicit short-term positive emotional reactivity using laboratory tasks but more difficult to elicit a shift towards a positive mood state, particularly over the course of a brief intervention. This possibly relates to the temporal dynamics of positive affect. For example, theoretical models of positive affect (Fredrickson, 2001) propose that positive affect induces resilience against low mood through the development of broad skill sets involving creativity and developing social relationships. Therefore, positive interventions for treating low mood may need to be carried out over a longer time scale. In support of this interpretation, a recent meta-analysis of positive psychological interventions found that interventions of longer duration were more effective (Sin & Lyubomirsky, 2009). Therefore, due to the temporal dynamics of positive affect and positive mood, clinical interventions for anhedonia may need to be implemented over longer time periods and have a two-pronged approach – increasing happiness through structured tasks such as positive memory recall or event recording (which may have an impact over longer time periods), which then facilitate the development of resilience-based skills such as forming social relationships and extracting more meaning or satisfaction from daily activities or pastimes. In other words, the enhancement of short-term experience of pleasure is unlikely to impact on low mood; instead, a more structured long-term approach with the aim of fostering resilience may be the most clinically effective technique.

Conclusions

In terms of personal development and critical reflection, I have learned a great deal over the course of carrying out this research, particularly in the areas of research design and theoretical aspects of affective science. The main learning point I

have taken away from this experience is the importance of keeping one's primary research question in mind when designing the study, as well as drawing on previous research experience and knowledge. I also learned the importance of anticipating difficulties in all aspects of the research process and identifying alternative approaches in advance of such difficulties arising. In broader terms, despite some methodological weaknesses, the findings from the present research project have contributed to the expanding literature on understanding the anhedonic features of depression. The findings are also clinically relevant, in that they suggest that current techniques for enhancing positivity in depressed clients, such as positive event logs, may not be as effective as previously thought and that elaboration of positive events is not effective over a short time span. Finally, the findings of this study flag up interesting directions for future research, including further examination of positive elaboration over longer time periods and the use of multi-faceted measures of emotion. Most importantly, replication studies are required with clinically depressed samples, in order to extend the clinical relevance of the findings.

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Appendix A: Participant information sheet and consent form

Information Sheet for Participants in Research Studies

Title of Project:	**Autobiographical memory and experience of pleasure in depression**
This study has been approved by the UCL Research Ethics Committee as Project ID Number:	**CEHP/2012/013**
Name, Address and Contact Details of Investigators:	**Sarah Howley, Trainee Clinical Psychologist** **Research Department of Clinical Educational and Health Psychology** **University College London** **Gower Street** **London WC1E 6BT** **Tel: +44 (0) 75 1626 1490 (Mobile)** **Email: sarah.howley.10@ucl.ac.uk**

We would like to invite you to participate in this research project. You should only participate if you want to; choosing not to take part will not disadvantage you in any way. Before you decide whether you want to take part, please read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or you would like more information.

What is the purpose of the study? We are interested in examining the relationship between mood and autobiographical memory i.e. memory relating to your own experiences. We are also interested in how attention and inhibition influence mood during recall of autobiographical memories. This may help us to better understand how depression is maintained, and possibly lead to the development of new psychological treatments, or improvement of existing treatments, for the condition.

Why have I been asked to take part? You are being asked to take part so we can explore how the recall of autobiographical memories affects your mood. We also wish to measure your bodily responses during memory recall.

What will I have to do? If you decide to take part, you will be asked to identify two positive autobiographical memories and two negative autobiographical memories that you would be willing to recall aloud in the lab. You will then be asked to provide the researcher with a cue word for each memory, which can be done via email. You will then be asked to visit the Psychology Department at University College London, at a time of your convenience for a single testing session lasting approximately 2 hours. We will give you an honorarium of £6 an hour for your time. You will also be asked to fill in questionnaires, including items asking about anxiety and depression. You will then be asked by the researcher to recall your personal memories in slightly different ways. During this task we will also be measuring your heart rate and changes in electrical activity on your skin, which is a painless procedure. After this, you will be asked to complete a short computerised task lasting around 15 minutes. Finally, you will be asked to record your positive daily experiences on a specially prepared form for 7 days and to rate how you are feeling after you record each experience. You will be given a stamped addressed envelope and asked to return this form to us after the 7 days.

Are there any risks in taking part? All of the tasks we will ask you to complete and equipment we use have been used safely in previous research. You may find it mildly stressful to do cognitive tasks but we will ensure that instructions are clear and that you are comfortable with the task beforehand. You will be able to contact a member of the research team (a qualified clinical psychologist) after leaving the unit should you feel you are experiencing distress as a result of taking part in the study.

Other information: This study has received ethical approval from the Ethics Committee of the Psychology Department at UCL. Results from the study will be presented at conferences and written up in journals. They will be presented in terms of groups of participants, so your personal data will not be identifiable.

It is up to you to decide whether or not to take part. If you choose not to participate, you won't incur any penalties or lose any benefits to which you might have been entitled. However, if you do decide to take part, you will be given this information sheet to keep and asked to sign a consent form. Even after agreeing to take part, you can still withdraw at any time and without giving a reason.

All data will be collected and stored in accordance with the Data Protection Act 1998.

Informed Consent Form for Participants in Research Studies

(This form is to be completed independently by the participant after reading the Information Sheet and/or having listened to an explanation about the research.)

Title of Project: **Autobiographical memory in depression**

This study has been approved by the UCL Research Ethics Committee as Project ID Number: CEHP/2012/013

Participant's Statement

I …….....

agree that I have

- read the information sheet and/or the project has been explained to me orally;
- had the opportunity to ask questions and discuss the study; and
- received satisfactory answers to all my questions or have been advised of an individual to contact for answers to pertinent questions about the research and my rights as a participant and whom to contact in the event of a research-related injury.

I understand that I am free to withdraw from the study without penalty if I so wish, and I consent to the processing of my personal information for the purposes of this study only and that it will not be used for any other purpose. I understand that such information will be treated as strictly confidential and handled in accordance with the provisions of the Data Protection Act 1998.

Signed: Date:

Investigator's Statement

I ……..

confirm that I have carefully explained the purpose of the study to the participant and outlined any reasonably foreseeable risks or benefits (where applicable).

Signed: Date:

Researcher notes, optional clauses:

I understand that I am being paid for my assistance in this research and that some of my personal details will be passed to UCL Finance for administration purposes.

Appendix B: Positive event logs and instructions

Positive Event Log

Please record one positive event every day, no matter how small it seems. Please say how you felt after the event. Finally please rate your mood from 0-100 **after completing the log.**

Date	Event/activity	How did you feel?	Rating of mood (0-100)

Positive Event Log (Elaborated)

Date/time	**Event** – what happened? Where did it happen? Who was there? How long did it last?	**Feelings –** how did this make you feel (emotions)? What sensations could you feel in your body? What could you see / hear / taste / smell / touch? **Please answer all questions as part of your description**	**Rating of mood (0-100)**

HOME TASK INSTRUCTIONS PLEASE BEGIN WITH: **STANDARD LOG**

Dear Participant,

Thank you for completing the laboratory section of the study. To complete the Home section of the study, please read the following instructions carefully.

1. The researcher will give you **two positive data logs** to take home with you, a "Standard" log and an "Elaborated" log. Please **follow the instructions** on each log before you complete it. You should complete each log for a total of three days each. Therefore you will complete a log for **6 days in total**.

2. You should begin to use the positive data logs **the day after** completing the laboratory section of the study

3. The researcher will randomly assign you to begin with either the "Standard" log or the "Elaborated" log e.g. you may be asked to complete the Standard log for the first three days and the Elaborated log for the next three days, or vice versa.

4. The log you should begin with is written in the **RIGHT HAND CORNER** of this leaflet.

5. Please try to complete your log at the same time each day.

6. You should spend approximately 5 – 10 minutes completing your log

7. When you have completed each log for three days, please post them back to us in the SAE provided

We are extremely grateful for your support in completing this research!

Sarah Howley

Lead Researcher

sarah.howley.10@ucl.ac.uk