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Effects of Repeated Attachment Security Priming on Depression and Anxiety in a Clinical Sample

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Mona-Maria Bejinaru

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ABSTRACT

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EFFECTS OF REPEATED ATTACHMENT SECURITY PRIMING ON DEPRESSED AND ANXIOUS MOOD IN A CLINICAL SAMPLE

MONA-MARIA BEJINARU

Previous research has identified an association between attachment orientations and depression and anxiety. Unfortunately, the majority of this work is correlational and we do not know if there is a causal relationship between having an insecure attachment style and affective disorders or vice versa. The first aim of this research was to fill this gap and review the literature that addresses the role of primed attachment security on depression and anxiety in a clinical sample. Twenty-four empirical studies met inclusion criteria. Although limited, evidence is emerging that supports the benefits of secure priming for improving affective disorders. However, limitations of existing literature including sample characteristics, type of priming method and the variability of outcome measures make generalisation of findings difficult.

The second aim of this research was to expand the existing knowledge-base by testing the effectiveness of secure attachment priming on a clinical sample of patients diagnosed with depression and/or anxiety disorders. Fifty-two participants engaged in secure attachment priming or neutral priming in the laboratory (Time 1), after which they received three daily consecutive primes according to their experimental condition (Times 2-4), aimed at maintaining the effects from Time 1 priming. A follow-up one day later (Time 5) was also included. Participants in the secure priming condition experienced higher felt-security following the initial prime and at all time-points than the control group, indicating that the felt security benefit was maintained across a number of days through repeated priming. Secure priming also had a beneficial impact on reducing the symptoms of anxiety and depression in comparison to the control prime though the differences between the groups were only significant at Time 4. This experiment was the first to use repeated security priming with a clinical sample and findings contribute towards the understanding of attachment processes and affective disorders.

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DECLARATION OF AUTHORSHIP

I, MONA-MARIA BEJINARU, declare that this thesis and the work presented in it are my own and has been generated by me as the result of my own original research.

Effects of repeated attachment security priming on depressed mood in a clinical sample

I confirm that:

1. This work was done wholly or mainly while in candidature for a research degree at this University;
2. Where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated;
3. Where I have consulted the published work of others, this is always clearly attributed;
4. Where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work;
5. I have acknowledged all main sources of help;
6. Where the thesis is based on work done by myself jointly with others, I have made clear exactly what was done by others and what I have contributed myself;
7. None of this work has been published before submission.

Signed:

Date: 23/10/2016

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Chapter 1: LITERATURE REVIEW

1.1 Introduction

The aim of the literature review is to identify and evaluate the existing literature on attachment priming and its potential benefits towards improving affect and reducing symptoms of depression and anxiety. The first part of the literature review will introduce the attachment theory and will discuss how attachment relates to affect regulation. In the second part of the literature review, the focus will be placed on discussing existing research related to attachment priming and its impact on affect, depression and anxiety. This research will be examined and synthethised and potential limitations discussed. Last, the chapter will conclude with a discussion related to the findings from the literature review and their implications for current clinical practice and future research.

1.1.1 Attachment Theory: Basics

The incidence of affective disorders in the UK it is estimated at about 15% of the population at one time. This figure is expected to increase over the coming years, as a result of the life-long nature of these conditions (NICE, 2011a). Attachment theory, which has become an important psychological framework for studying and understanding mental health, has been research for its potential positive impact on alleviating affective disorders (Bowlby, 1969, 1973, 1980). According to this theory, humans are born with an innate desire to seek proximity (*the attachment system*) to significant others (*an attachment figure*) in times of perceived threat (Bowlby, 1969). The attachment system serves two important functions: safety and affect regulation (Bowlby, 1988). When the attachment system becomes activated, attachment figures become a secure base, providing the infant with a sense of comfort, until the threat is reduced (Ainsworth, Blehar, Waters, & Wall, 1978; Bowlby, 1969). Making contact with the attachment figure helps the infant get a sense of '*felt security*', which helps him/her re-establish a sense of emotional wellbeing (Bowlby, 1973; Mikulincer & Shaver, 2016, 2007a; Sroufe & Waters, 1977). This affect regulation function is also evident in adult attachment relationships (Collins & Feeney, 2000).

Through repeated contact and patterns of interaction with attachment figures, internal representations of self and others form, which constitute the foundation for the development of individual attachment orientations (Ainsworth et al., 1978; Bowlby, 1988). Sensitive, reliable and responsive parenting supports the growth of a secure bond, where the child is confident

and comfortable with proximity seeking and develops positive representations of self and others. When the style of parenting is over-protective or neglectful, the attachment system fails to provide the sense of security and affect regulation and an insecure attachment style develops where negative representations of self and others may form. An inconsistent, intrusive style of parenting leads to the development of an insecure anxious attachment style, where the child becomes preoccupied with the availability of attachment figure and engages less in exploratory behaviours. Neglectful, rejecting parenting leads to an insecure avoidant attachment orientation, where the child has difficulties seeking proximity in times of need, supressing attachment-related behaviours (Ainsworth et al., 1978). The different attachment orientations area measured in terms of two independent dimensions: attachment anxiety and avoidance. Individuals who score low on these two dimensions, exhibit a secure attachment style (Brennan, Clark, & Shaver, 1998). Those who score high on anxiety, exhibit a strong desire for closeness and fear of abandonment. Those who score high on attachment avoidance are characterized by a desire for independence and distance from attachment figures due to discomfort with closeness (Hazan & Shaver, 1987; Mikulincer & Shaver, 2016; 2007a).

1.1.2 Attachment and Affect Regulation

Individuals who score high on attachment avoidance may rely on different affect regulation strategies when exposed to perceived threat, according to existing studies (Mikulincer & Shaver, 2007b, 2016). Hyperactivation of the attachment system may occur in the case of anxious attachment orientations as a coping strategy with unpredictable caregiving (Bartholomew & Horowitz, 1991; Hazan & Shaver, 1987; Pietromonaco & Barrett, 1997; Shaver & Brennan, 1992). On the other hand, avoidant infants may deactivate the attachment system in order to cope with inconsistent attention or rejection (Bartholomew & Horowitz, 1991; Fraley & Shaver, 1997). Securely attached infants experience something called the *broaden-and-build* model, where the caregiver's responsiveness and availability contribute to the formation of a positive cycle of attachment security (Fredrickson, 2001). Positive emotions associated with the caregiver relationship promote positive perceptions of self and others, which then lead to positive and trusting relationships, appropriate affect regulation and good social skills development (Mikulincer & Shaver, 2016; 2007a).

1.1.3 Attachment Stability

As discussed earlier, these individual attachment orientations are shaped early in life and can be maintained into adulthood (Fraley, 2002; Hamilton, 2000; Hazan & Shaver, 1987; Weinfeld, Sroufe, & Egeland, 2000), as similar processes of seeking and providing care happen

later in life (Collins & Feeney, 2000; Simpson & Rholes, 1994). Attachment orientations are both stable and flexible constructs across any given relationship as individuals are likely to respond to different situations in a way that fits the represented internal working model (Ainsworth, 1989; Hazan & Shaver, 1987). Zayas, Mischel, Shoda and Aber (2011) identified similarities between attachment orientations at 18 months and adult attachment at 22 years of age.

1.1.4 Attachment Hierarchy

From childhood into adulthood, one could form attachment relationships to more than one significant other as a result of the diversity of repeated social experiences (Bowlby, 1969, 1988). These different attachment relationships then become organised in a hierarchical fashion (Bartholomew & Horowitz, 1991; Collins & Read, 1994). At the top of the attachment hierarchy, the global (*dispositional*) attachment orientation represents relationship information formed from repeated patterns of interactions with a range of attachment figures (Figure 1; Collins & Read, 1994). The global attachment style tends to be the dominant attachment orientation, which may impact on the views of self and others across situations (Hazan & Shaver, 1987). At the next level, representations of general parent and general peer are held. Next, parent representations are split into mother and father and peer relationships are split into romantic and friendships. At the lowest level in the hierarchy, patterns of individual interactions with other close people such as romantic partners or friends are held.

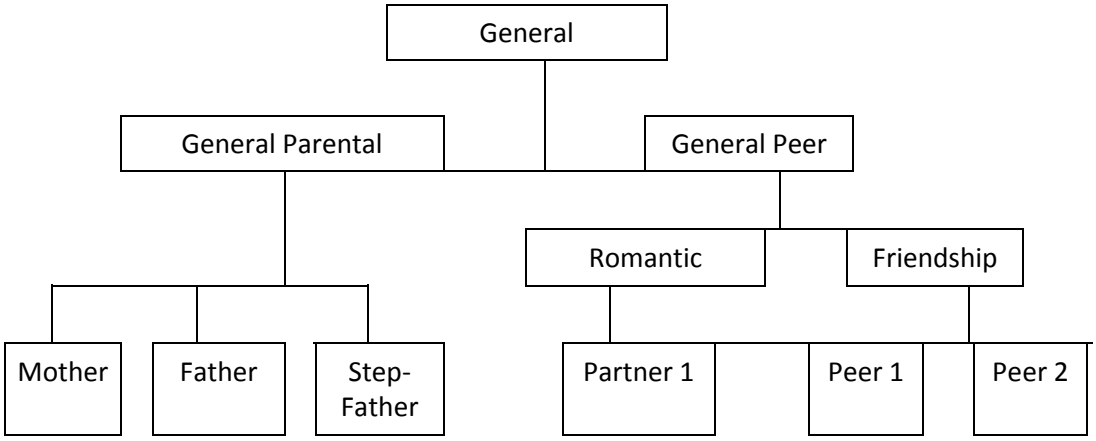


Figure 1. *Hierarchical Network of Attachment Orientations*
(Adapted from Collins & Read, 1994)

These global and relationship-specific attachment styles can function independently of each other (Mikulincer & Arad, 1999; Mikulincer & Shaver, 2001). There can be differences in attachment orientations with different people. For example, someone with an insecure global

attachment style may have a secure attachment relationship with a romantic partner but not with other people (Baldwin, 1992; Baldwin, Keelan, Fehr, Enns, & Koh-Rangarojoo, 1996; Collins & Read, 1994; Green & Campbell, 2000; Mikulincer & Arad, 1999; Mikulincer & Shaver, 2001; Pierce & Lydon, 2001).

1.1.5 Attachment and Mental Health

Global attachment orientations are linked to a number of aspects related to mental health in both clinical and non-clinical samples, according to an extensive body of literature (Brennan & Shaver, 1995; Crittenden, 1997; Mikulincer & Florian, 1998; Mikulincer & Shaver, 2016). Securely attached individuals are likely to hold more positive views about self (Bartholomew & Horowitz, 1991; Mikulincer, & Florian, 1998), and others (Collins, 1996). Those high in security appear to show more cognitive flexibility (Mikulincer, 1997), can regulate own emotions better (Bowlby, 1973) and are more able to cope with stressors (Birnbaum, Orr, Mikulincer, & Florian, 1997; Collins, & Read, 1990; Mikulincer & Florian, 1998). Those who score higher on attachment anxiety or avoidance scales respond to stressful situations with higher physiological distress (Feeney, Kirkpatrick, 1996; Mikulincer & Florian, 1998). Clinical samples also appear to report more attachment insecurities in comparison to non-clinical samples (Mikulincer & Shaver, 2016).

1.1.6 Attachment and Affective Disorders

In his trilogy, Bowlby postulated that attachment insecurities can lead to affective disorders as the attachment system has failed to meet one of its main functions of affect regulation (Bowlby, 1980; 1973). For example, the unavailability of the attachment figure can result in attachment insecurities, which can lead to anxiety about own abilities to cope and potential external threats. Neglectful or absent parenting can have the impact of inducing a sense of loss in the child which then can predispose him/her to depressive symptoms (Bowlby 1980). Mikulincer and Shaver (2007a; 2016) reviewed a significant number of studies exploring the link between attachment orientations and affective disorders and have concluded that it is likely that an insecure attachment style may predispose people to affective disorders. Wei, Mallinckrodt, Russell, and Abraham (2004) found a strong association between an insecure attachment style and depressive symptoms. Furthermore, high self-ratings on attachment avoidance and anxiety have been both linked to higher subjective ratings of depression (Carnelley, Pietromonaco, & Jaffe, 1994; Doi & Thelan, 1993). A secure attachment style appears to correlate to lower ratings for depressive symptoms (Kobak, Cole, Ferenz-Gillies, Fleming, & Gamble, 1993; Roberts, Gotlib, & Kassel, 1996).

Research has also linked having an insecure attachment style with anxiety (Bartholomew, 1990; Safford, Alloy, Crossfield, Morocco, & Wang, 2004). Kobak and Sceery (1988) identified a strong inverted relationship between secure attachment style and severity of anxiety symptoms. Insecurely attached individuals are more likely to report higher rates of Obsessive Compulsive Disorder symptoms (OCD; Doron, Mikulincer, Sar-El, & Kyrios, 2015), and Post Traumatic Stress Disorder symptoms (PTSD; Ein-Dor, Doron, Solomon, Mikulincer, & Shaver, 2010; Fraley, Fazzari, Bonano, & Dekel, 2006; Mikulincer, Florian & Weller, 1993). Studies have also explored links between attachment styles and physiological symptoms of anxiety. It has been proposed that attachment insecurity correlates with a heightened activation of the autonomic nervous system and of the hypothalamic-pituitary-adrenal (HPA) axis (Diamond, 2001). Insecurely attached individuals are more likely to experience an increased heart rate and a higher cortisol level following attachment separation or stress (Brooks, Robles, & Dunkel Schetter, 2011; Carpenter & Kirkpatrick, 1996).

1.1.7 Attachment Priming

Existing studies indicate that there is strong association between attachment styles and affective disorders. Although there is a significant degree of stability of attachment styles into adulthood (Fraley, 2002; Hamilton, 2000), Bowlby maintained the view that attachment orientations are amenable to change (Bowlby, 1973). Updated patterns of interaction, new relationships, development of cognitive abilities are factors that can alter attachment orientations both in childhood and adulthood (Bowlby, 1969, 1973; Crowell, Treboux, & Waters, 2002; Kirkpatrick & Hazan, 1994; Mikulincer & Shaver, 2007a; Vaughn, Egeland, Sroufe, & Waters, 1979). In support of this flexible aspect of attachment, researchers have been investigating the impact of activating a non-global attachment style. It has been suggested that once activated, the non-global attachment style can over-ride the dispositional attachment orientation, leading to a change in behaviours and cognitions that match the activated pattern of attachment (Mikulincer & Arad, 1999; Mikulincer & Shaver, 2016). It is possible therefore that activating a non-global attachment style can lead to a change in the global attachment style and this may impact on affect regulation of existing affective disorders.

In order to test the causal relationship between attachment orientations and affective disorders (and other aspects not covered in this review), researchers have used a process called attachment priming (Baldwin et al., 1996). Priming is aimed at activating a secure attachment style whilst measuring psychological, behavioural and physiological changes. It is believed that activating a secure attachment style may lead to temporary changes in an individual's attachment style, as he/she would think, feel and behave in ways consistent with

that attachment style temporarily (Baldwin & Fehr, 1995; Baldwin et al., 1996). Studies have found participants primed with a secure attachment style to benefit in a number of ways. Some have found priming to increase self-esteem (Carnelley & Rowe, 2007), or show improved problem-solving abilities (Mikulincer, Shaver, & Rom, 2011). Securely primed participants showed increased levels of empathy for a stranger in distress (Mikulincer, Gillath, Halevy, Avihou, Avidan, Eshkoli, 2001). Secure attachment priming has shown a beneficial impact on levels of stress and burnout among health workers (Pardess, Mikulincer, Dekel, & Shaver, 2014).

1.2 Aims of the Review

The aim of this literature review is to evaluate existing empirical evidence related to the effectiveness of secure attachment priming on improving mood and anxiety[1].

1.2.1 Review Objectives

1. To identify and critically evaluate existing studies investigating the causal relationship between secure attachment priming and negative affect and/ or anxiety in adults.
2. To ascertain current attachment priming methodology in the included studies.
3. To compare outcomes for single versus repeated attachment priming.
4. To discuss and provide suggestions related to clinical implications.

1.3 Method

1.3.1 Search Strategy

I order to minimise the potential for bias in the review process, this literature review process was informed by the Cochrane protocol (Higgins & Green, 2011). No previous systematic literature reviews on priming attachment impact on mood and anxiety were identified on Google Scholar, DARE and CDSR databases. Relevant articles were searched on

[1] In this review, the terms mood and anxiety are viewed as representing a continuum of symptoms. For example, the term low mood refers to a number of related concepts such as negative affect, depression, mood disorder. Similarly, anxiety will refer to other concepts such as worry, stress and fear as it is considered that anxiety and low mood are typical human emotions that can be identified both in clinical and non-clinical populations whereas depression and anxiety disorders may be specific terms used with clinical populations.

the following databases on the 20th November 2015: EBSCO, PsychINFO, Web of Science, PubMed, Cochrane Central and CINAHL.

Following a thesaurus search, previous related literature (Mikulincer & Shaver, 2016) and the diagnosis manual for mental health disorders (APA, 2000), the following search terms were used *attachment priming* or *security priming* or *repeated priming* and *depression* or *low mood* or *mood* or *mood disorders* or *depressive symptom* or *affect* or *depressive episode* or *dysthymia* and *anxiety* or *generalised anxiety* or *GAD* or *stress* or *worry,* or *social anxiety* or *post-traumatic stress disorder* or *obsessive compulsive disorder* or *phobia* or *panic disorder* or *fear* or *mixed anxiety and depression.* All English written published and unpublished studies exploring the impact of attachment priming on mood or anxiety in adult populations were included.

1.3.2 Inclusion Criteria

Initially, all published and unpublished studies exploring the impact of attachment priming on mood or anxiety in adult populations were included. Studies had to meet the following criteria:

a) they focused on clinical or non-clinical studies with adult populations;

b) they were written in English;

c) experimental studies where attachment priming would be the independent variable and affect the dependent variable;

d) no restriction on attachment priming technology employed , with studies including various subliminal and supraliminal priming methodologies (including: visualisation, writing about an attachment figure, reading a story about attachment, presentation of attachment-related words or seeing pictures representing attachment);

e) they focus on either single or repeated priming;

f) anxiety or mood are explicitly measured, in terms of psychological or physiological symptoms. For example, studies will be included looking at psychological symptoms of affect measured implicitly or explicitly (through subjective measures of symptoms such as *anxiety, depression, stress, distress, guilt, hopelessness, nervousness, feeling pleased, glad, sad, unhappy, angry* or *feeling worthless*). Physiological symptoms include

physical symptoms related to anxiety or depression (*cortisol levels, neural changes in the brain* or *levels of salivary alpha amylase*).

1.3.3 Exclusion Criteria

Certain exclusion criteria were established:

a) cross-sectional studies;
b) case studies;
c) dissertations;
d) studies exploring the impact of priming on enduring mental health problems (bipolar mood disorder, schizophrenia, eating disorders, psychosis);
e) attachment priming on anxiety and depression caused by an organic disorder, rather than a psychiatric condition (organic brain syndrome, stroke, memory impairment, neurodegenerative disorders including dementia and Huntington's disease, acquired brain injury).

1.3.4 Search Findings

Search results are presented graphically in Figure 2. The initial search yielded a total of 860 papers, published between January 1980 and the 20th November 2015. Removing duplicates resulted in 318 papers. An additional search of reference lists and Google Scholar was run on the 27th November 2015, which resulted in 39 additional articles. Three hundred and fifty-seven papers were screened at an abstract level and further narrowed down: six studies included younger participants, 177 were on a different topic and a further 38 were cross-sectional. The secondary search that took place on the 20th February 2016 identified an additional 34 potential research papers, which were added. Twelve papers describing 30 individual studies were included in the final review. From the total studies, 24 met the inclusion criteria.

1.3.5 Information Extracted

The following information was extracted from the included studies: a) design, b) population and settings, c) attachment measures, d) mood and anxiety measures and e) results (Table 1). In addition, information related to attachment priming methodology was extracted (Table 2): a) priming method, b) subliminal versus supraliminal priming, c) online or face-to-face, d) single or repeated priming and e) threat or neutral conditions.

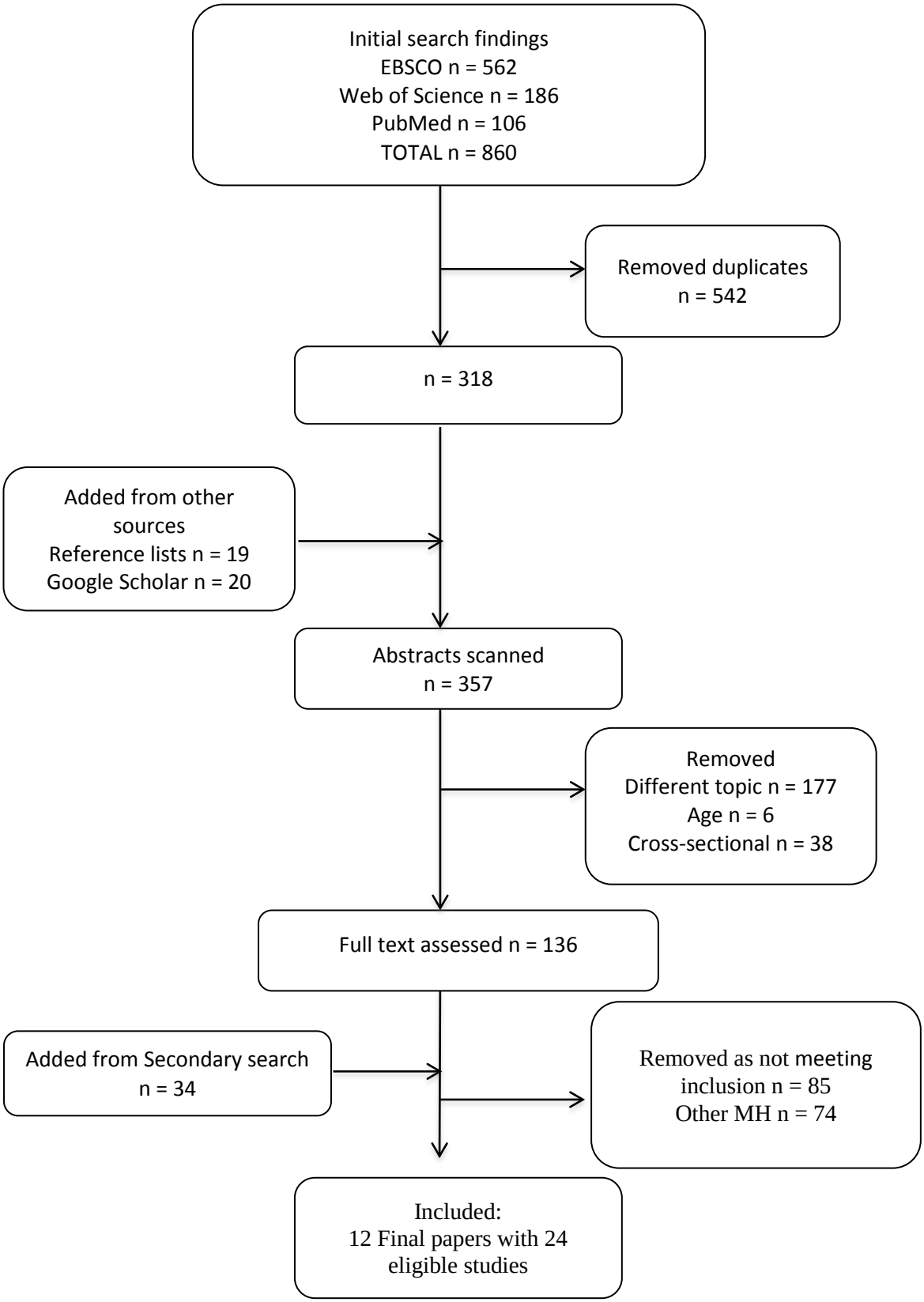


Figure 2. *Flowchart of Literature Search and Retrieval*

Table 1. *Description of Included Studies*

Reference	Design and conditions	Population & settings	Attachment measures	Mood & anxiety measures	Results
Bryant & Chan (2015)	RCT, Secure prime: nominated attachment Control: non-attachment figure	Students, Australia n = 61, Age (*M* = 20.8) Age range (not reported) Gender (F = 35, M = 26)	Experience of Close Relationships (ECR, 36-Items; Brennan, et al., 1998).	Depression, Anxiety & Stress Scale (DASS; Lovibond & Lovibond, 1995) Cortisol and salivary alpha amylase (SAA) in saliva samples.	Significant reduction in SAA levels in the securely primed group in comparison to the control group. Greater reduction in cortisol levels in the experimental group in comparison to the control group although only marginal.
Carnelley, Otway, & Rowe., (2015, 2016) Study 1 of 2	RCT Secure prime: nominated attachment Anxious prime: anxious relationship Avoidant prime: avoidant relationship Control group: supermarket shopping trip (Mikulincer & Shaver, 2001)	Students, England n = 144 Age (*M* = 20.1) Age range (18 - 50) Gender (F = 135, M = 9)	Experience of Close Relationships (ECR, 36 items; Brennan et al., 1998)	Depression & Anxiety items from Profile of Mood States (PoMS; McNair, et al., 1992)	*Depression symptoms*: Securely primed experienced significantly reduced depressive symptoms compared with those anxiously primed but no different from neutral or avoidant conditions. *Anxiety symptoms*: Lower levels of reported anxiety in the secure group when compared with the anxious and avoidant conditions but not when compared against the control group.

Reference	Design and conditions	Population & settings	Attachment measures	Mood & anxiety measures	Results
Carnelley et al., (2015, 2016) Study 2 of 2	RCT Secure prime: nominated attachment Control: supermarket shopping trip Repeated priming (Otway, Carnelley, & Rowe, 2014)	Students, England n = 81 Age (*M* = 20.3) Age range (18 - 33) Gender (F = 70, M = 11)	12 –Item Experience of Close Relationships, (ECR; Wei, et al., 2007) Information about Attachement Figures (Baldwin et al., 1996) Description of Relationships (Bartholomew & Horowitz, 1991)	Depression & Anxiety items from Profile of Mood States (PoMS; McNair et al., 1992)	*Depression*: Securely-primed reported lower levels of depression following first prime and a day after last prime thought this was not significantly different (but just above the significance line at T5). *Anxiety*: Securely primed reported lower levels of anxiety than the control group following the first prime and a day after last prime.
Norman, Lawrence, Iles, Benattayallah, & Karl (2015)	RCT Secure prime: pictures of people engaging in caring behaviours Control: 48 pictures of household items	NHS patients with PTSD, England n = 42 Students Age (*M* = not reported) Range (not reported) Gender (F = 29, M = 13)	Relationship Structures Questionnaire (RSQ; Fraley et al., 2006) State Adult Attachment Measure (SAAM; Gillath et al., 2009)	Anxiety: State Trait Anxiety Inventory (STAI-Y; Spielberger, Gorssuch, Lushene, Vagg, & Jacobs, 1983)	Participants primed securely experienced significantly lower amygdala activation than participants in the control group.

Reference	Design and conditions	Population & settings	Attachment measures	Mood & anxiety measures	Results
Luke et al., (2012) Study 3 of 3	RCT Secure prime: writing about a nominated attachment (Bartz & Lydon, 2004) Control: writing about a funny movie scene (Mikulincer & Arad, 1999)	Mixed student & public USA (59.6%) & UK (32.6%) n = 89 Age (*M* = not reported) Range (18-54) Gender (F = 53, M = 36)	Not reported	3-Item Affect scales: *content*, *happy* & *pleased* (derived from the Consensual Model of Affect; Watson & Tellegen, 1985)	No significant change in subjective ratings of positive affect identified between the experimental and control conditions.
Mikulincer & Arad (1999) Study 3 of 3	RCT Secure prime: Attachment scenario Control: Movie recently seen	Students, Israel n = 50 Age (*M* = not reported) Range (19-28) Gender (F = 31, M = 19)	Adult Attachment Style Scale (AASS; Hazan & Shaver, 1987) Information Attachment Figures (Baldwin et al., 1996)	1-Item Mood Scale 1 = *very negative*; 7 = *very positive* (Mikulincer & Arad, 1999)	Participants rated their mood as significantly better in the secure versus the control condition, regardless of their global attachment style.
Mikulincer et al., (2001) Study 1 of 5	RCT Secure attachment: nominated attachment Neutral priming: neutral story (control) Positive prime: comic story (positive)	Students, Israel n = 69 Age (*M* = not reported) Range (20-40) Gender (F = 44, M = 25)	Experience of Close Relationships, (ECR, 36 items; Brennan et al., 1998)	4-Item Mood Scales: *good*, *happy*, *bad* or *sad* (Mikulincer et al., 2001) Empathy & Personal Distress Scale: *alarmed, grieved, troubled, distressed, upset, disturbed worried and perturbed)* (Batson, Fultz, & Schoenrade, 1987)	Securely primed participants reported significantly lower anxiety levels and better mood than the control group but not in comparison to the positively primed group. When controlling for prior mood, security priming had a significant impact on reducing levels of personal distress in comparison to the neutral and positive priming.

Reference	Design and conditions	Population & settings	Attachment measures	Mood & anxiety measures	Results
Mikulincer et al., (2001) Study 2 of 5	RCT Secure prime: picture of someone being helped Positively primed: dog wearing a hat Neutrally primed: country view	Students, Israel n = 60 Age (*M* = not reported) Range (17-39) Gender (F = 31, M = 29)	Experience of Close Relationships, (ECR, 36 items; Brennan, et al., 1998)	4-Item Mood Scales: *good*, *happy*, *bad* or *sad* (Mikulincer, et al., 2001) 10-Items Personal Distress e.g. helplessness, anxiety and escapism (The Pitty Experience Questionnaire (PEQ; Florian, Mikulincer, & Hirschberger, 2000)	Secure priming had a significant impact on mood improvement, in comparison to neutral priming. Mood mediated the impact of priming on anxiety: the lower the mood, the higher the anxiety scores. When mood was controlled for, security priming had a significant impact on lowering anxiety scores, in comparison to positive and neutral priming.
Mikulincer et al., (2001) Study 3 of 5	RCT Secure prime: attachment words: *closeness*, *love*, *hug*, *support* Positive: *happiness*, *honesty*, *luck*, *success* Neutral: *office*, *table*, *boat*, *picture*	Students, Israel n = 60 Age (*M* = not reported) Range (19-36) Gender (F = 34, M = 26)	Experience of Close Relationships, (ECR, 36 items; Brennan et al., 1998)	4-Item Mood Scales: good, happy, bad or sad (Mikulincer et a., 2001) Personal Distress was rated by independent raters	Secure priming did not have a significant impact on improving mood, in comparison to positive or neutral priming. Security priming predicted significantly lower levels of distress (*anxiety*) than control or positive priming, regardless of previous mood ratings.

Reference	Design and conditions	Population & settings	Attachment measures	Mood & anxiety measures	Results
Mikulincer et al., (2001) Study 5 of 5	RCT Secure attachment priming Anxious attachment Avoidant attachment priming Scenarios: best friend or near stranger in attachment situation.	Students, Israel n = 150 Age (*M* = not reported) Range (18-27) Gender (F = 66, M = 26)	Experience of Close Relationships, (ECR, 36 items; Brennan et al., 1998) Adult Attachment Style Scale (AASS; Hazan & Shaver, 1987)	4-Item Personal Distress Measure: alarmed, worried, uneasy, distressed (Mikulincer et al., 2001)	Significantly lower levels of personal distress reported in secure versus anxious and avoidant priming groups. Higher personal distress in best friend scenario for all participants.
Mikulincer, Gillath, Sapir-Lavid, Yaakobi, Arias, Tal-Aloni, & Bor (2003) Study 1 of 3	RCT Secure prime: attachment-related personal experience Control: household task Positive prime: personal, non-attachment happy experience (Mikulincer & Shaver, 2001)	Israeli Jewish Students, Israel n = 72 Age (*M* = not reported) Range (20-38) Gender (F = 51, M = 21)	Experience of Close Relationships, (ECR-36; Brennan et al., 1998)	4-Item Personal Distress Measure: good, happy, bad and sad (Mikulincer et al., 2001)	Higher mood ratings reported by participants in the positive priming group. In comparison, neutral and securely primed participants reported lower mood ratings. There was no significant difference for mood ratings between secure and neutral groups.
Mikulincer et al., (2003) Study 2 of 3	RCT Primed: secure attachment picture Positive: dog dressed up Neutral: country view	Israeli Jewish Students, Israel n = 60 Age (*M* = not reported) Range (20-35) Gender (F = 41, M = 19)	Experience of Close Relationships, (ECR-36 Brennan et al., 1998)	4-Item Personal Distress Measure: *good*, *happy*, *bad* and *sad* (Mikulincer, et al., 2001)	Securely and positively primed participants reported higher mood ratings in comparison to participants in the neutral condition.

Reference	Design and conditions	Population & settings	Attachment measures	Mood & anxiety measures	Results
Mikulincer et al., (2003) Study 3 of 3	RCT Secure prime: attachment related personal experience Positive prime: personal, non-attachment happy experience Neutral: household task	Israeli Jewish Students, Israel n = 66 Age (*M* = not reported) Range (19-40) Gender (F = 41, M = 25)	Experience of Close Relationships, (ECR- 36; Brennan et al., 1998)	4-Item Personal Distress Measure *good*, *happy*, *bad* and *sad* (Mikulincer et al., 2001)	Positive priming had a significant impact on mood whereas secure priming or neutral priming did not. Secure priming led to a more positive mood than neutral priming but not significantly different.
Mikulincer & Shaver (2001) Study 2 of 5	RCT Secure prime: attachment related imagined experience Positive prime: winning the lottery scenario Neutral prime: shopping in a supermarket	Students, Israel n = 120 Age (*M* = not reported) Range (18-32) Gender (F = 74, M = 46)	Adult Attachment Style Scale (AASS; Hazan & Shaver, 1987)	6-Item Mood Measure: *happy*, *good*, *calm*, *sad*, *depressed* and *anxious* (Mikulincer & Shaver, 2001)	Significant positive impact of secure and positive primes in comparison to neutral prime.
Mikulincer & Shaver (2001) Study 3 of 5	RCT Secure prime: attachment related imagined experience Positive prime: happy person scenario Neutral prime: scenario with casual acquaintance	Students, Israel n = 80 Age (*M* = not reported) Range (19-28) Gender (F = 46, M = 34)	Information about Attachment Figures (Baldwin et al., 1996)	6-Item Mood Measure: *happy*, *good*, *calm*, *sad*, *depressed* and *anxious* (Mikulincer & Shaver, 2001)	Positive prime had a significant impact on positive mood in comparison to secure and neutral conditions, which were not significantly different. Mood was not correlated with threat appraisal.

Reference	Design and conditions	Population & settings	Attachment measures	Mood & anxiety measures	Results
Mikulincer & Shaver (2001) Study 4 of 5	RCT Secure prime: Attachment-related words Control: Neutral words	Heterosexual Students, Israel n = 120 Age (*M* = not reported) Range (18-32) Gender (F = 74, M = 46)	Adult Attachment Style Scale (AASS; Hazan & Shaver, 1987)	6-Item Mood Measure: *happy*, *good*, *calm*, *sad*, *depressed* and *anxious* (Mikulincer & Shaver, 2001)	Participants in the secure prime conditions reported significantly better mood ratings than those in the neutral condition.
Mikulincer & Shaver (2001) Study 5 of 5	RCT Secure prime: attachment related imagined experience Neutral: supermarket shopping	Jewish Students, Israel n = 120 Age (*M* = not reported) Range (19-34) Gender (F = 77, M = 43)	Adult Attachment Style Scale (AASS; Hazan & Shaver, 1987)	6-Item Mood Measure: happy, good, calm, sad, depressed and anxious (Mikulincer & Shaver, 2001)	Attachment priming had a significant impact on positive mood ratings in comparison to the control prime.
Pierce & Lydon (1998) Study 1 of 2	RCT Securely primed: attachment related words (*caring*, *helpful*, *supportive*, *accepting*, loving) Negatively primed: negative interpersonal words (*critical*, *rejecting*, *nagging*, *hurtful*, *distant*) Control group: random consonants	Students, Canada n = 51 (out of 60 initially) Age (*M* = 19.2) Range (17-28) Gender (F = 51, M = 0)	Adult Attachment Scale (Collins & Read, 1990)	16-Item Affect Balance Scale: Positive (*pleased*, *contented*, *glad* & *delighted*); negative (*anxiety* (*nervous*, *tense*, & *anxious*); guilt (*regretful*, *guilty*, *ashamed*) ; depression (*sad*, *unhappy*, *worthless*, *hopeless*) & hostility (*angry* & *resentful*) (Derogatis, 1975)	Significant impact of secure prime on mood in comparison to the negative prime. However, no significant difference was found between prime and control group.

Reference	Design and conditions	Population & settings	Attachment measures	Mood & anxiety measures	Results
Pierce & Lydon (1998) Study 2 of 2	RCT Primed secure attachment: attachment related words (*caring*, *helpful*, *supportive*, accepting, loving) Negative: negative interpersonal words (*critical*, *rejecting*, *nagging*, *hurtful*, *distant*) Control: consonants	Students, Canada n = 80 (from 107) Age (*M* = 19.3) Range (17-28) Gender (F = 80, M = 0)	Adult Attachment Scale (Collins & Read, 1990)	16-Item Affect Balance Scale: Positive (*pleased*, *contented*, *glad* & *delighted*); negative (*anxiety* (*nervous*, *tense*, & *anxious*); guilt (*regretful*, *guilty*, *ashamed*) ; depression (*sad*, *unhappy*, *worthless*, *hopeless*) & hostility (*angry* & *resentful*) (Derogatis, 1975)	Attachment priming on mood did not yield any significant differences between the positive, negative and control conditions.
Rowe & Carnelley (2003)	RCT Secure priming: attachment figure Avoidant style prime: avoidant attachment Anxious style prime: anxious relationship	Students, England n = 160 (dropped to 133 at T2) Age (*M* = 20.5) Range (17-42) Gender (F = 121, M = 39)	Experience of Close Relationships, ECR-36; Brennan et al., 1998) Information about Attachment Figures (Baldwin et al., 1996) Adult Attachment Style Scale (AASS; Hazan & Shaver, 1987)	6-Item Scale: positive items (*good*, *relaxed*, *warm*) and negative items (*bad*, *anxious* & *cold*).	Significant higher ratings on positive items and significantly lower ratings on negative items in secure priming condition versus anxiety or avoidance primes. No difference between anxiety and avoidance priming in regards to the positive or negative items.

Reference	Design and conditions	Population & settings	Attachment measures	Mood & anxiety measures	Results
Selcuk, et al., (2012) Study 1 of 3	RCT Secure prime: visualise mother Control: visualise a non-attachment figure	Students, USA n = 123 Age (*M* = 20) Range (not reported)Gender (F = 105, M = 18)	Adult Attachment Patterns, Hebrew (ECR-R, 10 items; Fraley, et al., 2000, revised by Zayas, Mischel, Schoda, & Aber, 2011)	1-Item Positive Affect and 1-Item Negative Affect Scale (Selcuk, et al., 2012)	Explicit mood ratings were more positive for secure than control group but only when prime was presented after threat, not before. No significant difference was found when the prime was presented prior to the threat.
Selcuk et al., (2012) Study 2 of 3	RCT Secure prime: picture of own mother Control: picture of acquaintance	Students, USA n = 139 Age (*M* = 20) Range (not reported) Gender (F = 105, M = 34)	Adult Attachment Patterns, Hebrew (ECR-R, 10 items; Fraley et al., 2000, revised by Zayas, et al., 2011)	1-Item Positive Affect and 1-Item Negative Affect Scale (Selcuk et al., 2012) Implicit Positive & Negative Affect Test items: *distressed*, *anxious*, *threatened*, *upset*, *secure*, *relaxed* & *calm*) (IPANAT; Quirin, Kazen, & Kuhl, 2009)	Explicit and Implicit mood ratings were more positive for secure versus control participants in the *recovery* but not for in the buffering setting.

Reference	Design and conditions	Population & settings	Attachment measures	Mood & anxiety measures	Results
Selcuk et al., (2012) Study 3 of 3	RCT Secure priming = own partner Control = picture of someone else's partner	Couples, USA n = 57 Age (*M* = 21) Range (not reported) Gender (F = not reported, M = not reported)	Adult Attachment Patterns Hebrew (ECR-R, 10 items; Fraley et al., 2000, revised by Zayas, et al., 2011)	1-Item Positive Affect and 1-Item Negative Affect Scale (Selcuk, et al., 2012) Implicit Positive & Negative Affect Test items: *distressed*, *anxious*, *threatened*, *upset*, *secure*, *relaxed* & *calm*) (IPANAT; Quirin, et al., 2009)	Significantly better explicit mood ratings in secure condition than control but no significant difference between secure and control for implicit ratings of mood. Female participants reported more positive mood following priming than males overall.
Wilkinson, Rowe, & Heath (2012)	RCT Anxious primed Securely primed	Students, England n = 21 Age (*M* = 21.2) Range (not reported) Gender (F = 21, M = 0)	Experience of Close Relationships (ECR- 36; Brennan et al., 1998) Information about Attachment Figures (Baldwin et al., 1996)	Mood, Alertness, & Physical Sensations Scale: *anxiety*, *cheerfulness*, *depression*, *misery*, *relaxation* and *stress* (MAPSS; Rogers, Hohoff, Heatherley, Mullings, Maxfield, Evershed, & Nutt, 2010)	There were no significant mood differences between attachment anxiety and security priming on mood.

Table 2. *Additional Priming Details from Included Studies*

Reference	Priming Method	Subliminal/ Supraliminal	Online or Face-to-face	Single/ Repeated Priming	Neutral/ Perceived Threat	Details Threat
Bryant & Chan (2015)	Imagine attachment / non-attachment figure	Supraliminal	Lab	Single Time = 60s	Threat (to self)	Being socially evaluated whilst completing a task
Carnelley et al., (2015, 2016) Study 1 of 2	Visualise and write about attachment figures (Bartz & Lydon, 2004)	Supraliminal	Online & Lab	Single Time = 10m	Neutral	N/A
Carnelley et al., (2015, 2016) Study 2 of 2	Visualise and write about attachment (Bartz & Lydon, 2004) Neutral primes (control group; Rowe & Carnelley, 2003) Attachment primed over 3 day; attachment primes (Otway et al., Rowe, 2014)	Supraliminal	Online, Lab & At home	Repeated Time 1 = 10m Time repeated = 3m	Neutral	N/A
Norman et al., 2015	Images of caring individuals or images of household items.	Subliminal	Lab MRI Scanner	Single	Threat (to self)	Images of angry faces
Luke et al., (2012) Study 3 of 3	Visualise and write about attachment figure or funny movie scene for control	Supraliminal	Lab	Single Time = 5-10m	Neutral	N/A
Mikulincer & Arad (1999) Study 3 of 3	Imagine and write down an attachment scenario (Baldwin et al., 1996)	Supraliminal	Lab	Single Time = not reported	Threat (to self)	Imagining self in a situation of personal need where others are caring and helpful.

Reference	Priming Method	Subliminal/ Supraliminal	Online or Face-to-face	Single/ Repeated Priming	Neutral/ Perceived Threat	Details Threat
Mikulincer et al., (2001) Study 1 of 5	Reading a story about attachment security (Mikulincer & Shaver, 2001)	Supraliminal	Lab	Single Time = 10s	Mixed Mood: Neutral Personal distress/ Anxiety: Threat (to others)	Reading a story about a student who had lost their parents in a car accident.
Mikulincer et al., (2001) Study 2 of 5	Pictures representing attachment (Mikulincer et al., 2001)	Supraliminal	Lab	Single Time not reported	Mood: neutral Personal distress/ Anxiety: Threat (to others)	Reading a story about same sex person suffering from disability.
Mikulincer et al., (2001) Study 3 of 5	Presentation of a prime word (Pierce & Lydon, 1998)	Subliminal	Lab	Single Time = 20" x 50 times	Mood: neutral Personal distress /Anxiety = Threat (to others)	Recalling a situation when someone else was in need of help.
Mikulincer et al., (2001) Study 5 of 5	Imagining attachment scenario (secure, avoidant or anxiety priming) (Hazan & Shaver, 1987)	Supraliminal	Lab	Single Time = 2 min	Mood: Neutral Personal Distress/ Anxiety = Threat	Visualise best friend or near stranger in distress
Mikulincer et al., (2003) Study 1 of 3	Describe and write about an attachment related personal experience (Mikulincer & Arad, 1999)	Supraliminal	Lab	Single Time = 2-3m	Neutral	N/A
Mikulincer et al., (2003) Study 2 of 3	Picture of an attachment scenario (Mikulincer et al., 2001)	Supraliminal	Lab	Single Time= 2-3 m	Neutral	N/A

Reference	Priming Method	Subliminal/ Supraliminal	Online or Face-to-face	Single/ Repeated Priming	Neutral/ Perceived Threat	Details Threat
Mikulincer et al., (2003) Study 3 of 3	Describe and write about an attachment related personal experience (Mikulincer & Arad, 1999)	Supraliminal	Lab	Single Time = 2-3m	Neutral	N/A
Mikulincer & Shaver (2001) Study 2 of 5	Describe and write about an attachment related personal experience (Mikulincer & Arad, 1999)	Supraliminal	Lab	Single Time = 2m	Threat (to self)	Distressing memory
Mikulincer & Shaver (2001) Study 3 of 5	Imagine and write down an attachment scenario (Baldwin et al., 1996)	Supraliminal	Lab	Single Time = 2m	Threat (to others)	Distressing memory
Mikulincer & Shaver (2001) Study 4 of 5	Lexical decision tasks and attachment-related words (Arndt, Schimel, Greenberg, & Pyszczynski, 2002)	Subliminal	Lab	Single Time = 5s x 15 times	Threat (to self)	Being evaluated
Mikulincer & Shaver (2001) Study 5 of 5	Describe and write about an attachment related personal experience (Mikulincer & Arad, 1999)		Lab	Single	Threat (to self)	Distressing memory
Pierce & Lydon (1998) Study 1 of 2	Lexical decision tasks, attachment-related words, negative interpersonal related words or consonants (Baldwin, 1994)	Subliminal	Lab	Single Time = 33ms x 100 times per each of 5 words	Treat (to self)	Imagining an unplanned pregnancy

Reference	Priming Method	Subliminal/ Supraliminal	Online or Face-to-face	Single/ Repeated Priming	Neutral/ Perceived Threat	Details Threat
Pierce & Lydon (1998) Study 2 of 2	Lexical decision tasks, attachment-related words, negative interpersonal related words or consonants (Baldwin, 1994)	Subliminal	Lab	Single Time = 33ms x 100 times per each of 5 words	Neutral	N/A
Rowe & Carnelley (2003)	Visualise and write about attachment, avoidant or anxious relationship (Pendry & McRae, 1996)	Supraliminal	Lab	Single	Neutral	N/A
Selcuk al., (2012) Study 1 of 3	Visualise mother or non-attachment figure (developed by authors)	Supraliminal	Lab	Single Time = 20s	Threat (to self)	Upsetting autobiographical memory
Selcuk, et al., (2012) Study 2 of 3	Exposed to picture of mother in secure condition (developed by authors)	Supraliminal	Lab	Single Time = 90s	Threat (to self)	Upsetting autobiographical memory
Selcuk et al., (2012) Study 3 of 3	Exposed to picture of romantic partner (developed by authors)	Supraliminal	Lab	Single Time = 90s	Threat (to self)	Upsetting autobiographical memory
Wilkinson et al., (2012)	Visualise and write about secure or anxious attachment (Bartz & Lydon, 2004 (experiment condition)	Supraliminal	Lab	Single Time – 10m	Neutral	N/A

1.4 Results

Results are presented in a tabular and narrative form (Tables 1 & 2). For the purpose of this review, included studies will be discussed according to the dependent measure: positive and negative mood (*N* = 11 studies), depression (*N* = 2 studies), anxiety (*N* = 8 studies) or mood, anxiety and depression (*N* = 5).

1.4.1 Positive versus Negative Mood

Mikulincer and Arad (1999) found security attachment priming to have a significant impact on improving mood, when compared to neutral priming. In the last of three studies[2], the authors investigated the impact of attachment priming on *cognitive openness* primarily, and on *mood* secondarily. During the priming experiment, those securely primed had to imagine themselves in a hypothetical situation of personal need during which other people would provide the needed support. In contrast, participants in the control group pictured themselves as the protagonists of a movie recently seen. Results illustrated a significant impact of attachment priming on subjective mood ratings, with participants in the secure condition reporting more positive mood ratings (*1-item mood scale*) than the neutrally primed. Notably, the priming effect on mood was not impacted by the effect of participants' attachment style, indicating that the effect of global attachment dimensions can be temporarily altered through attachment priming. However, it is not clear if the improvement in mood resulted from the positive nature of the attachment priming or the affect regulation impact of attachment priming as there was no group testing the impact of positive affect priming on mood. A further limitation relates to the mood rating as participants rated their affect using a 1-item mood scale instead of a more established mood measure. Similar to the studies described before, the felt security was not measured.

Rowe and Carnelley (2003) looked at the impact of secure relationship priming on affect, recall and expectations of others. On this occasion, participants were randomly allocated to three different priming conditions: secure, anxious or avoidant attachment priming. Depending on their prime, participants had to visualise and write about a secure, avoidant or an anxious attachment relationship. Results indicated a significant impact of secure priming on mood versus anxiety or avoidance priming, with the securely primed participants reporting both higher ratings on positive mood items and lower ratings on negative items than those primed with anxious or avoidant

[2] Studies 1 and 2 from Mikulincer and Arad (1999) were not included in this review as they did not meet inclusion criteria.

attachment styles. There was no significant difference between the ratings on mood for anxious or avoidant-primed participants. The main limitation of this study is related to not having had a control group in order to assess the differences between neutral and secure priming. Furthermore, the improvement in mood is expected as it is likely that priming anxiety and avoidance relationship will negatively affect one's mood.

The third study exploring the impact of secure attachment priming on mood deals with this limitation (Mikulincer et al., 2003). In a succession of three experiments exploring the impact of supraliminal secure priming on mood, undergraduate students were randomly allocated to one of three conditions: secure attachment priming, neutral priming and positive affect priming. In Studies 1 and 3, securely primed participants had to describe and write about an attachment related experience. Positively primed participants in Study 1 had to write about a funny experience, whereas positively primed participants from Study 3 had to write about a non-personal funny memory. In both studies, the neutrally primed groups described a household task. Results for Study 1 and 2 found positive priming to have a significant impact on improving mood, in comparison to secure and neutral priming. There was no mood difference identified between secure and neutral priming. Unfortunately, the authors did not assess the sense of felt security in participants. It is not known that the positive prime had positive impact on inducing a sense of felt security. However, as in Study 3 participants in the positive priming group imagined a non-personal funny experience, it is possible that the mood improvement only resulted form the positive prime rather than from activating the attachment system.

In their second study, the authors (Mikulincer et al., 2003) used pictorial representation primes. Securely primed participants were exposed to a picture representing attachment figures, whereas the positive and neutral groups were exposed to either a positive (*dog dressed up)* or a neutral picture (*countryside)*, respectively. Results indicated that both secure and positive priming had a positive impact on improving mood in comparison to neutral priming. It may be possible that when compared with positive priming, attachment priming may work in a similar way, by inducing a sense of wellbeing. On the other hand, it may be possible that seeing a picture of a dog dressed up may have an attachment activating effect, as many happy memories may involve pets, inducing a sense of felt security in both the secure and positive priming groups. Similarly to the studies above, felt security was not assessed. A second limitation of this study is the student sample, which may have an impact on generalising these findings. In summary, three studies compared the impact of secure, positive and neutral priming on mood. Based on this evidence, visualising a positive experience may have a greater impact on mood than visualising an attachment figure or engaging in a neutral task. Although in study 2 visualising an attachment figure was more

effective at improving mood, it is not possible to identify the mechanisms of change as participants did not complete felt security measured post prime.

In a series of studies, Selcuk et al., (2012) investigated the impact of activating a secure mental representation against coping with a personally upsetting event, such as reliving an upsetting autobiographical memory. The authors (Selcuk et al., 2012) hypothesized that attachment security priming has a *buffering effect* or a protective effect on positive mood, where the impact of a negative event is somewhat neutralised. It was also hypothesised that attachment security priming has a *recovery effect* on affect, when used after the negative event has occurred. In other words, the authors propose that priming attachment security prior to a negative event would reduce the impact of this event on mood but it would also improve *recovery* when priming takes place after the negative events has taken place. Priming involved visualisation tasks. In Study 1, participants were securely primed by visualizing their mother or a secure attachment figure, whereas the control group visualised an acquaintance for 10 minutes. Participants were primed either before or after recalling an upsetting memory. Mood was measured explicitly, with participants self-rating their affect on two items (*positive* and *negative)*. Results showed that participants in the secure attachment group experienced greater mood improvement following the upsetting event exposure than the participants in the control group, supporting the *recovery* aspect of attachment priming. However, when priming happened before the upsetting exposure, secure attachment priming had no impact on affect regulation, as there was no difference in affect (*explicit* or *implicit*) between the two groups, illustrating no support for the *buffering* hypothesis.

In Study 2 the prime was a picture of the participant's mother in the secure attachment condition or a picture of another participant's mother in the control group (Selcuk et al., 2012). Affect was measured both explicitly, with participants rating their mood on two scales (*positive* and *negative*) but also implicitly, where participants had to rate different words on how well they represented different mood states (Quirin et al., 2009). Priming occurred again either before or after the exposure to an upsetting memory. Similarly, to Study 1, participants in the secure priming condition showed less distress than those in the control group in the *recovery* stage but not for the *buffering* condition (although not significant, results were in the right direction), regardless if the mood was measured implicitly or explicitly. Results showed the benefits of secure attachment priming in affect regulation but only when priming happened after the upsetting event. This study illustrated how using a picture of an attachment figure can be as effective as consciously visualising a secure relationship.

In Study 3, the participants were 30 couples (Selcuk et al., 2012). Participants were primed with either a picture of their partner (secure attachment priming group) or a picture

of someone else's partner (control group). Affect was measured both explicitly and implicitly as in Study 2 and priming took place before or after the exposure to the upsetting memory. Participants in the secure attachment priming condition reported lower ratings of negative affect in comparison to participants in the control group, but only for the explicit affect ratings (*1-item positive* and *1 –item negative affect scale*), not for the implicit ratings. In this experiment, gender differences were found, with females benefiting more from the attachment priming than males. This could have been linked to the fact that women have been found to be more sensitive to faces then men (McBain, Norton, & Chen, 2009). In addition to the gender analysis, the researchers also explored the occurrence of affect related words in both groups and found that the securely primed participants reported significantly fewer negative affect-related words than those in the control group. Unfortunately, in this series of studies the sense of felt security was not measured and there was no positive priming condition to compare with secure attachment. In summary, these six studies appear to indicate that secure priming is an effective tool at improving mood especially when participants have been exposed to a personal threat regardless of the type of prime. Most studies used a *recovery* design, as participants are primed following their exposure to a potentially personal threat, rather than being exposed before. However, these results have to be interpreted with caution as there was no positive priming condition to compare against and the sense of felt security was not measured for any of the studies discussed, which appears to be a major limitation of all of the studies discussed so far.

Luke et al. (2012) conducted the only study where secure priming was compared against positive affect priming without including a neutral prime group (Study 3 of 3[3]). The authors used a mixed sample of students and members of the public who visualised and wrote about a secure attachment figure in the (secure priming, similar to Studies 1 and 3 from Mikulincer et al., 2003), or a recent movie in the control group (positive affect). Although the study explored the impact on *felt energy and exploration,* mood was also measured with participants completing a brief 3-item positive affect scale looking at feeling *content, happy* and *pleased* (Watson & Tellegen, 1985). Results failed to find differences in reported positive affect between the two conditions, with both the participants in the secure prime and positive affect prime groups experiencing similar mood following priming. This is the first study where the sense of felt security was measured. Results showed that despite no significant differences in mood ratings, participants primed securely reported higher felt security than participants in the positive priming group showing that attachment priming

[3] Studies 1 and 2 from Luke et al., 2012 were not included in this review due to not meeting the inclusion criteria.

had a positive impact on the sense of felt security whereas the positive priming did not. This may explain the reason why in the previous studies, participants primed positively experienced similar mood improvements to those primed securely.

Overall, the findings related to secure attachment priming and impact on positive and negative affect are mixed. Mikulincer and Arad (1999) and Rowe and Carnelley (2003) found participants in the secure express higher positive affect than participants in the control group. Mikulincer et al. (2003) found mixed evidence as secure attachment priming proved an effective tool in improving mood in Study 2 but not for Studies 1 and 3, where there was no significant difference between mood ratings between neutral and control groups. Positive priming appears to have supported mood improvement more than secure attachment priming. In their three studies, Selcuk et al. (2012, Studies 1 and 2) found strong evidence for secure attachment priming impact on improving positive affect and reducing negative affect during threat when this was conducted as a *recovery* tool. In Study 3, Selcuk et al. (2012) found secure attachment priming to help improve positive affect in the priming condition versus the control group with some gender differences, with females more likely to report positive ratings on mood than males. Luke et al., (2012) found attachment priming to be an effective tool in improving feelings of security but not on improving positive affect.

The main limitations that need to be considered are related to: 1) type of priming conditions, as many studies did not include a neutral and positive priming group ((Mikulincer & Arad, 1999; Rowe & Carnelley, 2003; Luke et al., 2012); 2) mood measure, with some studies using measures less well-established (Mikulincer & Arad, 1999) and 3) for many studies, the sense of *felt security* was not measured, making it difficult to assess if the priming was effective on inducing a sense of *security* rather than improving mood (Selcuk et al., 2012). Some of the strengths of current studies include comparisons between *implicit* vs *explicit* mood ratings and measuring impact of priming as a *buffer* versus *recovery* tool (Selcuk et al., 2012).

1.4.2 Depression

The existing literature on secure attachment priming and depressive symptoms is limited, with only two studies exploring this. In two separate experiments, Carnelley et al., (2015, 2016) explored the effects of secure attachment on depressive symptoms in a sample of British students. In their first experiment, 144 participants were primed with a secure, anxious or an avoidant attachment style, during a 10-minute task (Bartz & Lydon, 2004). All participants visualised and wrote about a nominated attachment figure for the secure condition, an anxious relationship or an avoidant relationship respectively in a priming task also used by Rowe and

Carnelley (2003). This time, a control group was also included. For the control group, participants visualised and wrote about a supermarket trip. For depression, results indicated that participants in the secure attachment group experienced the lowest reported levels of symptoms of depression, in comparison to the participants in the anxiety priming groups but not in comparison to the avoidance-priming group. However, the study did not show a statistically significant difference between secure, neutral and avoidant priming conditions. Interesting, a follow up linguistic analysis of participants' written texts illustrated that those in the neutral condition wrote about supermarket trips with family and friends and it is possible that this could have had a positive impact on their mood. In addition, text analysis also showed that secure attachment priming also triggered negative as well as positive emotions. As predicted, felt security was rated higher in the securely primed participants, showing that secure priming did have a positive impact on the sense of felt security in comparison to the all other priming conditions. This study shows that although secure priming impacts on the sense of felt security, this may not be illustrated by mood improvement as it seems that activating a sense of felt security may also trigger negative, not only positive emotions.

The authors used a novel priming methodology in Study 2 (Carnelley et al., 2015, 2016) as participants were primed repeatedly. Participants who were randomly allocated to either secure attachment priming or neutral priming engaged in a 10-minute secure or neutral priming task, similar to Study 1 (Bartz & Lydon, 2014). All participants were then primed repeatedly over 3-consecutive days with shorter primes related to their condition (*secure* or *neutral*) (Otway, et al., 2014). Securely primed participants reported lower depressed mood than the neutral group, though this difference did not reach statistical significance. The effect of the initial prime held across the time with similar results a day after the last prime. Interestingly, the difference became more pronounced over time towards the predicted direction. The novel priming technology was a strength of this study and it would have been useful to see if the priming effects maintained or became significant at a future follow-up, such as a week later. Had the priming continued, it might have become significant.

In summary, the two studies that investigated the impact of attachment priming on depression illustrate that secure attachment priming is effective at reducing symptoms of depression in comparison with anxiety priming, though the differences between avoidance, neutral and secure priming were not significant (Study 1). In Study 2, Carnelley et al. found secure attachment priming to reduce symptoms of depression across a number of days even if the differences between control and secure priming groups were not significant. The main limitations of these studies relates to authors not having included a positive priming group. The strengths of

these experiments include using a repeated priming technology as well as measuring the sense of *felt security*.

1.4.3 Anxiety

1.4.3.1 Physiological symptoms

Bryant and Chan (2015) explored the impact of secure attachment priming on stress symptoms[4] by measuring the physiological changes in response to priming. Following a test where participants had to hold their hand in cold water whilst being observed (the observation was intended to increase anxiety levels), participants visualized a nominated attachment or non-attachment figure for 60 seconds, depending on their allocation to the secure attachment priming or to the control group. In this study, in comparison to the previous ones, the priming tasks were focused on visualisation. Stress reduction was measured by changes in cortisol and salivary alpha amylase (SAA) levels[5]. Results show that attachment security primed participants experienced a significant reduction in SAA, in comparison to the control group, supporting one of the initial hypotheses. There was also a reduction in cortisol levels for the attachment primed group, thought this was not significant. Participated rated their anxiety prior to priming but not afterwards (DASS; Lovibond & Lovibond, 1995). This is a limitation of this study as it would have been of interest to see if the physiological and psychological anxiety measures correlated. In addition to this, the study is also limited as there was no positive priming group, the felt security was not measured in participants and the sample was made of students only.

1.4.3.2 Neurological symptoms

Some also explored the impact of secure attachment priming on reducing the brain's neural activation to threat stimuli (Norman et al., 2015). Forty-two student participants were randomly allocated to either secure attachment or neutral priming groups. Whilst in a functional magnetic resonance imagining scanner (fMRI), participants were initially primed by completing a picture orientation task, where they were subliminally primed with either pictures of caring individuals for the secure prime or pictures or images of household objects for the neutral prime. Following from priming, all participants were exposed to threat during two different tasks: a dot probe task involving exposure to neutral or threat words or a picture viewing task, involving images of angry or fearful faces. Priming happened before

[4] As previously mentioned, anxiety also refers to other concepts such as stress, worry and fear.
[5] Research has identified SAA and cortisol levels as significantly higher in social anxiety (Payne, Hibel, Granger, Tsao, & Zeltzer, 2014).

each of the threat tasks. It was predicted that security-primed participants would show lower neural amygdala activation than the control group, following exposure to threatening stimuli. Indeed, Norman et al. (2015) found that participants who had been securely primed showed lower amygdala activation to both threatening words and threatening faces, in comparison to the control group. These findings illustrate the neural mechanisms behind the process of secure attachment activation during stressful events. Similar to the study described earlier (Bryan & Chan, 2015), participants only completed the SAA measure only prior to priming, and not after, a major limitation to this research. In addition, the sense of felt security was not measured following priming.

1.4.3.3 Self-reported symptoms

Attachment priming impact on anxiety symptoms was also explored in two studies described earlier (Carnelley et al., 2015, 2016). In Study 1, the authors measured anxiety symptoms in a sample of students following secure, anxious, avoidant attachment priming and neutral priming (Bartz & Lydon, 2014) . Participants completed the PoMS anxiety-related items (PoMS; McNair et al., 1992). Results indicated that secure attachment priming had a significant impact on reducing anxiety symptoms in comparison to the avoidant and anxious primes. Participants in the anxious and avoidant prime groups scored higher anxiety ratings in comparison to the securely primed group. However, there was no difference in subjective ratings of anxiety symptoms between the securely primed and the control group, which could be explained by the linguistic analysis of the text written by participants, where there was no difference in relationship words between these conditions, indicating that the prime condition may have had a secure priming effect on participants.

Their second experiment also described earlier, compared the impact of secure attachment priming or neutral priming on anxiety (Carnelley et al., 2015, 2016, Study 2). Again participants engaged in an initial secure or neutral priming task over 10 minutes after which they were repeatedly primed over the next three days. As predicted, security-primed participants reported significantly lower levels of anxiety following the initial priming as well as a day after the last prime, in comparison to the neutrally primed group. It is interesting to note that this difference became more pronounced over time towards the predicted direction. According to their findings, security priming appears to be more effective with symptoms of anxiety rather than depression. However, it is possible that the sample of participants (all students) may have been more likely to suffer from symptoms of stress, possibly related to exams or coursework, which may have made the priming more helpful. Unfortunately, the study did not include a positive priming condition.

Mikulincer et al., (2001) conducted a series of studies exploring the impact of attachment priming on personal distress (*anxiety*). In Study 1, 69 Israeli students were allocated to one of three conditions: secure attachment priming, positive affect priming and neutral priming. Participants either read a secure attachment-inducing script, a positive affect story or a neutral script (Mikulincer & Shaver, 2001). Following the supraliminal priming, participants read a distressing story and were asked to rate the experienced personal distress (*alarmed, grieved, troubled, distressed, upset, disturbed, worried* and *perturbed*) (Batson, Fultz, & Schoenrade, 1987). Prior mood was also measured and included as a potential covariate. Results show that attachment security priming and positive priming are as effective at reducing symptoms in comparison to the neutral prime when mood was not accounted for. When controlling for prior mood, only secure attachment priming had made a significant impact on reducing the personal distress, illustrating the mediating role of mood on positive affect priming, but not on security priming. These findings show that secure attachment priming helps affect regulation in the face of perceived threat or stress whereas positive priming does not have the same effect. However, this study did not measure the sense of felt security.

In Study 2, Mikulincer et al., (2001) primed 60 undergraduates who were exposed to a pictorial representation of secure attachment, positive affect prime or a neutral picture respectively. Secure and positive priming had a similar positive impact on distress levels. However, when the mood was controlled for, only secure attachment priming had a significant impact on reducing levels of personal distress in participants, in comparison to the positive and neutral primes. The study was very interesting in exploring the links between mood and anxiety symptoms. A potential limitation of this study is related to the threat task. The story that participants read was hypothetical and not directly related to participants, which may have impacted on the levels of personal distress experience. Had the threatening scenario been related to a personal event, the levels of personal distress might have been higher. This limits the ecological validity of this study. Furthermore, the felt security was not measured post prime.

If Studies 1 and 2 used supraliminal priming, in Study 3 the authors subliminally primed participants who were randomly allocated to a secure attachment-priming group, a positive priming group or a neutral priming condition (Mikulincer et al., 2001). Similarly to Study 1 from Pierce and Lydon (1998), the primes were secure attachment related words, positive or neutral words, depending on the group. Participants self-rated their mood before writing about a personal distressing memory. Individual raters who read the described distressing memory rated participants' levels of anxiety. Unlike Study 1, results did not show any differences in the initial affect ratings between the three conditions. On the other hand,

contrary to Study 1, personal distress (*anxiety*) ratings were significantly lower in the secure attachment priming condition, in comparison to the positive or neutral priming groups. Therefore, this relationship was no longer mediated by mood. Irrespective of mood ratings, securely primed rated less personal anxiety than the other two conditions, showing that introducing an element of personal threat mediates the impact of prior mood on personal distress. It is important to be mindful that the personal distress was rated by some of the researchers in the study, which increases the chances of bias.

In Study 5[6], 150 undergraduates randomly allocated three supraliminal attachment-priming conditions (*secure attachment priming, anxious attachment priming* and *avoidant attachment priming*) were exposed to either a best friend threat or near-stranger threat scenario visualisations (Mikulincer et al., 2001). This time the study only measured personal distress (*anxiety*). From each group, half of participants engaged in a *best friend* visualisation scenario whereas the other half engaged in a *near-stranger* visualisation. Overall, results show that those primed with a secure attachment reported significantly less personal distress than participants from the avoidant or the anxious priming groups. Furthermore, anxious attachment priming led to significantly more distress than avoidant attachment priming. Self-rated personal distress levels were significantly higher in the best-friend scenario than in the stranger visualization, regardless the priming group, illustrating the personal distress was higher for all participants in the best-friend scenario than the near-stranger scenario. This study illustrates the benefits of secure attachment priming on personal distress but it also indicates that personally relevant threats are more likely to activate the attachment system, leading to initially higher ratings of distress in participants. However, there was no neutral control group to test these differences against.

The evidence base for the impact of secure attachment priming and anxiety symptoms appears to be stronger than the evidence for attachment priming and depressive symptoms. Eight studies were included in this section. Interestingly, some supporting evidence illustrates that secure attachment priming has a positive impact on reducing physical (Bryan & Chan, 2015), neural (Norman et al., 2015) as well as self-reported symptoms of anxiety (Carnelley et al., 2015, 2016, Study 2; Mikulincer et al., 2001), in comparison to control priming. Mixed evidence came from on of the studies, which found reduced anxiety following secure attachment priming in comparison to anxious and avoidant priming but not when compared to neutral priming (Carnelley et al., Study 1).

[6] The 4th study from this series (Mikulincer et al., 2001) was not included as it did not meet the inclusion criteria

A number of limitations apply to these studies, including: 1) not using anxiety self-reports alongside physiological measures (Bryant & Chan, 2015; Norman et al., 2015); 2) not including a positive priming condition (Bryant & Chan, 2015; Carnelley et al., 2015) or 3) omitting to include a measure for the sense of felt security (Norman et al., 2015). The strengths identified in these studies: 1) the novel ways of measuring priming impact, such as physiological (Bryant & Chan, 2015) and neurological (Norman et al., 2015); 2) the methodology, such as using repeated priming (Carnelley et al., 2015) and 3) comparing between priming in different conditions such as *neutral* versus *threat* (Mikulincer et al., 2001).

1.4.4 Mood, Depression and Anxiety

Seven studies investigated the impact of secure attachment priming on both anxiety and affect. These studies use mixed measures that do not differentiate between mood, depression and/or anxiety.

Pierce and Lydon (1998) conducted two of the earliest studies on attachment priming and its impact on mood and anxiety. In their first study, 51 Canadian female students were randomly allocated to three experimental conditions. All participants were exposed to a potentially personally upsetting scenario before being subliminally primed with positive interpersonal words for secure priming (*caring, helpful, supportive, accepting & loving)*, negative interpersonal words for negative priming (*critical, rejecting, nagging, hurtful & distant)* or random consonants for the neutral priming condition. Depression and anxiety were measured using a 16-Item Affect Balance Scale (ABS; Derogatis, 1975), which includes items for low mood (*sad*, *unhappy* and *worthless*) and anxiety (*nervous*, *tense* and *anxious*). Unsurprisingly, results showed that those securely and neutrally primed reported less negative affect than those in the negative priming condition. The difference between the neutral and secure prime was not significant; however, those in the secure condition reported higher positive mood ratings in comparison to the neutral group, though difference not significant. It is not clear from the priming methods if the secure prime had activated the attachment system or the outcome was related to mood manipulation.

In Study 2, Pierce and Lydon (1998) further explored attachment priming on affect and anxiety symptoms, this time exploring the impact of priming without the prior exposure of participants to a personally threatening task. This time, results show no significant differences between the three groups in terms of subjective mood ratings on the ABS (Dergatis, 1975). Results support the hypothesis that activating the attachment system through the distressing scenario in Study 1 created the mood improvement, rather than the

prime being perceived as positive. Had the participants in Study 1 been primed for longer, results may have been significant for secure attachment priming, as results were already moving in the right direction. However, the sense of felt security was not assessed in these two experiments, which makes it difficult to judge if priming was effective due to activating the attachment system or if it was a result of mood manipulation. Furthermore, it may be possible that the positive change in mood and anxiety symptoms may have been impacted on by the negative priming group experiencing lower mood and higher anxiety due to being primed negatively. In summary, the two studies comparing between secure, negative and neutral priming found mixed evidence related to secure priming in comparison to negative and neutral priming. It looks as if secure priming may be more effective when participants are also exposed to a personal threat, which is in line with the attachment theory which stipulates that the attachment system becomes activated during times of perceived personal stress (Bowlby, 1980).

Mikulincer and Shaver (2001) conducted a series of studies with an Israeli student population. Studies 2 to 5 are included in this review[7]. In Study 2, the measure used included items related to both positive (*happy, good, calm)* and negative affect (*sad, depressed* & *anxious*). Participants engaged in a priming task that involved describing in writing a secure attachment-related experience during a time of personal need (*personal threat)*, a happy memory or a shopping trip to a supermarket, depending on their condition (*secure attachment priming, positive priming* and *neutral priming*). Mood self-ratings indicated a significant main effect for secure attachment and positive priming on improving positive symptoms and reducing negative symptoms in comparison to the neutral condition.

In Study 3, in addition to priming, participants engaged in a threat-related task (*unrelated to self*), which involved writing about an out-group. The authors proposed that activating the attachment system under threat would make it more likely for the secure attachment prime to attenuate the threat appraisal and reduce distress. The priming procedure involved imagining and writing about a secure attachment figure, in the secure prime, a happy person scenario for positive priming and a casual acquaintance for the neutral prime group. Results indicate that the positive affect priming had a significant impact on improving the positive symptoms and reducing the negative symptoms, in comparison to the secure or neutral primes. Although securely primed participants rated their overall mood higher than the neutral condition, there was not a significant difference between the two groups.

[7] Study 1 was not included, as it did not meet the inclusion criteria.

In Study 4 (Mikulincer & Shaver, 2001), participants were exposed to a potential threat (*related to self*) in addition to being either securely or neutrally primed with neutral or secure attachment-related words. Following the priming task, participants completed a word completion exercise, whilst receiving either '*failure'* feedback in the threatening condition, or no feedback. The same mood measure from studies 2 and 3 was used. Secure attachment priming led to significantly higher mood ratings in comparison to the neutral condition indicating that secure base priming had the potential to protect an individual against personal threats whereas in the previous study (Study 3), the experienced threat was not related to self. However, this time the study had no positive prime condition.

The findings from Study 4 are supported in the final study (Mikulincer & Shaver, 2001; Study 5). Israeli student participants randomly allocated to either a secure attachment-priming group or to a control group engaged in a visualisation of an attachment figure or a supermarket trip scenario. Participants then engaged in a threat-to-self experience by reading an essay written by someone from an out-group who expressed negative views about Israeli people. Results showed a significant positive impact on mood (rated as in the previous study) in the secure priming condition, in comparison to the neutral condition, with participants who had been securely primed rating their mood as more positive than those in the control group. Studies 2, 4 and 5 suggest that attachment priming works better in cases of personal distressing situations, illustrating the affect regulation power of the attachment system. A potential limitation to these studies conducted by Mikulincer and Shaver (2001) is the mixed measure used, as it does not allow comparison between ratings on anxiety versus affect. In addition, the positive priming condition was not included in Studies 4 and 5.

Wilkinson and colleagues (2012) explored the impact of attachment priming on eating behaviours, whilst measuring also for changes in mood and anxiety. Twenty-one British female university students were primed with a description of either a secure attachment or an anxious attachment (secure versus anxious attachment priming conditions). This task was followed by a 10-minute description in writing of the allocated relationship. Mood was assessed using some items from MAPSS (Rogers et al., 2010), a measure including items for both affect and anxiety (*cheerfulness, depression, misery, relaxation,* and *stress*). Results indicated no significant difference in subjective ratings on mood for participants securely or anxious primed. However, the study had a very small sample size, which may have impacted on findings. In addition, findings cannot be generalised due to having included females only. Unfortunately, neither of these studies included a neutral condition or measured the sense of felt security (Rowe & Carnelley, 2003; Wilkinson et al., 2012). In summary, the evidence from the two studies comparing between secure, anxious and avoidant priming is mixed, with one study seeing a clear improvement in mood following secure priming in comparison to

anxious and avoidant priming with the second study failing to find a similar improvement following secure priming. Neither of the two studies measured the sense of felt security or compared the secure priming against neutral or positive priming, major limitations of these findings.

Seven studies explored the impact of secure attachment priming on mood, depression and anxiety. Some studies have found clear evidence that secure attachment priming works in improving overall mood ratings (Mikulincer & Shaver, 2001, Studies 2 and 5). A couple of studies have found secure attachment and positive priming to be as effective in improving overall affect (Mikulincer & Shaver, 2001, Study 2; Pierce and Lydon, 1998, Study 1). Two studies have identified positive priming to have more impact on improving overall affect than secure attachment priming (Mikulincer & Shaver, 2001, Study 3; Pierce & Lydon, 1998, Study 2) whereas one study has not found any difference between anxiety and secure attachment priming in a small sample of female participants (Wilkinson & Rowe, 2012). However, these findings need to be interpreted cautiously as a potential limitation of all these studies is related to the mixed measure employed, which does not differentiate between affect, depression and anxiety, limiting the generalizability of findings.

The main limitations related to these studies are similar to the ones discussed previously: 1) no positive priming condition (Mikulincer et al., 2001 - Studies 4 &5; Pierce & Lydon, 1998); 2) not measuring the *felt security* (all included studies) and 3) using mixed anxiety-mood measures, making it difficult to differentiate between priming impact on anxiety versus mood (all included studies). From the findings described in anxiety and mood sections, it appears that priming sometimes is more effective on reducing anxiety rather on improving mood and using mixed measures limits the findings of these mixed studies. A number of strengths have been observed such as: 1) subliminal versus supraliminal priming (Pierce & Lydon, 1998); 2) comparing the priming between *threat* versus *no threat* (Mikulincer et al., 2001; Pierce & Lydon, 1998) and 3) including a positive priming condition (Mikulincer et al., 2001 - Studies 2 & 3).

1.5 Discussion

1.5.1 Summary of Findings

The purpose of this literature review was to identify existing studies investigating the impact of secure relationship priming on affect, depression and/or anxiety. Twenty-four studies met the inclusion criteria and were discussed in this review. The results were organised based on

the dependent variable explored in each study. Overall, findings are promising and show that secure attachment priming can be considered an effective tool towards reducing negative symptoms of anxiety/ depression and improving mood overall. From the first group of studies exploring impact of secure attachment priming on positive and negative affect, two studies have identified clear support (Mikulincer & Arad, 1999; Rowe and Carnelley, 2003), four studies have found partial support (Mikulincer et al., 2003, Study 2; Selcuk et al., 2012, Studies 1-3). In contrast, three studies have failed to find supportive evidence (Luke et al., 2012; Mikulincer et al., 2003, Studies 1 and 3). In regards to secure attachment priming impact on depressive symptoms, Carnelley et al. (2015, 2016) indicated partial support. For anxiety symptoms, the evidence appears to be larger and stronger towards supporting secure attachment priming with seven out of eight studies supporting secure attachment priming (Bryant & Chan, 2015; Carnelley et al., 2015, 2016, Study 2; Mikulincer et al., 2001, Studies 1, 2, 3 and 5; Norman et al., 2015). Only one study found partial evidence (Carnelley et al., 2015, 2016, Study 1). From the seven studies exploring impact of secure relationship priming on mixed dependent variables, including affect, depression and/ or anxiety, two studies have found supportive evidence (Mikulincer & Shaver, 2001, Studies 4-5), two have found partial evidence (Mikulincer et al., Study 2; Pierce & Lydon, 1998, Study 1) and three have failed to find any difference between secure priming and other types of priming (Mikulincer & Shaver, 2001, Study 3; Pierce & Lydon, 1998, Study 2; Wilkinson & Rowe, 2012).

1.5.2 Limitations of Included Studies

Overall the included studies indicate that secure attachment priming may be an effective tool in reducing anxiety and depression symptoms. However, there are a number of potential limitations that need to be considered when appraising this literature.

1.5.2.1 Type Priming Condition

The studies included in this literature review vary greatly in regards to the different conditions compared. Some studies compared secure secure against neutral priming (Carnelley et al., 2015), whereas other studies included other conditions such as negative (Pierce & Lydon, 1998), positive (Mikulincer et al., 2003), or anxious and avoidant priming (Rowe & Carnelley, 2003). Interestingly, some studies report positive priming to be as effective as secure priming at improving mood and reducing anxiety symptoms (Mikulincer et al., 2003). On the other hand, some report that only secure attachment priming is effective when compared to positive priming when priming is done subliminally (Mikulincer et al., 2001). The subliminal message may be a more accurate measure of how the participant is feeling as it is not open to bias due to the

participant interpreting subjectively how they feel or through bias caused by the relationship between the participant and the researcher.

One way of comparing between the different priming conditions and their effectiveness would be to measure the sense of *felt security,* which unfortunately has not been measured in most of the studies included in this review. The only study that compared between positive and secure priming found secure attachment priming to have a significant impact on improving the sense of *felt security* but it was not as effective at improving mood as positive priming (Luke et al., 2012). A possible explanation for this may be the hypothesis that secure attachment priming may have both a positive and negative impact on mood. This is confirmed in one study where a linguistic analysis of the text written by participants indicates the presence of both positive and negative emotion related words following secure priming (Carnelley et al., 2015, 2016).

One aspect that needs considering relates to the benefits and potential costs of using different types of control, when studying attachment priming. For example, from an economical and recruitment perspective, it would be much more straightforward for studies to only compare between secure and neutral priming. In this way, recruitment would be more straightforward and therefore easier to reach the desired number of participants. This could be something that it is more likely to be appropriate in clinical settings, where the number of patients who would be willing to sign up may be limited. This could also be financially easier to manage. On the other hand, not having a second control group, such a positive priming group makes it difficult to understand fully the mechanisms of attachment priming or to differentiate secure from positive mood priming. When working with student and non-clinical populations it may be easier to recruit participants therefore it may be more beneficial to have more than a control group.

As it can be seen, the quality of the included studies does not allow a direct comparison between findings and make generalisation difficult. Future studies can explore this by including a range of control conditions such as positive and neutral priming and also measure mood as well as the sense of felt security.

1.5.2.2 Participant Characteristics

Seventy per cent of the included participants were female, with 23 studies having a majority of female participants (Table 1). Two studies included a female only sample of participants (Pierce & Lydon, 1998; Wilkinson et al., 2012). This gender difference could have implications in terms of generalizability of findings. One of the reviewed studies explored gender differences in regards to secure attachment priming and found females to show higher mood ratings in response to secure relationship priming than men (Selcuk et al., 2012). This is consistent

with prior findings in the attachment priming literature (Del Giudice, 2011; Diamond, Hicks, & Otter-Henderson, 2008). Further research could explore these gender differences.

In addition, the included studies relied heavily on student participants. Out of the 24 included studies, only one study included a non-student sample (Selcuk et al., 2012; Study 3). Students represent a specific segment of the population in terms of intellectual status, age and social class, which could potentially limit the generalizability of findings. It would be helpful to compare studies that have used student participants versus general public or clinical samples in order to see if the nature of the sample impacts on the effect of secure priming.

1.5.2.3 Outcome Measures

A diverse range of measures was used to assess affect and anxiety. Some studies assessed mood using a single item (scale) (Mikulincer & Arad, 1999), with only a minority of studies using established mood or anxiety measures (Carnelley et al., 2015, 2016; Selcuk et al., 2012). It was difficult to assess how secure priming impacted on mood versus anxiety, as many measures were mixed and analysis did not differentiate between anxiety versus mood ratings. For example, Mikulincer & Shaver (2001) measured mood with a mixed measure that included items related to feeling *happy, good, calm, sad, depressed* and *anxious.* It would have been helpful to see if secure priming had a different impact on feeling *good*, versus feeling *happy* or *depressed*. Carnelley et al., (2015; Study 2) found secure attachment priming to be more effective in reducing anxiety levels than improving mood, with both concepts analysed separately. It would have been helpful for studies to differentiate between anxiety and depressive symptoms in order to clarify if secure priming has a similar effect on both. Clinically, depression and anxiety disorders are defined as distinct clusters of disorders in diagnosis manuals (APA, 2000) therefore it would have been more useful to use different measures in these studies. It is very difficult to assess if secure priming is as effective at improving mood as it is at reducing anxiety symptoms. Further studies may take this into account.

1.5.2.4 Presentation of Findings

It might have been more useful to present findings in a meta-analysis style, to gain a more in-depth statistical perspective of findings. However, this was not possible due to the limited number of studies meeting the inclusion criteria.

1.5.3 Other Observations

1.5.3.1 Physiological Symptoms of Anxiety

Two of the studies utilised novel ways of testing secure attachment priming on symptoms of anxiety. Bryan and Chan (2015) used SAA and Cortisol levels in saliva samples as a measure of reduction of stress whereas Norman et al. (2015) looked at participants' amygdala response to threat. Bryan and Chan (2015) found some supporting evidence for the benefits of attachment priming on reduction of SAA levels with some reduction (though not significant) in cortisol levels. Norman et al., (2015) also found that securely primed participants showed a significant dampening of amygdala reactivity to threat in comparison to the control group. Previous studies illustrate that secure attachment priming can have a positive impact on physiological symptoms such as pain (Eisenberger et al., 2011). This novel way of exploring affect regulation on a physiological level can be helpful when participants do not disclose anxiety symptoms. For example, individuals with an avoidant attachment style are more likely to under-report anxiety or distress symptoms during stressful events, even if their physiological symptoms such as increased heart rate are similar to those who are secure or anxiously attached (Feeney & Kirkpatrick, 1996; Mikulincer & Florian, 1998; Sroufe & Waters, 1977). Using biological markers of anxiety might give more insight into subtle changes in anxiety levels, which may not come across in self-ratings. However, studies included in this review appear to illustrate the effectiveness of secure attachment priming on both physiological and self-rated symptoms of anxiety.

1.5.3.2 Subliminal versus Supraliminal Priming

Comparing between subliminal versus supraliminal priming is an interesting aspect that was identified in this literature review. For example, studies used a number of supraliminal and subliminal priming methods (Table 2), ranging from exposing participants to subliminal words or pictures (Mikulincer et al., 2001; Mikulincer & Shaver, 2001; Pierce & Lydon, 1998) to visualising and describing in writing attachment-related situations or memories (Carnelley et al., 2015, 2016; Mikulincer & Arad, 1999; Rowe & Carnelley, 2003). When comparing between studies using subliminal versus supraliminal priming, it appears that both methodologies are linked to mixed results with both supraliminal (Carnelley et al., 2015) and subliminal (Pierce & Lydon, 1998) linked to both improved affect regulation following priming or to no change. Some studies have found that supraliminal secure priming may have a similar impact on mood as positive priming whereas subliminal secure priming appears to be more effective in improving mood than positive priming (Mikulincer et al., 2001). The mechanisms behind subliminal priming may be related to the physiological impact of attachment priming, as discussed above.

1.5.3.3 Single versus Repeated Priming

Two studies included in this review employed a repeated priming design (Carnelley et al., 2016, Study 2; Norman et al., 2015). In one study, (Norman et al., 2015) participants were primed twice but this happened within the same experiment (within the same priming task). In contrast, Carnelley et al. (2015) primed participants over a number of days. As described earlier, participants were initially securely or neutrally primed, then received shorter primes for three consecutive days. Results show that after the initial prime, the anxiety symptoms are significantly reduced for the securely primed group when compared with the neutral group. Although this did not occur for depressive symptoms, the repeated primes continued to have an impact on reducing the depressive symptoms in the desired direction. This priming methodology shows potential, which could be tested through either further repeated priming.

1.5.3.4 The Prime

A number of secure attachment primes were used in the selected studies. These include attachment figures (Luke et al., 2013), images of caring individuals (Iles, 2015), attachment related words (Pierce & Lydon, 1998) or pictures of participants' mothers or their partners (Selcuk et al., 2012). It is difficult to assess if one prime is more effective than another (Table 1). Interestingly, in one study (Carnelley et al., 2015, 2016), secure attachment priming had a negative impact on mood for some participants. This was illustrated in after-prime text analysis, when participants reported sadness related to no longer being in touch with their selected attachment figure, or due to accessing sad memories during the prime. It is also worth considering that a neutral prime has the potential of becoming a secure prime as imagined positive or neutral scenarios may sometimes involve other people or relationships outside attachment figure. In a number of studies (Carnelley et al., 2016, Mikulincer et al., 2001; Pierce & Lydon, 1998), the secure prime was no different from positive or neutral primes in improving mood. In order to test these findings further, it would have been interesting to collect participant qualitative feedback following priming in order to understand more about the priming experience for each individual.

1.5.3.5 Neutral versus Threat Conditions

A valuable aspect that emerged from this review is related to the experimental condition during which priming took place: under neutral or perceived threat. In about half of the included studies participants were primed during threat conditions (*N* =15, See Table 2 for details). Out of the 15 studies, eight were supportive of the positive impact of secure priming on affect and anxiety, five had partial support as results did not differ in terms of mood ratings between secure, positive or neutral primes, and two studies did not gain evidence to support priming. Pierce and

Lydon (1998, Study 2) found secure attachment priming to have a significant impact on improving affect when female participants had to manage a personally distressing scenario (*unexpected pregnancy*), in comparison to a non-threat condition. This may indicate that secure attachment priming may work more effectively during threat than neutral conditions, as it is more likely for the attachment system to become activated during perceived personal threat (Bowlby, 1969, 1988; Mikulincer & Florian, 1998; Simpson & Rholes, 1994). In conclusion, it is possible that the activation of the attachment system may help emotion regulation and reduce negative affect.

1.5.3.6 Recovery versus Buffering

One paper (Selcuk et al., 2012) explored the *buffering* versus the *recovery* characteristics of the attachment system through priming, and identified that the attachment system has an affect *recovery* rather than a *buffering* function. This indicates that activating the attachment system prior to an upsetting event does not necessarily prevent individuals from experiencing distress; but may help recovery when priming takes places after the threat has occurred. This finding was supported by Bryan and Chan (2015), who primed participants after they had experienced the threat condition (being socially evaluated whilst holding their hand in freezing water). However, when looking at the included literature (Table 2), most of the studies that primed in threat conditions, priming occurred prior to participants being exposed to the perceived threat, with successful outcomes, which would support the *buffering* function of attachment security priming (e.g. Mikulincer et al., 2001). It may be possible that both *buffering* and *the recovery* functions of the attachment system may be effective in helping one become more resilient in the face of threat but also in helping one to cope better once the stressful event has occurred.

1.5.4 Pros and Cons of Different Priming Methods

This literature review has included all the existing studies on secure priming and impact on mood and anxiety symptoms[8].

1.5.5 Clinical Implications

Pierce and Lydon (1998) recommend that future research compare and contrast between attachment priming in neutral versus stressful situations as their finding showed that it is possible that security priming may work better under threat conditions. Although the included literature presents a range of designs that include both under threat or under no threat conditions, it is not clear if there is a significant different between priming security under different conditions (Table

[8] To the author's knowledge at the time of writing the literature review.

2). It is possible that findings would have been different, had the literature review included more studies with clinical samples where symptoms of anxiety or depression may be more directly linked to threat conditions than positive or negative affect are. Replicating these studies with clinical populations would further test the generalisability of these findings. According to previous research, moving someone towards a secure attachment style is likely to increase the individual's openness to seeking help and their engagement in treatment (Fraley & Shaver, 1997). Therefore, secure attachment priming could be used with clinical samples alongside existing interventions.

In one of the studies included, repeated priming proved to be an effective tool in maintaining the benefits of the initial attachment secure prime over a number of days, for both anxiety and depressive symptoms (Carnelley et al., 2015, 2016). This would be a ripe area for further exploration in clinical populations. To build on the success that Carnelley et al. (2015, 2016) had using texting as a means of priming, future research could also investigate how technology could be incorporated in delivering attachment priming. There is a drive towards using more technology alongside traditional mental health interventions (Cotton, Irwin, Wilkins, & Young, 2015). Priming could potentially become an integrated part of treatment as usual, where patients could receive reminders or short priming tasks on a daily or weekly basis. Technology has the potential to improve access, affordability of interventions and patient choice, as well as improve outcomes for established clinical interventions.

A limited number of studies examined the physiological aspect of secure attachment priming, with promising results (Bryant & Chan, 2015; Norman et al., 2015). Again, further research is warranted in this area, in order to understand more about the neurological mechanisms potentially underpinning affect regulation in relation to secure attachment priming, opening up the opportunity to accumulate additional evidence from the field of neuroscience.

1.5.6 Conclusion

The aim of this literature review was to consider the impact of secure attachment priming on mood, depression and/or anxiety. The limited number of studies included has brought out some promising findings with regards to secure attachment priming impact and mental health. However, the variability in attachment priming methodology, the different control groups and testing conditions make it difficult to draw clear conclusions about this research. There is a need to further develop the attachment priming methodology, and expanding this to other groups such as clinical populations or other mental health difficulties that may be co-morbid with anxiety and low mood. Last, using existing technology such as texting and the Internet, may be fruitful ways to continue to explore attachment priming in the future.

Chapter 2: EMPIRICAL PAPER

2.1 Introduction

The aim of this Chapter is to describe the first clinical study conducted on attachment priming and its impact on anxiety/ depression symptoms in a sample of patients diagnosed with affective disorders. The chapter begins with a brief review of attachment theory and its links to affect regulation. This is followed by an overview of existing studies and findings. Then the remaining part of Chapter 2 will focus on describing the research in question in detail. Finally, findings will be discussed in relation to clinical implications and recommendations for future research will be suggested.

2.1.1 Attachment Theory

Epidemiological studies estimate a high prevalence for affective disorders such as anxiety and depression (American Psychiatric Association, 2013); the lifetime occurrence of depression in the general population is estimated to 5-12% for men and 10-25% for women. As for anxiety, the Office of National Statistics (ONS, 2013) estimates that 1 in 5 people from Britain is likely to meet a diagnosis of anxiety at any one time and estimations indicate that approximately 9% of the British population meet the diagnosis of mixed anxiety and depression at one time (National Institute for Clinical Excellence, 2009; National Health Service, 2009). Despite the high prevalence, there is limited availability of psychological interventions (NICE, 2011a). We here examine how simple attachment priming might be a potential intervention aimed at alleviating symptoms in a clinical sample. First, a brief introduction to the attachment theory will be covered.

Attachment theory proposes that early relationships with attachment figures lead to the formation of working models about self and others (Bowlby, 1969, 1973). Different caregiving experiences early in life lead to the development of secure or insecure internal representations, which become templates that guide future relationships, behaviours and emotion regulation (Ainsworth et al., 1978; Bowlby, 1988; Hazan & Shaver, 1987). Attachment orientations are conceptualised along two dimensions: avoidance of intimacy and anxiety about rejection (Brennan et al., 1998). Secure individuals score low on both dimensions.

Mikulincer and Shaver (2016) suggest that an individual's position on these dimensions described above determines their personal global attachment orientation but it also influences

how that person manages stress and regulates affect. Repeated interaction with caring, available and sensitive attachment figures is likely to lead to an individual feeling a sense of *felt security*, a sense that the world is safe and that attachment figures are available in times of need. In this case, the attachment system meets one of its primary functions of emotion regulation. Securely-attached individuals present low avoidance and anxiety characteristics as they are comfortable with closeness and intimacy (Ainsworth et al., 1978). They express confidence in *seeking proximity* to the attachment figure in times of perceived need, which reinforces the use of this coping skill. In time, these strategies will lead to a confirmation of the positive appraisal of attachment figures, creating a cycle of *broaden-and-build* attachment security, a core benefit of attachment security (Fredrickson, 2001). This attachment cycle is constructed of psychological and behavioural events that contribute towards emotional stability and effective management of emotional distress (Mikulincer & Shaver, 2007a; Mikulincer & Shaver, 2010).

On the other hand, consistent early interaction with unavailable or non-responsive attachment figures leads individuals to experience a lack of *felt security* and to the development of *secondary attachment strategies* of emotion regulation (Cassidy & Kobak, 1988). Two such strategies are *hyperactivation* and *deactivation* of the attachment system. Individuals high in attachment avoidance are uncomfortable with closeness and mistrust others; thus they may resume to affect regulation through the *deactivation* of the attachment system, whilst developing over-reliance on self. Those high in attachment anxiety may *hyperactivate* the attachment system through hypervigilance for future threats and under-rating of personal coping abilities (Mikulincer & Florian, 1999; Mikulincer & Shaver, 2010, 2016). *Hyperactivation* strategies may increase the personal sense of helplessness and vulnerability to perceived stressors whereas the *deactivation* of the attachment system can have a negative effect on an individual's ability to seek proximity to others. Individuals differ in relation to their personal primary and secondary strategies and emotional coping styles (Mikulincer, Gillath, & Shaver, 2002; Mikulincer & Shaver, 2016).

2.1.2 Attachment and Affective Disorders

The link between attachment styles and affective disorders is made through the way individuals regulate emotions and how this is associated with their particular attachment orientation. In non-clinical samples, adults who are insecure in their attachment patterns were found to use less adaptive strategies for emotional regulation and were more likely to

experience depressive symptoms (Carnelley et al., 2016; Davila, 2001; (Hortaçsu, Cesur, & Oral, 1993; Williams & Riskind, 2004). Studies have identified both attachment anxiety and avoidance as positively linked to higher self-reported symptoms of anxiety (Irons & Gilbert, 2005; Mikulincer et al., 2001; Strodl & Noller, 2003). Higher ratings on attachment anxiety have been linked to higher self-reported symptoms of low mood (Mikulincer et al., 2001; Mikulincer et al., 2003; Mikulincer & Shaver, 2001). Attachment anxiety correlates with the development of depression (Wei, Heppner, Russell, & Young, 2006) and anxiety disorders (Mickelson, Kessler, and Shaver, 1997). Both attachment avoidance and anxiety were found to correlate with higher symptoms of OCD in a sample of students (Doron, Moulding, Kyrios, Nedeljkovic, & Mikulincer, 2009). Besser & Priel (2005) have identified higher ratings on attachment avoidance to correlate with higher depressive symptoms. Attachment avoidance has also been linked to higher self-rated symptoms of depression (Davila, 2001; Williams & Riskind, 2004). On the other hand, adults who possess a secure attachment style are more likely to manage distress better and experience less depressed mood (Besser & Priel, 2003, 2005; Kobak & Sceery, 1988).

Studies have further supported the link between attachment orientations and affective disorders also in clinical samples. Some found a correlation between the severity of social anxiety disorder and attachment anxiety in a clinical sample (Eng, Heimberg, Hart, Schneier, & Liebowitz, 2001). The authors also found that an anxious attachment is linked with more severe depressive symptoms in the same sample. Anxious attachment style is predictive of depressive and anxious symptoms in a sample of patients from primary care services (Bekker & Croon, 2010). An insecure anxious attachment style also appears to predict worsening of depressive symptoms over a 1-year period (Ciechanowski, Katon, Russo, & Hirsch, 2003). Furthermore, a clinical sample of women recovering from depressive symptoms presented with significantly higher attachment avoidance than non-depressed women (Carnelley et al., 1994).

Patients suffering from anxiety or major depressive disorders present with higher levels of attachment avoidance when compared with non-clinical groups (Reis & Grenyer, 2004). Also, attachment avoidance predicts negative therapy outcomes in comparison to attachment security (Reis & Grenyer, 2004). In clinical samples, attachment anxiety has been linked to specific anxiety disorders such as OCD (Doron et al., 2009; Myhr, Sookman, & Pinard, 2004) and PTSD (Fraley, Fazzari, Bonanno, & Dekel, 2006; Mikulincer, Shaver, & Solomon, 2015). Inversely, secure attachment orientations were found to reduce vulnerability to depressive symptoms (Carnelley et al., 1994; Ciechanowski et al., 2003; Hortaçsu et al., 1993; Rice & Mirzadeh, 2000) and to correlate with better treatment outcome to interventions for depression (Reis & Grenyer,

2004). On the other hand, secure attachment has been linked to lower levels of anxiety (Kobak & Sceery, 1988; Mikulincer et al., 1993) and depression (Kobak, Cloer, Ferenz, & Fleming, 1993).

2.1.2.1 Attachment Priming

Many of the studies mentioned above explore the correlation between affective disorders and attachment orientations but they do not imply causality. Through secure attachment priming, it is possible to test the causality between attachment dimensions and affective disorders. Studies have used secure attachment priming methods in order to activate the sense of felt security, which characterises the secure attachment style (Mikulincer & Shaver, 2016). Priming a secure attachment orientation leads an individual to respond cognitively, emotionally and behaviourally as if their global attachment style were secure (Carnelley & Rowe, 2010; Mikulincer & Arad, 1999; Mikulincer et al., 2003; Mikulincer & Shaver, 2001; Rowe & Carnelley, 2003). Attachment priming research has employed a range of subliminal and supraliminal attachment priming methods including semantic priming (Carnelley et al., 2016); exposing participants to attachment-related pictures (Iles et al., 2015; Selcuk et al., 2012) or recalling memories of close and supportive relationships (Gillath, Selcuk, & Shaver, 2008; Hazan, & Kross, 2012).

Research found that priming a secure attachment in participants impacts on self-reported levels of felt security, with participants in the secure priming group reporting higher felt security levels in comparison to participants from the control group (Baldwin et al., 1996; Carnelley et al., 2016; Carnelley & Rowe, 2010; Mikulincer & Shaver, 2001). This is important as one of the main goals of the attachment system is establishing a sense of felt security, which helps with emotion regulation therefore impacting on symptoms of anxiety or low mood. Higher felt security levels have been associated with an enhanced coping ability with stress and negative affect (Lopez & Brennan, 2000) as well as good mental health (Carnelley et al., 1994). When compared between priming an insecure versus a secure attachment style, research has identified secure attachment priming to have a positive impact on participants' felt security (Luke et al., 2012; Otway et al., 2014). Interestingly, through repeated priming, the increased sense of felt security can be maintained over a number of days, when participants engage in shorter primes for three days after the initial security priming task (Otway et al., 2014).

2.1.2.2 Attachment Priming and Affective Disorders

In addition to measuring the impact on *felt security,* studies have also explored the effect of secure attachment priming on reduction of anxiety symptoms. Findings indicate that different types of over (supraliminal) or covert (subliminal) attachment priming can contribute towards a significant reduction in anxiety symptoms in a non-clinical sample (Mikulincer et al., 2001) Carnelley et al. (2016) found that participants primed with a secure attachment style reported lower levels of anxious mood post-prime, which was maintained over a number of days through repeated priming. In addition, both the initial prime as well as the repeated (shorter) text primes had a similar effect in reducing the anxiety symptoms and maintaining this reduction over a number of days. Some studies indicate that attachment priming can have a potentially beneficial impact on reducing physiological symptoms of anxiety. For example, Bryan and Chan (2015) found secure priming to contribute towards a reduction in the SAA levels whereas Norman et al. (2015) found that participants in the secure prime condition experienced lower activation of amygdala following threat than participants who were neutrally primed.

If studies indicate that attachment priming has a beneficial impact on the reduction of anxiety symptoms, the existing evidence-base for attachment priming on improving depressive symptoms is more limited. Some found that secure attachment priming had a marginal effect in reducing depressive symptoms in comparison to neutral priming, trend which was maintained over a number of days through repeated text priming (Carnelley et al., 2016). In a second experiment conducted by Carnelley and colleagues (2016), found undergraduates primed with an insecure anxious attachment style to report more depressive symptoms than participants primed with neutral, secure or avoidant attachment styles, indicating a causal relationship between anxious attachment style and depression.

2.1.3 Rationale of Current Study

Considering the common occurrence of affective disorders in the UK (NICE, 2009) and the potential benefits of secure attachment priming on the symptoms of anxiety and depression, it would be clinical beneficial to explore if security priming a clinical sample of patients who had been diagnosed with affective disorders would yield positive results. If secure attachment priming was successful, it is expected that activation of a sense of felt security in participants primed with a secure attachment may also have a positive impact on affect regulation and on the symptoms on anxiety and depression in this group, in comparison to a control group.

2.1.4 Research Questions

The aim of this study is to explore whether priming depressed and anxious patients with a secure or neutral attachment style leads to differences in self-reported levels of felt security, anxiety and depression. A second aim of this study is to explore whether it is possible to keep a secure prime activated over 3 days via text messaging or 'security boosters'.

2.1.5 Hypotheses

It is predicted that participants in the secure condition will report higher levels of felt security and lower levels of reported depression and anxiety symptoms, than those in the neutral prime condition, at all Time points during the study.

2.2 Method

2.2.1 Ethical Approvals

The study was granted ethical approval by the University of Southampton Ethics Committee (ERGO 13400), the NHS Research Ethics Committee and the NHS Trust Research & Development Team (see Appendices A, B & C).

2.2.2 Design

The study used a mixed-design, with one between-subject variable (priming task) and one within-subjects variable (Times 1, 4 and 5). The dependent variables were *felt security, anxiety and depression symptoms.*

A statistical power analysis was performed for sample size estimation. In order to detect a large effect size in an Analysis of Variance (ANOVA) with two groups, Cohen's criteria (1992) was used. With an alpha of .05 and power of 0.50, the projected sample size needed for a large effect (GPower 3.1) is 52 participants, with approximately $N = 26$ for each group to enable group comparison an in line with existing literature (Otway et al., 2014). The final sample size included ($N = 52$) was somewhat lower than initially planned.

2.2.3 Participants

Patients were recruited from a tertiary British mental health service. Participants were 52 adults (30 females and 22 males) 9 who had a diagnosis of depression and/ or anxiety disorder, for which they received psychotropic treatment. Participants' age ranged between 18 to 76 (M = 50); 35 participants described themselves as White British, 8 as British, 2 as Indian, 2 as Caucasian, 1 as Asian British, 1 as Irish, 1 as Black British and 4 did not disclose their ethnicity. Twenty participants described themselves as married, 13 as single, 9 as divorced, 5 in a relationship, 2 as living with partner, 2 as widowed and 1 as separated. Patients diagnosed with bipolar disorder, or mental health problems due to substance misuse or organic difficulties were not recruited.

Fifteen participants reported their main diagnosis as depression, 8 as depression with other anxiety disorders, 2 as generalised anxiety disorder, 13 as mixed anxiety and depression, 7 as mixed anxiety and depression and other anxiety disorders, 4 as recurrent depressive disorder and 3 have not given an answer to this question (see Appendix D for full details of participants' diagnoses). In regards to the diagnosis duration, 12 participants have had a diagnosis for less than 5 years, 20 reported that their diagnosis had been made between 6 and 20 years, 8 between 21 and 30 years and 3 over 40 years. Nine participants did not answer this question (see Appendix D for further info). The average diagnosis duration for participants was 14.12 years, range 2 to 45 years. Most participants have had either medication or psychological intervention in the past for their current diagnosis (see Appendix D).

2.2.4 Materials

2.2.4.1 Linguistic Inquiry and Word Count (LIWC; Pennebaker, Francis, & Booth, 2001)

This is a text analysis software program, which counts the number of times participants use different categories of words across qualitative text. This was used to analyse the occurrence of affect-related words in the qualitative data collected from this study.

[9] Participants volunteered their participation and did not receive monetary rewards. From all patients approached, fifteen patients refused to participate, 6 gave their consent but then dropped out and 6 participants were excluded from analysis, as they did not complete the treatment tasks accordingly.

2.2.4.2 Demographics

This form included information related to gender, age, relationship status, ethnicity and a keyword for each participant.

2.2.4.2 Adult Attachment

The two adult attachment dimensions were measured using the Experiences in Close Relationships Inventory, short version (ECR-12; Wei et al., 2007; See Appendix E). The ECR is composed of two 6-item scales, one to assess attachment avoidance and one for attachment anxiety. Respondents are asked to rate a close relationship (e.g. romantic partner, close friend or family member) on the two scales. Those who score low on both items are more likely to exhibit a secure attachment style. The ECR-12 has exhibited good internal consistency as well as test-retest reliability. This measure has also been used in different languages and has displayed good construct and criterion validity (Mikulincer & Shaver, 2016; Wei et al., 2007). For this study, the Cronbach's alphas for the avoidance and anxiety subscales was lower than expected at .64 and .77 respectively.

2.2.4.4 Information on attachment figures (Carnelley & Rowe, 2007)

Participants were asked to list up to 10 people they regarded as their closest significant others. Participants were provided with an adapted single paragraph describing each of the different attachment styles described by Bartholomew and Horowitz (1991; see Appendix F). Participants had to choose from the list the attachment style that best illustrated how they felt in each relationship, in a procedure adapted from Carnelley and Rowe (2007). Participants also had to rate each relationship's best fit on a Likert scale, 1 (not at all representative) to 7 (extremely representative) of the chosen description.

2.2.4.5 Depression

Baseline and post-prime depression were measured using the depression items from the Profile of Mood States (POMS; McNair, et al., 1992; see Appendix G). Twenty-four of the original 65 items were related to depresion. Respondents used a 5-point Likert-type scale (*0=not at all, 4=extremely*) to rate the extent to which they had experienced various mood states over the past week. Post-prime, participants were asked to rate each item based on how they were feeling "right now. The Cronbach's reliability coeffficient was high (0.96).

2.2.4.5 Anxiety

Baseline and post-prime anxiety levels were measured using 9 anxiety-related items from the Profile of Mood States (POMS: McNair et al., 1992; see Appendix G). In the current study, the reliability of the scale was high (0.91).

2.2.4.6 Time 1 lab primes (Bartz & Lydon, 2004)

The priming method used was an adaptation of the method employed by Bartz and Lydon (2004; see Appendix H). Participants were randomly allocated to either a secure or neutral prime condition. Participants in the secure condition were asked to write about one of their secure relationships for 10 minutes. Participants in the secure condition unable to list a secure attachment figure during their introductory session were given a description of a secure relationship and asked to imagine being in such a relationship. They were asked to write for 10 minutes about how they would feel in this kind of relationship. Those in the neutral condition wrote for 10 minutes about a time they visited a supermarket for a large or weekly shop.

2.2.4.7 Daily text primes

Participants received instructions for 3 minute visualisation tasks via text messages, on three separate occasions, on three consecutive days following the initial priming task. Participants in the secure condition were asked to spend 3 minutes thinking about the relationship they visualised in the lab. An example secure text prime is: **"**Please spend 3 minutes thinking about the relationship that you visualised in the session on Thursday. Try and imagine that person encouraging you to feel safe, secure and comforted. What would they say or do? When finished, please reply "Done", along with any words or thoughts that came to mind during the task". Participants in the neutral condition were asked to visualise neutral events. An example neutral text prime is: "Please spend 3 minutes thinking about a time you did some laundry. When finished please reply "Done" along with any words or thoughts that came to mind during the task" (see Appendix I).

2.2.4.8 Felt security measure

To find out whether the experimental manipulation was successful, participants also completed a 16-item measure of felt security (Luke et al., 2012; see Appendix J). This scale consists of ten words relating to feelings of security, comfort and safety (e.g., *loved*, *protected*). Participants rated the extent to which the person or scenario in the visualisation task made them feel *secure*, by rating each item using a 6-point Likert-type scale (1=*not at all*, 6=*very much*). Cronbach's alpha for this measure was high (0.96).

2.2.5 Procedure

Participants were informed of this research in writing, before their upcoming appointment at the CHMT (see Appendices K & L). Participants were then approached after their appointment. During the introductory session, participants were briefed on the procedure of the study and were then asked to provide information about their attachment figures (see Appendices F & M). Participants also provided their mobile telephone number and a "keycode", made up of their initials and date of birth, so that their data could be linked at each timepoint. Participants completed measures either online or on paper, depending on personal choice and computer literacy. The measures completed during at baseline covered demographic variables, attachment style (ECR-12; Wei et al., 2007), depression and anxiety (PoMS; McNair et al., 1992; see Appendices K & L). For the secure condition, the following attachment figures were chosen: Wife or Husband (*N* = 10), Brother or Sister (*N* = 5), Friend (N = 5), Mother (N = 2), Daughter (*N* = 2), Aunt (*N* = 1), Therapist (*N* = 1) and one person chose an alternative attachment figure as they were unable to name a secure relationship.

One week later, participants attended another session where they were randomly allocated (using a random number generator) to either a secure or a neutral experimental condition ('Time 1'). Participants were blind to conditions. Participants then completed a ten minute priming task, where they wrote about a secure attachment figure in the secure condition, or a supermarket scenario in the neutral condition (see Appendix M). Immediately after the prime task, participants completed measures of felt security, anxiety and depressed mood.

One day later ('Time 2') participants received a text message in the morning, reminding them to expect a short visualisation task to come through the same evening (also by text message). That evening, at 8 p.m. or at agreed time, participants received a text containing a 3-minute visualisation task (either a secure or neutral prime, in accordance with the condition they had been allocated to at Time 1; see Appendix O). Participants were asked to send a reply text with the word "*done*" and any words or sentences concerning thoughts or feelings they had during the task. The same procedure was repeated for the next two days ('Time 3' and 'Time 4'). Participants received three prime texts in total, each 24 hours apart. Immediately after completing their last text prime task, participants were asked to complete measures of felt security, anxiety and depressed mood.

Finally, one day later ('Time 5') participants completed again measures of felt security, anxiety and depressed mood. Participants then received a debriefing statement (either by email or by post) and were also given verbal feedback about the study, their allocated condition as

well as the opportunity to ask additional questions (see Appendix N). Participants in the neutral condition were offered the opportunity to experience the secure priming condition.

All data collected about the participants was kept strictly confidential. Participants' data was linked by the use of keycodes. Participants' contact information and data were not stored together. Following the debrief, each participant's data was fully anonymised.

2.3 Results

First, data was prepared for main analysis by identifying outliers and replacing missing values. Next, preliminary analyses were conducted in order to check if the basic assumptions were met for an ANCOVA analysis (see Appendix O, tables 6 and 7). Then a mixed-design ANCOVA was conducted on *felt security, depression* and *anxiety* as dependent variables. Last, a Linguistic Inquiry Word Count was conducted on all written text provided by participants.

2.3.1 Data Preparation

The statistical package SPSS was used (IBM, 2013). All data was checked for errors against the original questionnaires and identified discrepancies were corrected. Two outliers were identified as a result of typing errors and data was replaced with the accurate entry from original questionnaire. Data were normally distributed.

Missing values were identified using the Missing Value Analysis from SPSS (MVA). There were 2 missing values on the ECR variables. Little's Missing Completely at Random test (MCAR) identified the missing values as MCAR, $\chi^2(2)$ (1, N = 52) = .912, p = .34. There were no missing values on felt security at Time 1. However, there were 4 missing values for felt security at Time 4. Little's MCAR test identified the missing values as not missing at random (NMAR) $\chi^2(2)$ (1, N = 52) = .00, p <.01. Four values were missing for felt security at Time 5; Little's MCAR test indicated that the data was NMAR $\chi^2(2)$ (1, N = 52) = .00, p < .01.

There was 1 missing value for baseline depression; Little's MCAR test, χ^2 (2) (1, N = 52) = 37.93, p = .61 indicated that data was MCAR. At Time 1, there were no missing values for depression. For depression at Time 4, 2 values were missing; Little's MCAR test identified the data as NMAR ($\chi^2(2)$ (1, N = 52) = .00, p < .01). At Time 5, 5 values were missing for depression, identified as MCAR by Little's MCAR test ($\chi^2(2)$ (1, N = 52) = 9.92, p = .77).

There was 1 value missing for baseline anxiety. Little's MCAR test identified the data as MCAR ($\chi^2(2)$ (1, N = 52) =23.58, p =49). At Time 1 anxiety, 1 value was missing at random,

according to Little's MCAR (χ^2(2) (1, *N* = 52) =7.37, *p* = 50). Four values were missing at Time 4 anxiety, identified as NMAR (χ^2(2) (1, *N* = 52) =.00, *p* <.01). For Time 5 anxiety, 4 values were also missing, identified as NMAR (χ^2(2) (1, *N* = 52) =.00, *p* =.001).

Missing data were dealt with using Expectation-Maximization in SPSS (Field, 2015). Evidence suggests that multiple imputations is a superior method of dealing with missing data, compared to traditional methods (i.e., listwise case deletion), particularly when the missingness mechanisms within the data are Missing at Random or Missing Not at Random (Wayman, 2003). Multiple imputations preserves the important characteristics of the data set as a whole (e.g., means, variances, regression parameters), which is an advantage over more traditional methods of dealing with missing data (Wayman, 2003).

2.3.2 Preliminary Analyses

Preliminary analysis were conducted in order to decide if variables met the basic assumptions for an ANCOVA analysis for each of the dependent variables: *felt security, depression* and *anxiety* (see Appendix O, Table 6). These analyses looked at linearity of regression, homogeneity of error variances, independence of error terms and homogeneity of regression slopes. For *felt security*, attachment anxiety, attachment avoidance, baseline depression and baseline anxiety met these requirements. For *depression* and for *anxiety,* attachment anxiety and attachment avoidance did not meet the assumptions, whereas baseline anxiety and baseline depression did (in separate analyses). There was no significant difference between the secure and control groups on depression ($F(1, 48) = .965$, $p = .390$; Ms = 2.02[10], Mc=2.29) or anxiety ($F(1, 50) = 2.10$, $p = .361$; Ms=2.29, Mc=2.53; Table 3).

2.3.3 Felt Security

A mixed-design ANCOVA was conducted on felt security with time (3 levels: Time 1, 4 and 5) as the within-subjects factor and condition (2 levels: secure versus neutral priming) as a between-subjects factor, whilst controlling for attachment avoidance, attachment anxiety, baseline depression and baseline anxiety as covariates. Felt security was the dependent variable. The effect of prime was significant, $F(1,46) = 6.99$, p = .011. Participants in the secure priming group (M=3.52, SE=.16) report significantly higher felt security than those in the neutral prime

group (M=2.91, SE=.17) as hypothesised (Figure 3). The η_p^2 (partial eta squared) for priming condition indicated that prime accounted for 13.2% of the variance in felt security.

There was no significant main effect of time (F(2,92)=0.46, p = .634) or time by condition interaction (F(2,92)=0.93, p =.399). There was no significant difference between felt security in the experimental group between Time 1, 4 and 5; *F* (1, 46) = .46, *p* = .58 (Table 3).

Covariates baseline depression (F(1,46) = 2.10, p = .15), baseline anxiety (F(1,46) = 2.21, p = .14), and attachment anxiety (F(1,46) = .07, p = .79) were not associated with felt-security. Higher attachment avoidance was associated with lower felt-security (β=-.345, F(1,46) = 4.91, p < .05, η_p^2=9.7%).

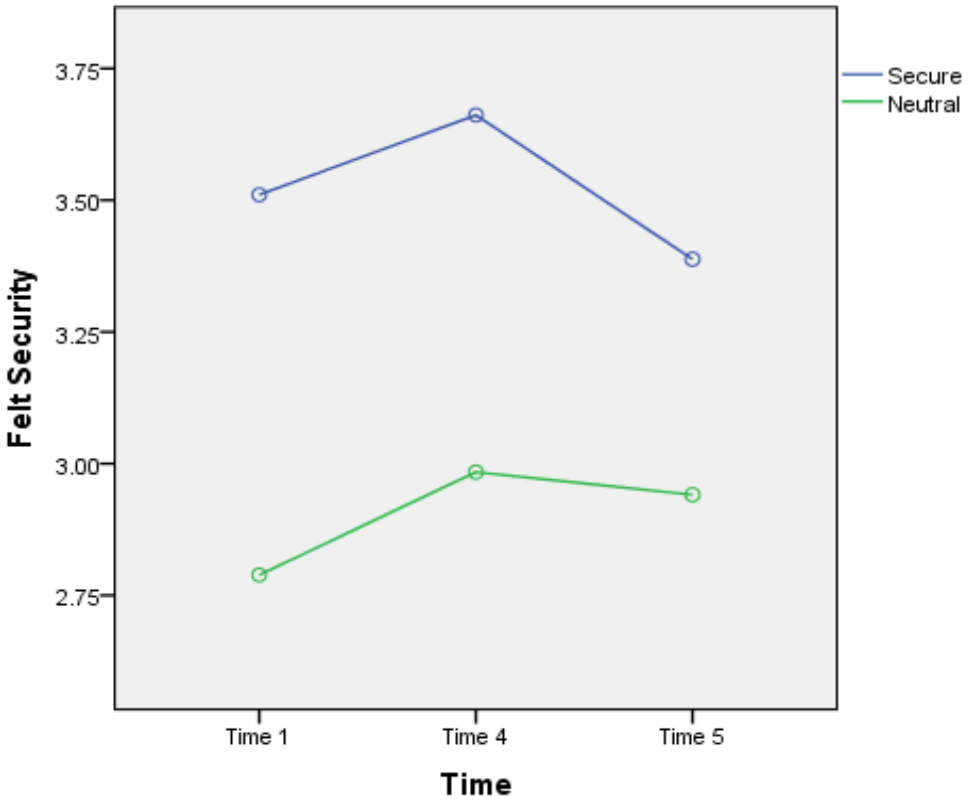


Figure 3. *Estimated Means for Felt Security*

The table below includes all the means for the dependent variables at Baseline, Time 1, Time 4 and Time 5 as applicable. Note that Felt Security was not measured at Baseline.

Table 3. *Means for Dependent Variables at Different Time Points*

DV	Felt Security		Depression		Anxiety	
IV	**Experiment**	**Control**	**Experiment**	**Control**	**Experiment**	**Control**
Baseline	Not measured		2.02	2.29	2.29	2.53
T1	3.51	2.79	1.79	2.08	1.87	2.21
T4	3.66	2.98	1.58	2.22	1.65	2.33
T5	3.38	2.94	1.63	2.07	1.91	2.12

2.3.4 Depression

A mixed-design ANCOVA was conducted on depressive symptoms with time (3 levels: Time 1, 4 and 5) as the within-subjects factor and condition (2 levels: secure versus neutral priming) as a between-subjects factor, with baseline depression and baseline anxiety as covariates. The main effect of prime was nonsignificant ($F(1,48) = 2.65$, $p = .11$) but in the expected direction, indicating that the securely primed group ($M=1.75$, $SE=.12$) experienced (nonsignificantly) lower levels of depression in comparison to the control group ($M=2.03$, $SE=.12$). However, the time by prime interaction was marginally significant, $F(2,96)=2.70$, $p = .072$, $\beta=-.477$, η_p^2=5.3%). Results showed that although the effect of prime was not significant at Time 1 or at follow-up at Time 5, it was significant at Time 4 (after the final text prime); the securely primed participants reported significantly lower symptoms of depression in comparison to the control group, $t=-2.28$, $p = .027$, η_p^2=.098. This may indicate that the effects of the prime on depression became more pronounced following repeated priming (Figure 2).

The main effect of time was nonsignificant, $F(2,96)= 0.34$, $p = .714$, (Table 3). Baseline anxiety was not associated with depressed mood $F(1,49) = 1.57$, $p = .22$. However, higher baseline depression predicted higher depressed mood, $F(1,49) = 5.06$, $p < .05$ at Time 1, $t=7.40$, $p < .001$, $\beta=.962$, Time 4, $t= 4.04$, $p < .001$, $\beta=.607$, and Time 5, $t=4.64$, $p < .001$, $\beta=.674$. There was no significant difference on depressive mood in the experimental group between Time 1, 4 and 5; $F (1, 49) = .34$, $p = .6$.

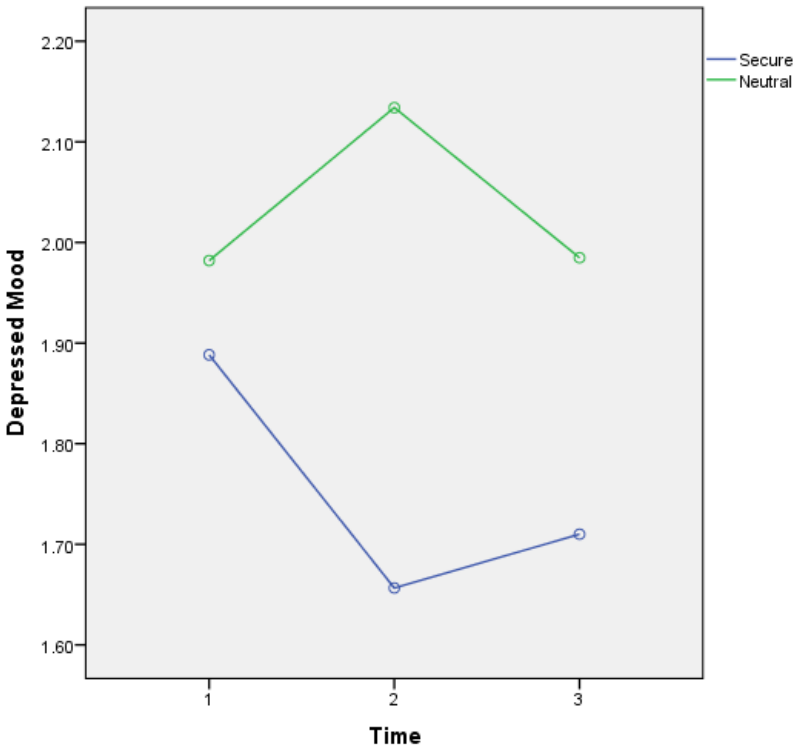


Figure 4. *Estimated Means for Depression for the Entire Dataset*

2.3.5 Anxiety

A mixed-design ANCOVA was conducted on anxious mood with time (3 levels: Time 1, 4 and 5) as the within-subjects factor and condition (2 levels: secure versus neutral priming) as a between-subjects factor, with baseline depression and baseline anxiety as covariates. There was no significant main effect of prime, though the anxiety levels were in the predicted direction (secure-primed M=1.89, SE=.13; control-primed M=2.14, SE=.14, F(1,48) = -1.73, p = .19).

There was no statistically significant time by prime interaction (F(2,96)=2.34, p = .102, however the effect of prime on anxiety differed at each time-point. Figure 3 shows that the effect of prime at Time 1 (t=-0.75, p =.455) and Time 5 (t=2.37, p = .809) were nonsignificant, but was significant at Time 4 (t=-2.46, p = .018, η_p^2=11.2%). After the last text prime, those in the secure-prime (versus control-prime) condition report lower anxiety. There was no significant main effect of time, F(2,96)=0.29, p = .749.

Baseline depression did not predict anxiety symptoms (F(1,48) = 1.05, p = .31), however Baseline anxiety did (F(1,48) = 10.94, p < .05) with higher baseline anxiety predicting higher post-prime anxiety levels at Time 1, t=2.93, p < .05, β=.505, Time 4, t=2.85, p < .05, β=.498, and Time 5, t=2.50, p < .05, β=.536.

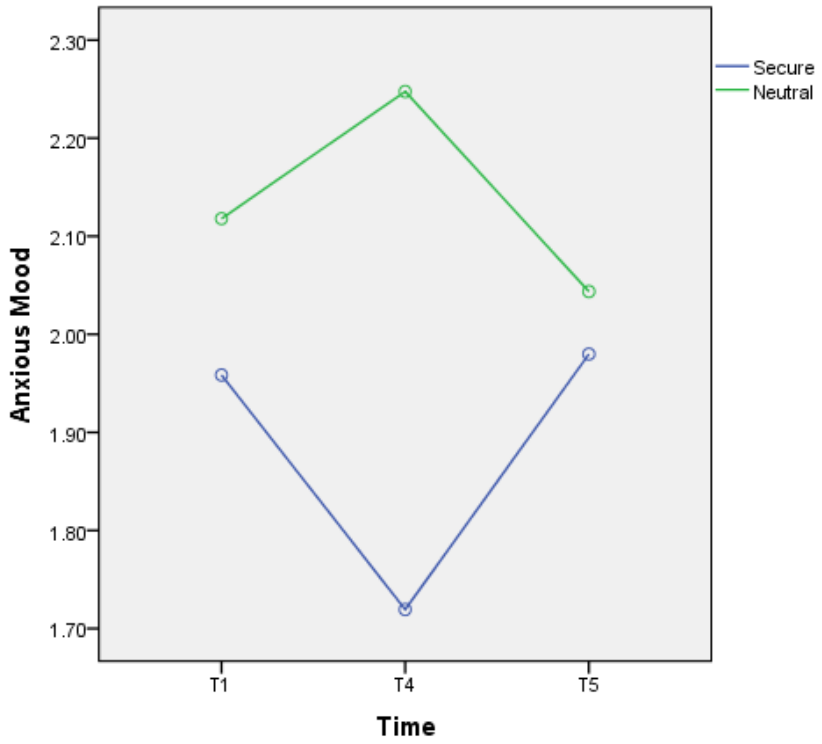


Figure 5. *Estimated Means for Anxiety for the Entire Dataset*

2.3.6 Linguistic Inquiry and Word Count

All participants' written text during the secure and neutral primes was analysed using the Linguistic Inquiry and Word Count (LWIC; Pennebaker et al., 2001). This exploratory process was completed in order to assess if participants engaged in the priming tasks as expected. For example, participants in the secure priming group were expected to use more affect-related words than the participants in the control group, who were expected to use more neutral words. The written text following the initial prime at Time 1 was compared against the written text that was obtained at Times 2, 3 and 4. The number of words illustrating affect (both negative and positive) was counted for both groups at all times.

Time 1

The secure primed group used significantly more positive emotion words (*M* = 7.05, *SD* = 4.27) than the control group (*M* = 1.21 , *SD* = 1.32) but also more negative affect words (*M* = 2.04, *SD* = 1.92) than the control group (*M* =0.95, *SD* = 1.80). Securely primed participants used more anxiety-related words at Time 1 (*M* = .75, *SD* = .88), than the control group (*M* = .16, *SD* = .41).

Times 2, 3 and 4

Text from participants in the secure group used more positive affect words (*M* = 6.17, *SD* = 5.73) than participants in the control group (*M* = 1.25, *SD* = 2.20) but also less negative affect words (*M* = 1.02, *SD* =1.41) than the control group (*M* = 1.30, *SD* = 2.20). Furthermore, those in the secure group used a similar number of anxiety-related words (*M* = .11, *SD* = .32), than the control group (*M* = .41, *SD* = 1.03), indicating a reduction in anxiety-related words since Time 1. These findings indicate that participants in both groups engaged well in the priming tasks therefore making these priming tasks valid.

Table 4. *Linguistic Analysis Descriptives*

	Time 1				Times 2,3 & 4			
Term	Secure Group		Control Group		Secure Group		Control Group	
	M	SD	M	SD	M	SD	M	SD
Positive emotions	7.05**	4.27	1.21**	1.32	6.17**	5.73	1.25**	2.20
Negative emotions	2.04*	1.92	0.95*	1.80	1.02	1.41	1.30	2.20
Anxiety	0.75*	0.88	0.16*	0.41	0.11	0.32	0.41	1.03

Note: Means: M = Means, SD = Standard Deviation
Superscript * = p < .05; superscript ** = p<.001.

2.4 Discussion

2.4.1 Felt Security

The current study is the first to examine the impact of repeated attachment priming on symptoms of anxiety and depression in a clinical sample. As predicted, the results for *felt security* supported the initial hypothesis. The attachment priming successfully induced a sense of *felt security* at all three Time points: at Time 1 after the lab prime, at Time 4 after the final text prime, and at Time 5, one day after the last prime, regardless of participants' baseline anxiety and depression. These results are encouraging, indicating that repeated security priming has the potential to induce longer-term security with more frequent security priming. These findings support and extend existing evidence that indicates that attachment priming can induce a sense of *felt security* (Carnelley et al., 2015, 2016; Luke et al., 2012; Rushforth, 2009). However, attachment avoidance correlated negatively with the sense of felt security whereby the higher the self-rated avoidance levels, the lower the level of felt security. Although this is something identified in previous research (Carnelley et al, 2016; Study 1), it was still a surprising finding as it was expected that the secure attachment priming would over-ride existing attachment styles. It might have been useful to see if this impact was different for participants, depending on their diagnosis and duration of symptoms. However, this analysis was not conducted due to the small sample size. It is important to note that the avoidance and anxiety subscales used had a lower than expected Cronbach's alpha at .64 and .77 respectively, and this could have an impact on findings. It is a possibility that the scales did not capture clearly the two different concepts measured .

2.4.2 Depression

Attachment priming had a positive impact on improving depressive symptoms after the last prime, in comparison the neutral prime. Although the securely primed participants reported lower depressive symptoms than the neutrally primed participants, this difference was not statistically significant. With time, the difference between the secure and neutral groups became significant. However, this difference was not maintained a day later at the follow-up (at Time 5). Existing research identified secure priming to impact on reducing symptoms of depression in non-clinical samples, when compared with neutral priming (Carnelley et al., study 1; Besser & Priel, 2005). Although the effect of the prime in the current study was not maintained at follow-up, this may be attributed to the relatively short duration of the study, with participants being primed only on a few occasions. Had the study continued

over a longer period of time, it may be possible that the prime effects would carry over a longer period. Baseline depression had a significant impact on depressive symptoms with higher baseline ratings correlated to higher ratings of depressive symptoms post-prime.

2.4.3 Anxiety

The results for anxiety symptoms supported the initial hypothesis partially as the difference between the securely primed group and the control group was not statistically significant, even if the securely primed group reported lower levels of anxiety post-prime, which is different from existing findings (Carnelley et al., 2014) where repeated attachment priming was found to be an effective tool in reducing symptoms of anxiety. The effect of priming was not maintained a day later, at follow up. It is important to consider the short nature of this intervention. Previous findings with student populations found repeated secure priming to be effective in reducing the symptoms of anxiety for the securely primed group (Carnelley et al., 2014). It is possible that short-term secure priming may be more effective with non-clinical levels of anxiety whereas a longer-term priming would be necessary with clinical samples.

2.4.4 Limitations

There are a number of limitations that are worth discussing. First, due to difficulties recruiting from this client group, the sample size was small, limiting the study's statistical power. Although recruitment took place over 18 months, many patients attending this mental health service were not suitable or declined participating in the study. This limitation could be addressed in future research by initially running the study with patients from primary care services, where the referral rate may be higher and participants more likely to meet the inclusion criteria.

Second, participants were primed on only four occasions and the effects were not maintained at the follow up. As priming continued, symptoms appeared to reduce indicating that the priming was effective, but more time was needed to establish the benefits. Future research may consider increasing the duration of the study and the number of primes.

Third, the study may be limited by some of the measures included. For example, the ECR (ECR-12; Wei et al., 2007) had lower reliability than expected. In their comprehensive review of attachment literature, Mikulincer and Shaver (2016) suggest a number of alternative adult attachment measures that can be used. Last, this study did not include a positive prime control

group. Some previous studies have identified positive affect priming to be as effective at improving mood as secure attachment priming. In order to effectively identify if there are any differences between secure and positive priming, future studies may need to compare between the effects of secure, positive but also neutral priming.

2.4.5 Strengths

This is the first study to explore attachment-priming impact on depression and anxiety in a clinical sample. Looking at existing literature, the number of studies conducted with clinical samples is limited (Mikulincer & Shaver, 2016). Conducting the study with a clinical sample has highlighted a number of aspects that would need to be considered in future research including the sample size and the methodology. Furthermore, this study shows that attachment priming works and that it can successfully reduce depression and anxiety symptoms (after the last prime), even in a sample with long-standing difficulties. Research supports the idea that repeated attachment priming is more likely to induce long-lasting effects than single priming (Brown, 1996). As changes in attachment patterns take time and require repeated patterns of interaction with caring individuals, it is likely that repeated attachment priming can be used to consolidate the effect of the initial prime over time. Although in the current study the follow up data does not indicate long-lasting effects, studies already show that repeated attachment priming can have long-lasting effects from the initial prime lasting for up to a week (Carnelley et al., 2016; Gillath & Shaver, 2007) or even 10 days (Sohlberg & Birgegard, 2003) after the last prime.

2.4.6 Mechanisms of Change

These findings indicate that visualisation of a secure attachment figure can have a positive impact on reducing symptoms of affective disorders whilst increasing *felt security.* It is however important to discuss some potential mechanisms of change. Current therapeutic approaches such as Cognitive Behavioural Therapy use imagery and visualisation as key interventions for treating a range of difficulties, especially anxiety disorders (Clark & Wells, 1995; Stopa, 2011). Images can be powerful tools when working with anxiety or depression as they often represent an individual's mental representation of self or the world but also contain personal meaning (Freeman, 2007). Images may also involve a range of sensory modalities such as physiological sensations, emotions or behaviours, and therefore trigger powerful emotional states (Holmes & Matthews, 2010).

One of the proposed mechanisms of change is related to the impact that the image has on the emotional systems in the brain as sensory information may trigger rapid responses from the parts of the brain involved in emotions, such as the amygdala (Holmes & Matthews, 2010). Furthermore, certain parts of the brain, which are developed pre-verbally, may respond quicker to images or sensorial information than they do to language (Holmes & Matthews, 2010). Brain imaging has revealed how visual mental imagery may activate areas of the brain that would also be activated by engaging in the same activities that were imagined (Kosslyn & Thomson, 2003). Vivid mental images may also be more likely to be remembered as true events (Johnson, 2013). Emerging neuroscience research shows for example how attachment experiences impact the brain and the body at a physiological level as the brain as structural and functional brain networks are shaped through repeated attachment related interactions (Svanberg, 2005). Attachment priming is similar in a way to other imagery-based interventions such as the compassionate mind (Gilbert & Irons, 2004) or self soothing (Kelly, Zuroff, & Shapira, 2009), interventions which have been identified as having a positive impact on the individual brain (e.g. such as on how the brain regulates emotion).

Another potential mechanism of change of priming may be explained by attachment-based therapy, where families support children in developing better attachment relationships through repeated positive and safe interaction (Hughes, 2004; Stern, 1985). *Attunement,* a key element in this therapy is represented by the intersubjective sharing of affect and positive interaction between two individuals (Stern, 1985).Visualising a positive interaction with an attachment figure may create a sense of *attunement* for participants. Schore (2013) hypothethised that this shared experience creates a *brain-to brain* interaction, which promotes brain development and facilitates the neural representations of attachment relationships as *attunement* has positive benefits such as affect regulation (Hughes, 2004). Initially this occurs in childhood where the child learns to regulate own affect through how the attachment figure regulates their own emotions. These learnt behaviours have an impact on the wiring of the brain, in a way that an individual develops emotional coping strategies through repeated interactions with attachment figures. This then helps the development of future social and emotional coping strategies (Schore, 2003). The child develops the ability to *mentalise* own experiences, or to make sense of their own emotional, physical, cognitive state (Gergely, Fonagy, Jurist, & Target, 2002). Attachment-based therapy aims at helping the client develop affect regulation (Fosha, 2003). Clients, with the help of the therapist are supported in experiences of *attunement* as well as with repairs of the therapeutic alliance when ruptures take place. Fosha suggests that a single relationship with a supportive, understanding other can counteract the effects of early attachment difficulties (Fosha, 2003).

Bowlby suggested that the first goal of attachment-based therapy should be inducing a sense of security, especially through the client accessing a '*reliable, attentive and sympathetically responsive*' therapist (Bowlby, 1988, p. 140), with the aim of supporting the client re-construct internal working models about self and others. The aim of the attachment priming is to induce that very sense of *felt security*, comfort and co-regulation through participants accessing the image of a potential caregiving attachment figure.

2.4.7 Clinical and Theoretical Implications

This study examined for the first time the effects of repeated security priming in a clinical sample, as a potential intervention for affective disorders. Security priming is a simple intervention which can be viewed as an 'addition' to existing treatments. Future research might follow up participants for longer and assess possible reasons for maintenance or non-maintenance effects, for example using a diary method. If this intervention was applied successfully in primary care services, mental imagery could be included in alongside existing interventions. It would also be helpful for future research to focus more on the mechanisms of change related to imagery and symptoms of affective disorders. One of the things that would be helpful is to assess individual's ability to connect with the imagery task through rating the vividness of the image. This would maybe be helpful in determining if priming is more or less effective depending on how the individual is able to connect to the image in his mind.

Furthermore, as technology such as mobile phone and the internet are beginning to be used much more in health and mental care services (Krishna et al., 2009), this intervention would be low cost and could potentially be delivered solely online and by text, or in addition to existing interventions, making it accessible for services. Aguilera and Munoz (2011) report that patients attending a course of CBT benefited from receiving text messages in between appointments and this also strengthened the therapeutic alliance. Furthermore, a multi-site national study found that patients who experience a sense of felt-security in their interaction with their psychological therapist were more likely to improve faster than those who did not feel secure in the presence of their therapist (Zuroff & Blatt, 2006). This creates an ideal opportunity for continuing to develop the attachment priming methodology alongside treatments as usual and by employing the use of the Internet or mobile phones.

The current study investigated the impact of secure attachment priming in a specific sample from secondary care services. Due to the age and nature of mental health difficulties (length of diagnosis etc.), it is difficult to generalise these findings to different wider clinical groups. It would be beneficial to test this intervention with patients who have been diagnosed

with depression and anxiety from primary care services in order to test if short-term security priming is more effective when working with less severe presentations.

Looking at the selected attachment figures for the study, a number of participants selected siblings or friends. Although this is acceptable, it may be possible that participants selected someone that they are less often in touch with, hence the initial negative affect. It is likely that participants became sad at the thought that they do not see the attachment figure every day. Zeifman and Hazan (2008) talk about the transition through the different attachment figures at different life stages, from parents in childhood to spouses and partners in adulthood. They postulate that adults are more likely to have a partner as a key attachment figure rather than a family member. Future studies could explore the impact of attachment priming by priming an alternative attachment figure, similar to the one used in this study with participants who were not able to identify a secure attachment relationship in their life. It would be interesting to check if there are any differences in priming effect between someone choosing an attachment figure versus someone imagining an attachment figure.

2.4.8 Conclusion

These results need to be interpreted with caution due to the range of limitations discussed. This research follows from existing studies with non-clinical samples that identified secure attachment priming as having the potential to bring on a sense of security and comfort, which then supports one's emotional regulation, thus possibly having a positive impact on symptoms of anxiety and depression (Frederickson, 2001). This study is the first experimental study to explore and demonstrate the impact of attachment priming on symptoms of affective disorders in a clinical sample. Further research could continue to investigate the impacts of this type of intervention with different clinical samples. Studies should also explore the potential of running this study online, without participants having to attend laboratory sessions. This would be likely to increase accessibility and reduce dropout rates. Given the high prevalence of depressive disorders, high pressure on mental health services and the sub-optimal effectiveness of current pharmacological and psychological treatments, it seems important to further examine the effects of security priming in this context, particularly as it is easily administered, even by text, and can be used alongside other treatments.

Appendices

Appendix A Ethical Approval

RGO Ref: 8784

Project Title Exploring the Effects of Repeated Attachment Security Priming on Depressed Mood (in a clinical sample).

I am writing to confirm that the University of Southampton is prepared to act as Research Sponsor for this study under the terms of the Department of Health Research Governance Framework for Health and Social Care (2nd edition 2005).
http://www.dh.gov.uk/en/Aboutus/Researchanddevelopment/Researchgovernance/DH_400211

I would like to take this opportunity to remind you of your responsibilities under the terms of the Research Governance Framework Medicines for Human Use Act 2004 if conducting a clinical trial.

We encourage you to become fully conversant with the terms of the Research Governance Framework by referring to the Department of Health document which can be accessed at:
http://www.legislation.gov.uk/uksi/2004/1031/contents/made
http://www.legislation.gov.uk/uksi/2006/1928/contents/mad

The University of Southampton fulfils the role of Research Sponsor in ensuring management, monitoring and reporting arrangements for research. I understand that you will be acting as the Principal Investigator responsible for the daily management for this study, and that you will be providing regular reports on the progress of the study to the Research Governance Office on this basis.

Please also familiarise yourself with the Terms and Conditions of Sponsorship on our website:
http://www.soton.ac.uk/corporateservices/rgo/media/TCSpons%20(CTIMP)%20V2%2022011.do
http://www.soton.ac.uk/corporateservices/rgo/media/TCSpons%20(Non%20CTIMP)%20V2%20022011.doc

In this regard if your project involves NHS patients or resources please also be reminded that you may need a Research Passport to apply for an honorary research contract of employment. Information can be found on our website:
http://www.soton.ac.uk/corporateservices/rgo/respassport/about.htm

(...continued overleaf)

Corporate Services, University of Southampton, Highfield Campus, Southampton SO17 1BJ United Kingdom
Tel: +44 (0) 23 8059 4684 Fax: +44 (0) 23 8059 5781 www.southampton.ac.uk

Please send us a copy of your NHS REC and Trust approval letters when available.

Please do not hesitate to contact me should you require any additional information or support. May I also take this opportunity to wish you every success with your research.

Yours sincerely

Dr Martina Prude
Head of Research Governance
Tel: 023 8059 5058
email: rgoinfo@soton.ac.uk

Appendix B ERGO Approval Letter

From: Ergo <ergo@soton.ac.uk>
Date: Mon, 9 Sep 2013 15:44:00 +0000
To: (name and email of Supervisor>
Subject: Ethics ID:7534 has been reviewed and approved

Submission Number :7534
Submission Name: Exploring the effects of repeated attachment security priming on depressed mood (in a clinical sample). (Amendment 2)
This is email is to let you know one of your student submissions has been reviewed and approved by the ethics committee.

Please note that they cannot begin their research before they have had positive approval from the University of Southampton Research Governance Office (RGO) and Insurance Services. They should receive this via email within two working weeks. If there is a delay please email rgoinfo@soton.ac.uk.

ERGO: Ethics and Research Governance Online
http://www.ergo.soton.ac.uk

DO NOT REPLY TO THIS EMAIL

Appendix C NRES Approval Letter

Study title:	**Effects of repeated attachment security priming on depressed mood: a clinical study**
REC reference:	**12/SW/0309**
Protocol number:	**N/A**
IRAS Project Number	**113733**

Thank you for your letter of 14 November 2012, responding to the Committee's request for further information on the above research and submitting revised documentation.

The further information was considered in correspondence by a sub-committee of the REC. A list of the sub-committee members is attached.

We plan to publish your research summary wording for the above study on the NRES website, together with your contact details, unless you expressly withhold permission to do so. Publication will be no earlier than three months from the date of this favourable opinion letter. Should you wish to provide a substitute contact point, require further information, or wish to withhold permission to publish, please contact the Co-ordinator Mrs Naazneen Nathoo, nrescommittee.southwest-bristol@nhs.net.

Confirmation of ethical opinion

On behalf of the Committee, I am pleased to confirm a favourable ethical opinion for the above research on the basis described in the application form, protocol and supporting documentation as revised, subject to the conditions specified below.

Ethical review of research sites

NHS sites

The favourable opinion applies to all NHS sites taking part in the study, subject to management permission being obtained from the NHS/HSC R&D office prior to the start of the study (see "Conditions of the favourable opinion" below).

Non-NHS sites

The Committee has not yet been notified of the outcome of any site-specific assessment (SSA) for the non-NHS research site(s) taking part in this study. The favourable opinion does not therefore apply to any non-NHS site at present. We will write to you again as soon as one Research Ethics Committee has notified the outcome of a SSA. In the meantime no study procedures should be initiated at non-NHS sites.

Conditions of the favourable opinion

The favourable opinion is subject to the following conditions being met prior to the start of the study.

Please advise the Committee what arrangements are in place for supervising the first few interviews to be undertaken by you.

Management permission or approval must be obtained from each host organisation prior to the start of the study at the site concerned.

Management permission ("R&D approval") should be sought from all NHS organisations involved in the study in accordance with NHS research governance arrangements.

Guidance on applying for NHS permission for research is available in the Integrated Research Application System or at http://www.rdforum.nhs.uk.

Where a NHS organisation's role in the study is limited to identifying and referring potential participants to research sites ("participant identification centre"), guidance should be sought from the R&D office on the information it requires to give permission for this activity.

For non-NHS sites, site management permission should be obtained in accordance with the procedures of the relevant host organisation.

Sponsors are not required to notify the Committee of approvals from host organisations

It is the responsibility of the sponsor to ensure that all the conditions are complied with before the start of the study or its initiation at a particular site (as applicable).

Appendix D Participant Characteristics

Self-reported Diagnosis

	Frequency	Percent	Valid Percent	Cumulative Percent
Did not answer	3	5.8	5.8	5.8
Depression	14	26.9	26.9	32.7
Depression and OCD	1	1.9	1.9	34.6
Depression, anxiety, OCD	1	1.9	1.9	36.5
Depression, anxiety, panic attacks	1	1.9	1.9	38.5
Depression, anxiety, PTSD, Agoraphobia	1	1.9	1.9	40.4
Depression, bereavement	1	1.9	1.9	42.3
Depression, bereavement, alcohol misuse	1	1.9	1.9	44.2
Depression, panic attacks, anxiety, bereavement	1	1.9	1.9	46.2
Depression, self-harm	1	1.9	1.9	48.1
Generalised anxiety disorder	2	3.8	3.8	51.9
Mixed anxiety and depression	13	25.0	25.0	76.9
Mixed anxiety and depression, overweight, physical health concerns	1	1.9	1.9	78.8
Mixed anxiey and depression, bereavement, PTSD	1	1.9	1.9	80.8
OCD, depression & anxiety	1	1.9	1.9	82.7
Recurrent depression, emotion regulation, binge eating disorder	1	1.9	1.9	84.6
Recurrent depressive disorder	4	7.7	7.7	92.3
Recurrent depressive disorder, panic disorder	1	1.9	1.9	94.2
Recurrent depressive disorder, anxiety, memory loss, panic attacks	1	1.9	1.9	96.2
Recurrent depressive disorder, Insomnia, Anxiety, Family difficulties	1	1.9	1.9	98.1
Severe depression	1	1.9	1.9	100.0
Total	52	100.0	100.0	

Duration Diagnosis

	Years	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2.00	1	1.9	2.3	2.3
	3.00	4	7.7	9.3	11.6
	4.00	2	3.8	4.7	16.3
	5 Years	5	9.6	11.6	27.9
	6.00	4	7.7	9.3	37.2
	7.00	2	3.8	4.7	41.9
	8.00	1	1.9	2.3	44.2
	10 Years	3	5.8	7.0	51.2
	12.00	2	3.8	4.7	55.8
	14.00	2	3.8	4.7	60.5
	15 Years	2	3.8	4.7	65.1
	19.00	2	3.8	4.7	69.8
	20 Years	2	3.8	4.7	74.4
	21.00	3	5.8	7.0	81.4
	23.00	1	1.9	2.3	83.7
	25 Years	1	1.9	2.3	86.0
	29.00	2	3.8	4.7	90.7
	30 Years	1	1.9	2.3	93.0
	40 Years	2	3.8	4.7	97.7
	45 Years	1	1.9	2.3	100.0
	Total	43	82.7	100.0	
Missing	System	9	17.3		
Total		52	100.0		

Past Interventions

	Frequency	Percent	Valid Percent	Cumulative %
	26	50.0	50.0	50.0
CBT	1	1.9	1.9	51.9
CBT, medication	1	1.9	1.9	53.8
CBT, medication	1	1.9	1.9	55.8
CBT, medication, mindfulness	1	1.9	1.9	57.7
Clinical psychology	1	1.9	1.9	59.6
ECT, medication, psychotherapy	1	1.9	1.9	61.5
Inpatient, 4 months; ECT, medication, CBT, psychotherapy 5 years, clinical psychology	1	1.9	1.9	63.5
Inpatient, CHMT	1	1.9	1.9	65.4
Medication	11	21.2	21.2	86.5
Medication, A&E, inpatient	1	1.9	1.9	88.5

Medication, psychotherapy, CBT, mindfulness, counselling	2	3.8	3.8	92.3
Psychology, mindfulness, CBT for OCD	1	1.9	1.9	94.2
Psychotherapy, medication	1	1.9	1.9	96.2
Therapies and medication	1	1.9	1.9	98.1
Various therapies, CBT, psychotherapy, Integrative therapy, Solution Focused Therapy, inpatient, private therapy	1	1.9	1.9	100.0
Total	52	100.0	100.0	

Chosen Attachment Figure

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		25	48.1	48.1	48.1
	Alternative	1	1.9	1.9	50.0
	Aunt	1	1.9	1.9	51.9
	Bestfriend	2	3.8	3.8	55.8
	Brother	2	3.8	3.8	59.6
	Daughter	1	1.9	1.9	61.5
	Daughter-in-law	1	1.9	1.9	63.5
	Friend	3	5.8	5.8	69.2
	Husband	5	9.6	9.6	78.8
	Mother	2	3.8	3.8	82.7
	Sister	3	5.8	5.8	88.5
	Therapist	1	1.9	1.9	90.4
	Wife	5	9.6	9.6	100.0

Appendix E Experience of Close Relationships

Short form of ECR:

1. I worry that romantic partners won't care about me as much as I care about them.
2. I want to get close to my partner, but I keep pulling back.
3. I am nervous when partners get too close to me.
4. My desire to be very close sometimes scares people away.
5. I try to avoid getting too close to my partner.
6. I need a lot of reassurance that I am loved by my partner.
7. I do not often worry about being abandoned.
8. I find that my partner(s) don't want to get as close as I would like.
9. I usually discuss my problems and concerns with my partner.
10. I get frustrated if romantic partners are not available when I need them.
11. It helps to turn to my romantic partner in times of need.
12. I turn to my partner for many things, including comfort and reassurance.

Participants how much they agree/disagree with each item using a 7-point Likert-type scale ranging from 1 (*disagree strongly*) to 7 (*agree strongly*).

Avoidance items: 2, 3, 5, 9(R), 11(R), 12(R)

Anxiety: items 1, 4, 6, 7(R), 8, 10

Appendix F Information about Attachment Figures

Please follow the instructions below carefully:

I. Please place the names of up to 10 people you regard as your **closest significant others** in the first column of the table on the following page (a through to j). Please only include people who you currently have a relationship with. Please don't include people you are unlikely to speak to, see face to face or have contact with in the foreseeable future.

II. In the second column please indicate **how this person is related to you** (e.g., parent, best friend, girlfriend).

III. In the third column indicate **which of the 4 descriptions** on the following page **best describes how you feel in each of the ten important relationships you listed**. To do this, place a 1, 2, 3, or 4 (representing a relationship description) next to the letters A through J.

IV. In the fourth column **please indicate the extent to which the description you have assigned to each relationship you listed is representative of how you feel in that relationship** by using the following scale: 1 = not very representative through 5 = very representative.

V. Finally, in the last two columns please indicate the **frequency of contact** you have with each listed person and the length of time you have known them.

Relationship Descriptions

1. It is easy for me to be emotionally close to this person. I am comfortable depending on this person and having her/him depend on me. I don't worry about being rejected or not accepted by this person.

2. I am comfortable without emotional closeness to this person. It is very important to me to feel independent and self-sufficient, and I prefer not to depend on this person or have her/him depend on me.

3. I want to be completely emotionally intimate with this person, but I often find that that this person is reluctant to get as close as I would like. I am uncomfortable being without closeness to this person, but I sometimes worry that she/he doesn't value me as much as I value him/her.

4. I am uncomfortable getting close to this person. I want to be emotionally close to him/her, but I find it difficult to trust her/him completely, or to depend on this person. I worry that I will be hurt if I allow myself to become too close to him/her.

Name/ Initials	**How is she/ he related to you? (mum, dad, etc.)**	**Relationship description (1, 2, 3, 4, from above)**	**How representative is the relationship description? (1 = not very 5 = very)**	**Frequency of contact** **1 = almost daily** **2 = at least once a week** **3 = at least once a month** **4 = 6-10 times per year** **5 = 3-4 times per year** **6 = twice a year** **7 = once a year** **8 = less than once a year**	**Length of time known (in years)**
a.					
b.					
c.					
d.					

Appendix G Profile of Mood States

During the introductory session (when we collect baseline depression measures) participants read the following instructions: “Below is a list of words that describe feelings that people have. Please read each word carefully. Then select the number that best describes how you have been feeling during the PAST WEEK, INCLUDING TODAY”.

At the other time points in the study (in which we collect state mood measures) participants read the following instructions: “Below is a list of words that describe feelings that people have. Please read each word carefully. Then select the number that best describes how you feel RIGHT NOW”.

Participants select a number on a 5-point Likert-type scale ranging from 0 (*Not at all*) to 4 (*Extremely*).

Depression items: 2,3, 5, 7, 9, 11, 14, 16, 17, 19, 20, 21, 22, 23, and 24.

Anxiety items: 1, 4, 6, 8, 10(reverse scored), 12, 13, 15, and 18.

1) Tense
2) Unhappy
3) Sorry for things done
4) Shaky
5) Sad
6) On edge
7) Blue
8) Panicky
9) Hopeless
10) Relaxed
11) Unworthy
12) Uneasy
13) Restless
14) Discouraged
15) Nervous
16) Lonely
17) Miserable
18) Anxious
19) Gloomy
20) Desperate
21) Helpless
22) Worthless
23) Terrified
24) Guilty

Appendix H Time 1 Primes

Secure Attachment Prime

The researchers are interested in people's ability to use their visualisation skills and imagination. You will be given a description of a relationship and asked to think about someone with whom you have experienced that kind of relationship. You will be asked to type what you are thinking about during the task.

Please think about a relationship you have had in which you found that it was relatively easy to get close to the other person and you felt comfortable depending on the other person. In this relationship you didn't often worry about being abandoned by the other person and you didn't worry about the other person getting too close to you.

Now take a moment to think about what it is like being in this relationship. What is it like being with this person who makes you feel safe and secure? You may want to remember a time when you were actually with this person. Try and get a visual image in your mind. What would he or she say to you? What would you say in return? How do you feel when you are with this person? How would you feel if they were here with you now?

Please type your thoughts in the space provided. You will have 10 minutes to complete this task. The computer timer will let you know when the 10 minutes are up. If you finish before the 10 minutes are up, please continue to think about the relationship and write down anything else that comes to mind about the relationship.

Alternative Secure Attachment Prime (for participants who are unable to list a secure attachment figure)

The researchers are interested in people's ability to use their visualisation skills and imagination. You will be given a description of a relationship and asked to imagine being in this kind of relationship. You will be asked to type what you are thinking about during the task.

Please imagine a relationship where you find it relatively easy to get close to the other person and you feel comfortable depending on the other person. In this relationship you don't often worry about being abandoned by the other person and you don't worry about the other person getting too close to you. You may have experienced such a relationship, either currently or in your past, but if not, try to imagine what such a relationship might be like.

Now take a moment to imagine what it would be like to be in such a relationship. What would it be like to be with a person who makes you feel safe and secure? Imagine you are actually with this person. Try and get a visual image in your mind. What would he or she say to you? What would you say in return? How do you feel when you are with this person? How would you feel if they were here with you now?

Please type your thoughts in the space provided. You will have 10 minutes to complete this task. The computer timer will let you know when the 10 minutes are up. If you finish before the 10 minutes are up, please continue to think about the imagined relationship and write down anything else that comes to mind.

Neutral Prime

The researchers are interested in people's ability to visualise their past experiences. You will be given a scenario and asked to remember and visualise the last time you were in that situation. You will be asked to type what you are thinking about during the task.

We now want you to complete a visualisation task. We would like you to write for 10 minutes about a supermarket scenario. Try to think of a particular time that you visited a supermarket to do a large or weekly shop and give information about the sequence of events that you completed as you moved around the store. For example, you may have selected a trolley and walked down the first aisle, picking up items as you went. Please try to give as much detail as possible about what you picked up or looked at, i.e., did you have to weigh an item or did you have to reach up to a top shelf?

Please type your thoughts in the space provided. You will have 10 minutes to complete this task. The computer timer will let you know when the 10 minutes are up. If you finish before the ten minutes are up, please continue to think about the scenario and write down anything else that comes to mind.

Appendix I Security "Boosters"

Text 1 (Secure)

Please spend 3 minutes thinking about the relationship that you visualised in the session on Thursday. Try and imagine that person encouraging you to feel safe, secure and comforted. What would they say or do? How would you feel? When finished, please reply "Done", along with any words or thoughts that came to mind during the task.

Text 1 (Neutral)

Please spend 3 minutes thinking about the route you take from home to the supermarket. Try and visualise the route you take and your surroundings. When finished, please reply "Done", along with any words or thoughts that came to mind during the task.

Text 2 (Secure)

Please spend 3 minutes thinking about the relationship that you visualised in the previous tasks. Try and imagine that person making you feel loved and valued. What would they do or say? How would you feel? When finished, please reply "Done", along with any words or thoughts that came to mind during the task.

Text 2 (Neutral)

Please spend 3 minutes thinking about a time you did some laundry. For example, did you sort the clothes by colour? How did you dry the clothes? When finished please reply "Done" along with any words or thoughts that came to mind during the task.

Text 3 (Secure)

Please spend 3 minutes imagining the person you visualised yesterday making you feel supported and good about yourself. What would they say or do? How would you feel? When finished please reply "Done", along with any words or thoughts that came to mind during the task. Immediately after you have replied, please check your email account, you will be directed to an online questionnaire, which you should complete ASAP. If participants have elected to fill out paper questionnaires they will be instructed to open and complete the appropriate questionnaire pack for that day, labelled "Sunday".

Text 3 (Neutral)

Please spend 3 minutes thinking about the route you take from the supermarket to home. Try and visualise the route you take and your surroundings. When finished please reply "Done"

along with any words or thoughts that came to mind during the task. Immediately after you have replied, please check your email account, you will be directed to an online questionnaire, which you should complete ASAP. If participants have elected to fill out paper questionnaires they will be instructed to open and complete the appropriate questionnaire pack for that day, labelled “Sunday”.

Text 4 (Secure and Neutral)

Please check your email account ASAP. Here you will be directed to the final online part of the study (If participants have elected to fill out paper questionnaires they will instead be instructed to open the questionnaire pack labelled by the appropriate day of the week).

Appendix J Felt Security Scale

1. Care

Please respond to the items below using the following 6-point rating scale.

1 2 3 4 5 6

Not at all Very much

Thinking about the person/scenario I described in the visualisation task makes me feel…

_____ Comforted

_____Supported

_____ Looked after

_____ Cared for

2. Safe

Please respond to the items below using the following 6-point rating scale.

1 2 3 4 5 6

Not at all Very much

Thinking about the person/scenario I described in the visualisation task makes me feel…

_____Secure

_____ Safe

_____ Protected

_____ Unthreatened

3. Self-Esteem

Please respond to the items below using the following 6-point rating scale.

1 2 3 4 5 6

Not at all Very much

Thinking about the person/scenario I described in the visualisation task makes me feel…

_____ Better about myself

_____ Valued

_____ More positive about myself

_____ I really like myself

4. Love

Please respond to the items below using the following 6-point rating scale.

1 2 3 4 5 6

Not at all Very much

Thinking about the person/scenario I described in the visualisation task makes me feel…

_____ Loved

_____ Cherished

_____ Treasured

_____ Adored

Appendix K Patient Info Sheet

Visualisation Study - Information for potential participants

Chief Investigator: (Name of Psychiatrist)

Principal Investigator: (Name of Trainee/ Researcher)

Co-investigators: (Name of Supervisor)

Invitation

You are being invited to participate in some research. Before you decide whether to participate, it is important for you to understand what your participation will involve. Please take time to read the following information carefully. Please ask us if there is anything that is not clear or if you would like further information.

Why am I being invited?

All patients who are being treated for unipolar depression by (name of psychiatrist) and his team at (CHMT) are being invited to participate. We hope that this research will help to advance knowledge of the causes and treatment of depression.

What is the purpose of the study?

The study primarily involves taking part in some short visualisation tasks and completing some questionnaires. During the visualisation tasks you will be asked to spend some time thinking about memories of people or situations you have experienced in the past. The aim is for you to get as involved in the tasks as possible, perhaps by closing your eyes and letting images come in to your mind, relating to that person or scenario. You will be asked to list the thoughts that come in to your mind as you think about a particular person or scenario.

Do I have to take part?

No. It is your choice whether you decide to take part or not. If you decide to take part, you will be given this information sheet to keep and you will be asked to sign a consent form. If you decide to take part in the study, you will still be free to withdraw from the research study at any time, and without giving a reason. This will not affect the continuing care that you receive from Professor Baldwin and his team. If you do not wish to take part in the research, simply do nothing.

If I agree to take part, what am I agreeing to do?

- You will be invited to meet with (name of researcher) at (CHMT) to complete the first part of the study. During this session she will talk you through the study in more detail and answer any questions you may have. You will also be asked to complete some questionnaires. This session will last approximately 30 minutes.
- Approximately one week later, you will meet with (name of researcher) again (at CHMT) and complete a short 10-minute visualisation task on a computer. You will also fill out a brief questionnaire. This session will take around 20 minutes. This is the last session with (name of researcher) that you would attend in person.
- On the following three days of the same week you will receive a visualisation task via text message (one task each day, with each task taking 3 minutes to complete). You will be asked to send a short reply to the texts. An example text task is: "Please spend 3 minutes thinking about the kitchen in your house. Try and visualise being in the room and your surroundings. When finished please reply "Done" along with any words or thoughts that came to mind during the task."
- After you receive your last text task, you will be asked (via text message) to complete a short (5 minute) questionnaire online, immediately afterwards (the link would be sent to your email account). If you prefer not to use email (name of researcher) can provide you with a paper questionnaire.
- Finally, on day five of the study, you will be asked (via text message) to complete the last online questionnaire (lasting approximately 5 minutes). Again, if you prefer not to use email, (name of researcher) can provide you with a paper questionnaire instead.
- As the text messages you will receive from the researcher are only meant for you, please ensure that you keep your phone in a secure place where others do not have access to it, or keep it on your person.

It is also important to remember that if you agree to take part in the study:

- You can decide to stop participating at any point.
- You need not answer questions that you do not wish to.
- Anything you tell us will be absolutely confidential.
- It will not be possible to identify anyone from our reports on the study.

Are there any risks involved?

During the course of the study you may be asked about your feelings and your relationships. Although this task is to think about positive things, and most people find it a pleasant

experience, some people might find it emotionally challenging. If you find yourself negatively affected by anything you are asked during the course of the study, or by any depression symptoms you may be experiencing, please contact your care co-ordinator. Also, please remember that you can stop participating in the research at any point. In the extremely unlikely event that any harm occurs to you as a direct result of your participation in this research, indemnity insurance has been provided through the University of Southampton.

Reimbursement of costs

You will be reimbursed for parking expenses and text message costs that are a result of your participation in this research (i.e., the cost of extra parking at (CHMT) and the cost of any text messages sent in reply to the researcher, as part of the research). You will not be reimbursed for travelling expenses, unless you have travelled to (CHMT) specifically to take part in the research (i.e., you did not have an appointment at the clinic immediately prior to participating in the research). In practice, this means that you will be reimbursed for travelling expenses for attending the second session with (name of researcher), but not the first introductory session.

Will my GP be contacted?

If you agree to take part, we will contact your GP to tell them that you are participating in this research.

Will the researchers look at my medical records?

Relevant sections of your medical notes may be looked at by individuals from the University of Southampton, from the NHS trust, or from regulatory authorities, where it is relevant to your taking part in this research. For example, we may need to know whether you are currently taking any medication. All information about you will be kept strictly confidential.

Would my data be kept confidential?

Yes. All information that will be collected about you during the course of the study will be kept strictly confidential within the limits of the law.

Any information about you will be coded with a number, rendering it anonymous. This means that you could not be recognised from it. Regulations require that any data will have to be stored for 15 years, but this would only be accessed by the researchers listed on this information sheet and would be destroyed after this time. The only situation in which confidentiality would be breached would be in the event that it was judged that someone was at immediate risk of serious harm (for example, if someone was seriously planning to end their life) or if we had concerns about harm to others. In these circumstances we would disclose information to your GP or the police if it were necessary to do so in order to safeguard the

person at risk. If you decide to withdraw from the study, we would like to be able to include and analyse your data up until the point at which you withdrew from the study. Your data would be kept confidential and anonymised as described above. However, if you would prefer that we do not use your data, please let Professor (name Psychiatrist) or another member of the research team know.

What would happen to the results of the research?

If the findings from this research are to be used as part of a research publication you will not be identifiable. If you wanted to have a copy of the published results, we would be pleased to send them to you when they become available. Simply let (name of researcher) or Professor (name of Psychiatrist) know if this is the case.

Who has reviewed the study?

This research has been reviewed and approved by the Psychology Ethics Committee at the University of Southampton (ERGO ID: 13400). If you have questions about your rights as a participant in this research, you may contact the Chair of the Ethics Committee, Psychology, University of Southampton, Southampton, SO17 1BJ, Phone: +44 (0)23 8059 3856, email fshs-rso@soton.ac.uk.

This research has also been reviewed by the National Research Ethics Committee South West – Central Bristol.

Contact for Further Information

If you have any further questions about this research, please feel free to contact (name of researcher) at (researcher)'s email) or on (telephone number).

If you wish to take part in the research, please return your signed informed consent form to (name of researcher), in the stamped addressed envelope provided. Please also provide a contact email address or telephone number, so that (name researcher) can contact you to arrange an appointment. Alternatively, you may contact (name researcher) directly to arrange an appointment at (email address) or by telephone.

Thank you for taking the time to read this information sheet and considering whether to take part. You will receive a copy of this information sheet and signed consent form to keep if you do decide to take part.

Feel free to show it to any health professional involved in your care and discuss it with friends and family before deciding whether to take part if you wish.

CONSENT TO RESEARCH FORM

Local Research Ethics Committee number: 13400

Title of Project: Visualisation Study.

Name of Researchers: Mrs. (name of researcher), Dr. (Name of Supervisor), Professor (name of Psychiatrist), Academic Centre, (CHMT with address).

Please initial the box that accompanies each statement.

1. I confirm that I have read and understand the participant information sheet 2 (dated 22/12/2014) for the above research participation. I have had the opportunity to consider the information, ask questions and have had these questions answered satisfactorily. ☐

2. I understand that my participation is voluntary and that I am free to withdraw at any t until my data have been irrevocably anonymised, without giving any reason, without my medical care or legal rights being affected. ☐

3. I understand that relevant sections of my medical notes and data collected during the course of this research may be looked at by individuals from the University of Southampton, from the NHS trust, or from regulatory authorities, only where it is relevant to my taking part in this research. I give permission for these individuals to have access to my records. ☐

4. I agree to my GP being informed of my participation in this research. ☐

5. I agree to take part in the above research study. ☐

_____	_____	_____
Name of Patient	Date	Signature
_____	_____	_____
Name of person taking consent	Date	Signature

Please provide your email address or telephone number below (so that (name of researcher) can contact you to arrange an appointment): ☐

For further details please contact (name of researcher) at the above address at the top of this form or at (email address)

Appendix L Letter to Participants

Dear Patient,

I am writing to invite you to participate in some research that is being conducted at (Name of CHMT), under the supervision of (Name of Psychiatrist).

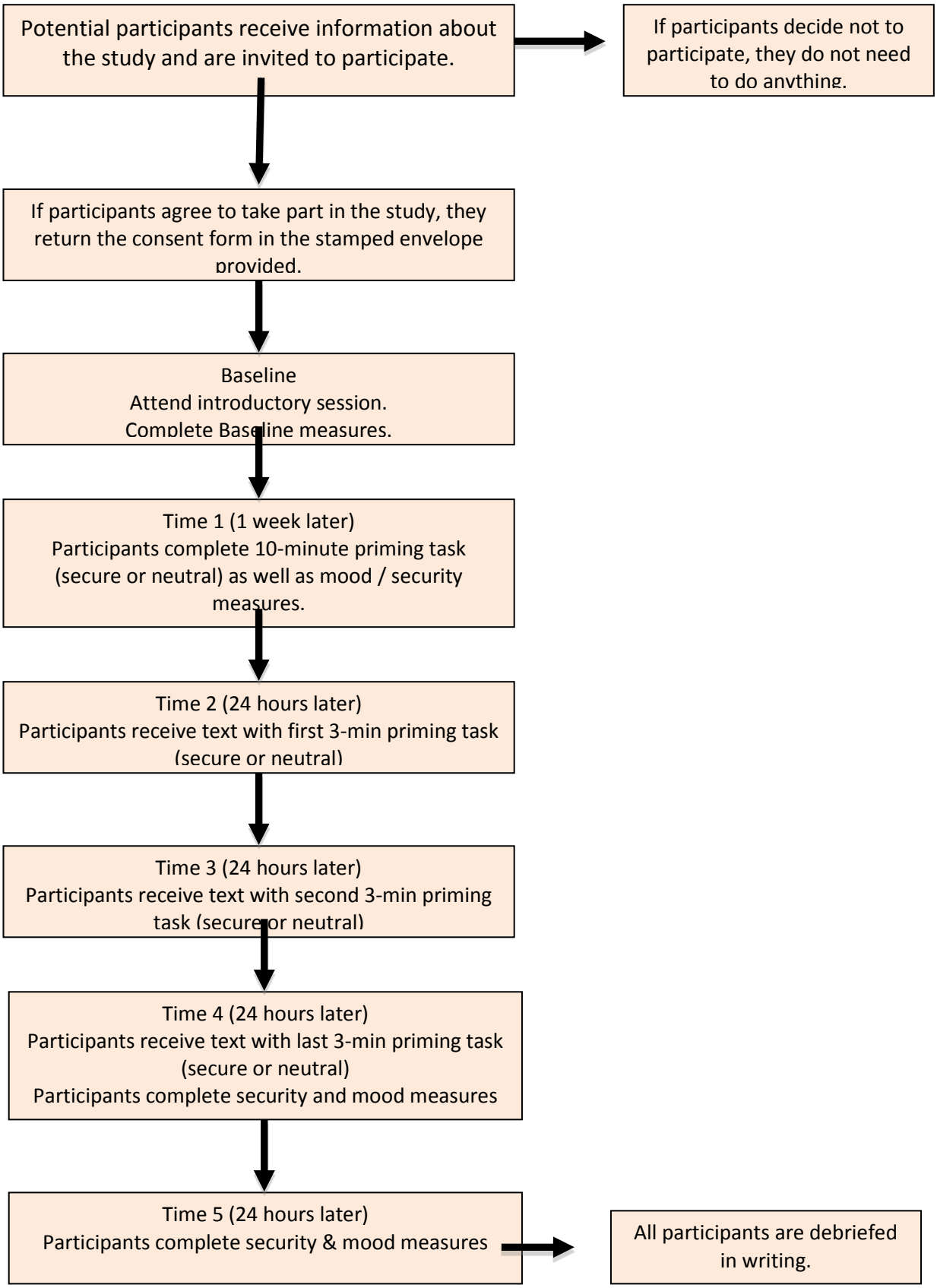
I would be most grateful if you could read through the enclosed information regarding the research I am carrying out. If you decide you would like to take part in the research, please complete and return the consent form in the stamped addressed envelope provided.

Yours Sincerely,

(name of trainee)

Trainee Clinical Psychologist

Appendix M Procedure



Appendix N Debriefing Statement

Debriefing Statement

Thank you for taking part in this research. The aim was to explore the relationship between adult attachment security and depression. You were randomly allocated to one of two visualisation conditions. This means that you were either asked to visualise experiences with a close significant other, or you were asked to visualise emotionally neutral tasks. This is so that we can compare the effects of these two types of visualisations on mood. Put simply, we were interested in exploring the effects of thinking about positive relationship experiences on people's feelings. Your data will help our understanding of these areas of research.

Published results of this study will not include your name or any other identifying characteristics. We did not deceive you in any way in this research. You may have a copy of this summary if you wish. You may also request a summary of the research findings of this project (once it is completed). If you require a copy of either document, please contact me at the email address below. Please do not disclose the purpose of this study to other potential participants as this may bias our results. If answering any of the questions on our questionnaires upset you, the following contact details may be of assistance. If you want to talk to someone about how you're feeling, or what you're experiencing, you can contact:

Samaritans - 08457 90 90 90/ NHS Direct - 0845 46 47. Both services are available 24 hours a day, 365 days a year.

As you already use NHS mental health services, your care co-ordinator will have provided you with details of what to do out-of-hours if you feel you need help. Remember: if it's an immediate, life-threatening situation always call 999.

If you have any further questions please contact me: (name and email of researcher) or the Chief Investigator of the study, Professor (name and email of Psychiatrist).

If you have questions about your rights as a participant in this research, or if you feel that you have been placed at risk, you may contact the Chair of the Ethics Committee, Psychology, University of Southampton, Southampton, SO17 1BJ, Phone: +44 (0)23 8059 3856, email fshs-rso@soton.ac.uk.

Appendix O Preliminary Analyses

Felt Security: Preliminary Analyses

Table 3 presents the descriptive statistics as well as the correlation between all variables. Attachment anxiety correlated with felt security at Time 4 and Time 5 therefore meeting the first assumption to be used as a covariate. Attachment anxiety correlated with felt security at Time 1. Baseline depression and baseline anxiety both correlated with felt security at Time 1, Time 4 and Time 5. Potential covariates have to be independent from experimental effects. Attachment anxiety, attachment avoidance, baseline depression and baseline anxiety were all independent from the experimental effect.

The final assumption for a potential covariate is the ANCOVA homogeneity of regression slopes. The ANCOVA model on SPSS was customised in order to explore this assumption. The within-subjects was the felt-security at the different Times (Time 1, 4 and 5) whereas condition was entered as between-subjects variable with attachment anxiety, attachment avoidance, baseline depression and baseline anxiety as covariates. The interaction between attachment anxiety and condition was not significant, F (1, 42) = .05, p = .83. As the homogeneity of regression slopes was met, attachment anxiety met all the assumptions to become a covariate. The interaction between attachment avoidance and condition was not significant, F(1,42) = .24, p = .63, indicating that the homogeneity of regression assumption was met and attachment avoidance was a suitable covariate. The interaction between baseline depression and condition was not significant F (1, 42) = .12, p = 73, thus baseline depression was also entered as a covariate in the main analysis. Baseline anxiety interaction with felt security was not significant, F(1,42) = .002, p = .96, thus baseline anxiety being considered a suitable covariate.

Table 5.

Descriptive Statistics and Correlations among All Variables

	Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13
1	AVO	3.21	1.26	1	-.001	.068	.168	.077	.058	.051	.116	-.068	.080	-.362**	-.062	-.197
2	ANX	3.58	1.40		1	.425**	.175	.155	.161	.422**	.260	.233	.161	-.191	-.305*	-.333*
3	BDEP	2.15	1.09			1	.804**	.668**	.691**	.769**	.616**	.531**	.444**	-.492**	-.482**	-.469**
4	T1D	1.93	1.09				1	.802**	.778**	.531**	.762**	.611**	.526**	-.585**	-.497**	-.407**
5	T4D	1.89	1.02					1	.895**	.517**	.616**	.822**	.669**	-.516**	-.646**	-.604**
6	T5D	1.84	.99						1	.500**	.578**	.720**	.726**	-.474**	-.580**	-.595**
7	BA	2.41	.96							1	.671**	.612**	.537**	-.484**	-.494**	-.460**
8	T1A	2.04	1.02								1	.754**	.614**	-.520**	-.452**	-.316*
9	T4A	1.97	1.01									1	.721**	-.442**	-.632**	-.529**
10	T5A	2.01	1.09										1	-.296*	-.462**	-.464**
11	T1S	3.16	1.12											1	.765**	.655**
12	T4S	3.34	1.10												1	.864**
13	T5S	3.17	1.14													1

Note: *N* = 52. AVO = attachment avoidance; ANX = attachment anxiety; BDDEP = baseline depression; T1D = depression at Time 1; T4D = depression at Time 4; T5D = depression at Time 5; BA = anxiety at baseline; T1A = anxiety at Time 1; T4A = anxiety at Time 4; T5A = anxiety at Time 5; T1S = felt security at Time 1; T4S = felt security at Time 4; T5S = felt security at Time 5.

*p <.05. **p < .01.

The data from the customised ANCOVA for felt security was saved and the normality of distribution across the error scores was analysed. Levene's test for Time 1 was not significant, that the error variances were not significantly different across conditions, F (1, 50) = .006, p = .93. For Time 4, Levene's test was again not significant, F (1, 50), = .00, p = .99. For Time 5, Levene's test was not significant for Time 5 felt security, F (1, 50) = .013, p = .91.

Table 6.

Summary of ANCOVA assumptions

DV	Potential Covariate	Correlated with DV	Independent from experimental effects?	Homogeneity
Felt Security	Attachment Anxiety	T1S, no T4S, T5S, yes	- yes F (1, 50) = .83, p = .24	- yes F (1, 42) = .05, p = .83
	Attachment Avoidance	T1S, yes T4S, T5S, no	yes F (1, 50) = 1.92, p = .20 -	yes F(1,42) = .24, p = .63 - -
	BL Depression	T1S, T4S, T5S, yes	yes F (1, 50) = 1.56, p = .34	yes F(1, 42) = .12, p = 73
	BL Anxiety	T1S, T4S, T5S, yes	yes F (1, 50) = 2.10, p = .36	yes F(1,42) = .002, p = .96
Depression	Attachment Anxiety	No	-	-
	Attachment Avoidance	No	-	-
	BL Depression	T1D, T4D, T5D, yes	yes F (1, 50) = 1.56, p = .34	yes F(1, 46) = .16, p = .69
	BL Anxiety	T1D, T4D, T5D, yes	yes F (1, 50) = 2.10, p = .36	yes F(1, 46) = .34, p = .56
Anxiety	Attachment Anxiety	No	-	-
	Attachment Avoidance	No	-	-
	BL Depression	T1A, T4A, T5A, yes	yes F (1, 50) = 1.56, p = .34	yes F(1, 46) = .11, p = .74
	BL Anxiety	T1A, T4A, T5A, yes	yes F (1, 50) = 2.10, p = .36	yes F(1, 46) = 1.44, p = .24

Note: DV = dependent variable; T = Time; BL = Baseline

Depression: Preliminary Analyses

Attachment anxiety and attachment avoidance did not correlate with the dependent variable at any time therefore did not meet the first assumption to become covariates (table x). Baseline depression correlated with depression at Time 1, 4 and 5. Baseline anxiety correlated with depression at Time 1, 4 and 5. Potential covariates have to be independent

from experimental effects. Baseline depression and baseline anxiety were both independent from experimental effects .

ANCOVA was next customised in SPSS in order to determine if the assumption of homogeneity of regression slopes was met. The within-factor was depressed mood (3 Levels, Time 1, 4 and 5); the between-subject variable was the experimental condition (2 Levels, prime and control). Baseline depression and baseline anxiety were covariates. The interaction between baseline depression and condition was not significant, $F(1, 46) = .16$, $p = .69$. The interaction between baseline anxiety and condition was not significant, $F(1, 46) = .34$, $p = .56$, indicating that the assumption of homogeneity of regression slopes was met for both baseline depression and baseline anxiety, thus both were entered as covariates in the main analysis.

Anxiety: Preliminary Analyses

Attachment anxiety and attachment avoidance were not correlated with the dependent variable therefore did not meet the requirements to be included as covariates in the analysis. Baseline depression and baseline anxiety correlated with anxiety at Time 1, Time 4 and Time 5 and were considered as potential covariates (Table 6). Potential covariates have to be independent from experimental effects. Baseline depression and baseline anxiety were both independent from the experimental effect, meeting the second ANCOVA assumption (Table 4).

ANCOVA was customised in SPSS in order to test the assumption of homogeneity of regression of slopes for baseline depression and baseline anxiety. The within-subjects variable was anxiety (3 levels: Time 1, 4 and 5) whereas condition was the between-subjects variable (2 levels: prime and control) with baseline anxiety and baseline depression as covariates. The interaction between baseline depression and baseline anxiety was not significant $F(1, 46) = .16$, $p = .69$., indicating that the assumption for homogeneity of regression slopes was met. Both baseline depression and baseline anxiety met all the assumptions and were entered in the main model as covariates (Table 4). The interaction between baseline depression and condition was not significant, $F(1, 46) = .11$, $p = .74$. The interaction between baseline anxiety and condition was not significant, $F(1, 46) = .1.44$, $p = .24$, indicating that the assumption of homogeneity of regression slopes was met for both baseline depression and baseline anxiety (Table 7).

Table 7

Means for each condition

DV	Felt Security		Depression		Anxiety	
IV	**Experiment**	**Control**	**Experiment**	**Control**	**Experiment**	**Control**
Baseline	Not measured		2.02	2.28	2.29	2.49
T1	3.51	2.79	1.79	2.08	1.87	2.21
T4	3.66	2.98	1.58	2.22	1.65	2.33
T5	3.38	2.94	1.63	2.07	1.91	2.12

List of References

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