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Attachment styles and secure base priming in relation to emotional reactivity after frustration induction

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ABSTRACT
In two experimental studies, we explored the role of attachment in predicting emotional reactivity after frustration induction. In the first study, using a cognitive frustration task, we examined in a college sample \((N = 134)\) how attachment styles related to the experience and expression of emotions after frustration induction. In the second study, we investigated in college students \((N = 198)\) the effect of conscious priming of the secure base schema on mood disturbance after the performance of a cognitive frustration task. Results showed that individuals experienced and expressed emotions after frustration induction independent of their attachment styles. Conscious priming of the secure base script attenuated self-reported emotional reactivity after frustration induction independent of individuals’ attachment styles. These findings suggest that the mechanism of attachment-related emotional reactivity might not pertain to frustration during an unsolvable cognitive task, but that the activation of the sense of having a secure base is useful in reducing mood disturbance in the context of a frustrating performance task.

Attachment styles are suggested to relate to behaviours aimed at establishing proximity to external or internalised attachment figures when under threat, which can be linked to the emotion regulation strategies an individual employs when experiencing distress (Bowlby, 1982; Shaver & Mikulincer, 2002). Experimental studies have examined associations between attachment styles and emotional reactivity in response to emotion induction (e.g. Mikulincer, Gillath, & Shaver, 2002; Pereg & Mikulincer, 2004). However, associations between attachment styles and emotional reactivity after the induction of frustration are currently understudied. Furthermore, although there is evidence that a sense of a secure base can be experimentally activated, affecting individuals’ emotions and responses to a stressful event (e.g. Mikulincer & Shaver, 2001; Pierce & Lydon, 1998), effects after frustration induction are still unknown. Therefore, the present research aims to examine associations between attachment styles and emotional reactivity (Study 1) and the effect of secure base priming on emotional reactivity (Study 2) after frustration induction.

According to adult attachment theory, internal working models are formed during early childhood and act as prototypes for relationships in and outside the family later in life (Bowlby, 1982; Hazan & Shaver, 1987). Adult attachment styles can be described in terms of two dimensions: (1) attachment anxiety, characterised by fear of rejection and preoccupation with relationships, and (2) attachment avoidance, characterised by discomfort with closeness and intimacy, because of which an individual does not share thoughts, feelings, and emotions with others (Brennan, Clark, & Shaver, 1998; Shaver & Mikulincer, 2002). Attachment styles are proposed to relate to the individual’s tendency to cope with stressors by seeking support from external or internalised...
attachment figures (Bowlby, 1982; Mikulincer & Shaver, 2007; Shaver & Mikulincer, 2002). When confronted with a threat, individuals who score high on attachment anxiety consider support seeking as a viable option, although accompanied with worries about being separated from the attachment figure. They tend to apply hyperactivating strategies, involving emotional and hypersensitive proximity-seeking reactions, such as distress exacerbation, hypervigilance, and rumination (Mikulincer & Shaver, 2007; Shaver & Mikulincer, 2002). In contrast, for individuals high on attachment avoidance who are confronted with a threat, support seeking is not a viable option. They rather tend to handle the distress on their own by applying deactivating strategies, involving suppression of the threat and down-regulation of emotions to distance themselves from the source of stress and the attachment figure (Mikulincer & Shaver, 2007; Shaver & Mikulincer, 2002).

Several studies found associations between attachment style and emotional reactivity in line with the theory of hyperactivating and deactivating strategies as a function of attachment anxiety and avoidance respectively (e.g. Bailey, Paret, Battista, & Xue, 2012; Fraley & Shaver, 1997; Mikulincer et al., 2002; Pereg & Mikulincer, 2004). For example, anxiously attached people had difficulties suppressing negative thoughts and emotions, whereas avoidantly attached people tended to suppress negative thoughts and emotions (Fraley & Shaver, 1997). Effects of attachment styles, in particular, have been demonstrated for negative emotions (Carnelley, Israel, & Brennan, 2007; Gentzler, Kerns, & Keener, 2010), whereas positive emotions have been less thoroughly examined.

However, other studies reported findings, seemingly inconsistent with hyperactivation as a function of attachment anxiety or deactivation as a function of attachment avoidance (e.g. DeWitte & De Houwer, 2008; DeWitte, Koster, De Houwer, & Buyse, 2007; Donges, Zeitschel, Kersting, & Suslow, 2015; Fraley, Garner, & Shaver, 2000; Maier et al., 2005; Mikulincer & Orbach, 1995; Niedenthal, Brauer, Robin, & Innesker, 2002). For example, studies found anxiously attached individuals to inhibit their attention to attachment-related threat words (DeWitte & De Houwer, 2008; DeWitte et al., 2007), and avoidantly attached individuals to be hypervigilant to emotional stimuli (Donges et al., 2015; Maier et al., 2005; Niedenthal et al., 2002). With respect to positive emotions, Gentzler and Kerns (2006), who studied daily reports of events, demonstrated that attachment anxiety and attachment avoidance were both negatively related to the level of recalled positive emotions, although for attachment avoidance only in respect to positive interpersonal events.

Previous studies generally measured attention, thoughts, recognition, or vigilance to emotional stimuli, rather than emotion experience or expression (see Vrtička, Sander, & Vuilleumier, 2012). Hypervigilance for negative information has been explained as a prerequisite for successful avoidance (Maier et al., 2005), which could explain some discrepant study findings. Moreover, neurobiological studies showed that among individuals scoring high on attachment avoidance, suppression of negative thoughts did not fully deactivate certain brain regions associated with suppression (i.e. subcallosal cingulate cortex; lateral prefrontal cortex), and that suppression was not successful when a cognitive load was added to a suppression task (Gillath, Bunge, Shaver, Wendelken, & Mikulincer, 2005; Mikulincer, Birnbaum, Woddis, & Nachmias, 2000).

In the present research, we examine emotional reactivity (i.e. emotion experience and expression) during the performance of a frustration task, i.e. an unsolvable anagram task. Frustration can evoke anger because the fulfilment of a task is blocked (Lawrence, 2006). However, anger is a complex emotion with a multifaceted nature, which can be distinguished according to the degree that it is motivated by constructive or destructive goals (Mikulincer & Shaver, 2007). It may elicit positive or negative responses that are expressed in functional or dysfunctional ways and can have positive and negative effects on relationships (see Mikulincer & Shaver, 2007). Frustration needs to be distinguished from provocation because the anger elicited by frustration is not directed to other people (Lawrence, 2006). In the context of task performance, disappointment and fear of failure may play a role (Harrington, 2005; Zimmermann, Maier, Winter, & Grossmann, 2001). A frustration task might elicit an individual’s attachment-related support seeking tendencies, reflected in his or hers emotional reactivity. However, this has hardly been examined until now. In a study measuring disruptive behaviour in adolescents who performed a difficult, frustrating cognitive task with the help of a friend, disappointment and anger appeared associated with more frequent disruptive behaviour among insecurely attached individuals and less disruptive behaviour among securely attached individuals (Zimmermann et al., 2001). It is questionable whether deactivation can be found in individuals...
high on attachment avoidance who perform a non-social frustration task because a cognitive load might interfere with suppression (Mikulincer et al., 2000; Szasz, Szentagotai, & Hofmann, 2011).

Several previous studies examined anger-triggering situations in a social context. Avoidantly attached individuals have been found to not report intense anger in response to another person’s negative behaviour, but to display intense physiological arousal (Mikulincer, 1998). Roiles, Simpson, and Orina (1999) observed couples in an anxiety-provoking situation and found more avoidantly attached individuals to express greater anger. Diamond and Hicks (2005) showed that attachment anxiety was positively associated with self-reported distress and anger during and after anger-inducing tasks, also expressed by their vagal tone. Studies further report that anxiously and avoidantly attached individuals’ facial expressions were incongruent with the emotional situation, which might reflect anxiously attached individuals’ confusion and emotional dysregulation and avoidantly attached individuals’ attempts to block negative emotions (Roisman, Tsai, & Chiang, 2004; Sonnby-Borgström & Jönsson, 2004).

An alternative approach to getting more insight into the relation between frustration, attachment, and emotional reactivity is to activate a sense of a secure base by actual or imagined interactions with available or supportive others (Baldwin, 1992; Mikulincer & Shaver, 2001). To the best of our knowledge, effects of secure base priming during the performance of a frustration task have never been examined before.

We designed two experimental studies to examine the associations between attachment styles and emotional reactivity in response to induced frustration. Because gender differences are reported for attachment styles and emotional expressivity (Becht & Vingerhoets, 2002; Bekker, Bachrach, & Croon, 2007), we controlled for gender in our studies. We evaluated whether attachment anxiety and attachment avoidance were associated with emotional reactivity during a cognitive frustration task, measured as self-reported and expressed intensity of negative and positive emotions (Study 1). Furthermore, we examined whether secure base priming attenuated emotional reactivity in response to induced frustration (Study 2). Because secure base priming was expected to have a broad effect on emotion experience, supporting an individual maintaining his or her well-being (Mikulincer & Shaver, 2001), we applied a more general approach in this study and examined self-reported emotional reactivity in the form of total mood disturbance.

**Study 1**

We tested relations between attachment styles and emotional reactivity (self-reported and expressed) after frustration induction using a non-social cognitive frustration task, taking into account gender of the participants. We hypothesised that both attachment anxiety and attachment avoidance were positively related to self-reported intensity of negative emotions during the frustration task. Attachment anxiety was expected to be positively related to expressed intensity of negative emotions during the frustration task, reflecting support seeking tendencies. We did not have clear expectations for the association between attachment avoidance and expressed intensity of negative emotions during the frustration task because the cognitive load of the task might interfere with suppression (Mikulincer et al., 2000; Szasz et al., 2011). Further, associations with self-reported and expressed intensity of positive emotions were explored.
Method

We report how we determined our sample size, all data exclusions (if any), all manipulations, and all measures in the study.

Participants

Participants were 134 Dutch undergraduate psychology students (105 first-year students; 102 women, 32 men), aged between 18 and 41 years ($M = 20.06$, $SD = 3.31$). Power analysis using G*Power 3.1 (Faul, Erdfelder, Buchner, & Lang, 2009), based on analysis of variance repeated measures within–between interaction design, closely related to our analysis (2 groups, 2 measurements), suggested 54 participants to detect medium effects ($f = .25$) with a statistical power of .95 and a significance level set at .05. Medium effects were expected based on results of previous studies investigating effects of attachment styles on emotional reactivity (Fraley & Shaver, 1997; Mikulincer et al., 2002). We used a conservative approach by recruiting a larger number of participants, having sufficient power to detect potential smaller effects and being able to test interaction effects with attachment styles in our analyses. There were no age differences between men and women. The great majority of the participants (97%), as well as their mothers (90.3%) and fathers (91%), were of Dutch origin. None of the participants had children, 96.3% had at least one sibling, and 50.7% were involved in a romantic relationship of up to 6.5 years ($M = 24.10$ months, $SD = 17.12$). Half of the participants (50%) lived with at least one of their parents, 7.5% lived with their partner, 23.9% lived alone, and 18.7% lived elsewhere. Participants voluntarily enrolled in the study and received course credits for participation.

Procedure

Participants were randomly assigned to one of two conditions—the neutral or the frustration condition. The participant was informed that (s)he would also be videotaped during the experiment. Questions on demography were completed on the computer and baseline emotion experience was measured during a task in which the participant copied 35 words shown on the computer screen, all referring to furniture. Next, the anagram task of the targeted condition started, and emotion experience was measured again. Subsequently, a questionnaire on attachment styles was completed. Finally, an informed consent form and a confidentiality agreement were signed. Videotapes were coded afterward by a team of trained coders. Emotions expressed at baseline and during the anagram task were observed.

Materials

Attachment styles

The 29-item Attachment Style Questionnaire Short Form (ASQ-SF; Karantzas, Feeney, & Wilkinson, 2010) was used to measure attachment avoidance (16 items, e.g. “I find it hard to trust other people”) and attachment anxiety (13 items, e.g. “I wonder why people would want to be involved with me”). Items were rated on a 6-point Likert scale, ranging from 1 (totally disagree) to 6 (totally agree). The ASQ-SF has been shown to be a more parsimonious measure than the full ASQ, showing good fit of the two-factor structure (Karantzas et al., 2010). The back translation procedure was used for the development of the Dutch version (Bekker et al., 2007). In the present study, Cronbach’s alpha values were .86 for attachment avoidance and .84 for attachment anxiety.

Anagram task

The anagram task was created and pilot tested for both the neutral and frustration condition. Stressful anagram tasks have been used in prior emotion regulation research to elicit frustration and anxiety (e.g. Johnson, 2009). Participants had to unscramble a group of letters to make a word. In both conditions, the words were in the category of animals. The same example was given in both conditions (“Of ‘kip’ you can make the word ‘kip’”, the Dutch word for “chicken”). The neutral condition consisted of 35 easily solvable anagrams of three or more letters. When containing more than three letters, the first letter of the solution was presented. Participants solved all anagrams, with no time-limit set. They were instructed to skip the words they could not solve. The frustration condition consisted of 21 anagrams of four or more letters. Again for some words, the first letter of the solution was presented. Some anagrams were very difficult but solvable, others were unsolvable, to ensure that each participant was blocked in his/her goal of finishing the puzzle. To increase frustration, a time-limit of four minutes was set. Participants were told that solving anagrams requires essential cognitive abilities, and that research has shown that university students should be able to solve these anagrams within four minutes.
Self-reported intensity of emotions
Just after typing words of the baseline measure, participants rated to what extent they experienced each of seven emotions: anger, confusion, fear, amusement, happiness, interest, and sadness (Ekman, 1992). Immediately after the anagram task, participants rated to what extent they experienced the same seven emotions when performing the task. Emotions were rated using an anchored 9-point Likert scale, ranging from 1 (not at all) to 9 (very much). Emotion scores were averaged to create variables for positive emotions (amusement, happiness, and interest; baseline $a = .72$, task $a = .83$) and negative emotions (anger, confusion, fear, and sadness; baseline $a = .77$, task $a = .70$).

Expressed intensity of emotions
The Emotional Expressive Behavior (EEB; Gross & Levenson, 1997) coding system was used to score emotions, after translation into Dutch and pilot testing. Six codes, of which also self-report ratings were available, were used: anger, confusion, fear, amusement/happiness, interest, and sadness. A four-point Likert scale enabled the coder to register the intensity of emotional expressivity from 0 (mild) to 3 (strong). Three trained master’s students in psychology (1 men, 2 women) scored the video materials, blind to the participants’ conditions. Two variables were created for both baseline and frustration ratings by averaging codes for positive emotions (happiness/amusement and interest) and negative emotions (anger, confusion, fear, and sadness). Interrater reliability for each pair of coders was based on 21% of all cases. Gamma was used as a measure of reliability because it is a statistic that controls for chance agreement and is appropriate for ordinal data (Liebertau, 1983). Average Gamma was .82 for positive emotions (.88 for happiness/amusement, .76 for interest), and .99 for negative emotions (1.00 for anger, .97 for confusion, 1.00 for fear, 1.00 for sadness).

Statistical analyses
Our hypotheses were evaluated using the linear mixed models (LMMs) procedure in SPSS. LMMs are appropriate for analyzing data with repeated measurements because they accommodate the dependency in the data (West, 2009). The parsimonious covariance structure of compound symmetry was used for the analyses, which assumes equal covariances for all combinations of repeated measures as well as equal variances. The models, estimated using the maximum likelihood procedure, included a random term for the participant, fixed terms for the effects of theoretical interest, and interactions. Only the fixed intercept was entered in the models.

First, we examined the self-reported intensity of negative emotions at baseline and after the frustration task as the outcome variable and included time, experimental condition, and gender as factors, and the continuous attachment anxiety and attachment avoidance scores as covariates. Only the interactions of interest were included: time × condition, attachment anxiety × condition, attachment anxiety × time, and attachment anxiety × condition × time. Continuous variables were centred before analysis. In the case of a non-significant three-way interaction, the analysis was rerun without including the three-way interaction term. Next, we conducted the same analysis, now including interactions with attachment avoidance instead of attachment anxiety.

Simple effects tests were conducted for the interpretation of the two-way interaction effects between categorical variables, based on pairwise comparisons among the estimated marginal means. All simple effects tests referred to were Bonferroni tests to adjust for the number of comparisons. To decompose two-way interaction effects with continuous attachment style scores, follow-up LMMs were conducted for each condition separately. Significant three-way interactions with attachment style were interpreted based on follow-up LMMs for high (> 1 SD above the mean) and low (< 1 SD below the mean) values of attachment styles.

Results
Descriptive analyses
Based on visual inspection of box plots, six outliers were identified, concerning the variables baseline self-reported intensity of negative emotions and baseline expressed intensity of positive emotions. Further inspection of the outliers revealed that the scores represented valid responses from participants, because of which we retained these outliers. Table 1 presents the descriptives and correlations among the variables at baseline. There were missings in the observational data, because of camera problems ($n = 18$) and because some participants did not give permission to be videotaped ($n = 6$). T-tests showed that of all combinations of repeated measures as well as equal variances. The models, estimated using the maximum likelihood procedure, included a random term for the participant, fixed terms for the effects of theoretical interest, and interactions. Only the fixed intercept was entered in the models.

First, we examined the self-reported intensity of negative emotions at baseline and after the frustration task as the outcome variable and included time, experimental condition, and gender as factors, and the continuous attachment anxiety and attachment avoidance scores as covariates. Only the interactions of interest were included: time × condition, attachment anxiety × condition, attachment anxiety × time, and attachment anxiety × condition × time. Continuous variables were centred before analysis. In the case of a non-significant three-way interaction, the analysis was rerun without including the three-way interaction term. Next, we conducted the same analysis, now including interactions with attachment avoidance instead of attachment anxiety.

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variables measured at Time 1 only self-reported intensity of negative emotions was higher in the neutral condition, $M = 1.92, SD = 1.22$, than in the frustration condition, $M = 1.75, SD = 0.75$, $t(109.41) = 2.14, p = 0.035$. MANCOVA revealed a significant effect of condition on self-reported intensity of negative emotions, $F(1, 129) = 168.54, p < .001, \eta^2_p = .57$, but not on self-reported intensity of positive emotions, $F(1, 129) = 0.012, p = .91, \eta^2_p < .001$. Not surprisingly, the frustration task induced more negative emotions than the neutral task, denoting a successful manipulation. No effect of gender was found.

### Attachment styles and emotional reactivity

**Self-reported intensity of negative emotions**

We first examined associations between attachment styles and self-reported intensity of negative emotions after frustration induction. The analysis including interaction terms with attachment anxiety revealed significant main effects of attachment anxiety, $F(1, 134) = 13.02, p < .001$, time, $F(1, 134) = 71.79, p < .001$, and condition, $F(1, 134) = 29.23, p < .001$. More precisely, attachment anxiety was positively associated with self-reported intensity of negative emotions, self-reported intensity of negative emotions increased from Time 1 to Time 2, and self-reported intensity of negative emotions was higher in the frustration condition than in the neutral condition. Also, a significant two-way time $\times$ condition interaction effect, $F(1, 134) = 141.06, p < .001$, was found. Simple effects tests indicated that self-reported intensity of negative emotions decreased in the neutral condition, $M_{\text{difference}} = -.29, F(1, 134) = 5.79, p = .017$, but increased in the frustration condition, $M_{\text{difference}} = 1.75, F(1, 134) = 207.03, p < .001$. Moreover, we found a three-way time $\times$ condition $\times$ attachment anxiety interaction effect, $F(1, 134) = 7.45, p = .007$. Simple effects tests of the follow-up LMMs revealed that individuals who scored high on attachment anxiety experienced a decrease in intensity of negative emotions in the neutral condition, $M_{\text{difference}} = -0.97, F(1, 23) = 5.89, p = .02$, in contrast to individuals who scored low on attachment anxiety, $M_{\text{difference}} = 0.10, F(1, 20) = .11, p = .75$. In the frustration condition, increased intensity of negative emotions was experienced by individuals scoring high, $M_{\text{difference}} = 2.11, F(1, 23) = 30.90, p < .001$, and low, $M_{\text{difference}} = 1.90, F(1, 20) = 45.95, p < .001$, on attachment anxiety.

The analysis including interaction terms with attachment avoidance only revealed significant main effects of attachment anxiety, $F(1, 134) = 13.05, p < .001$, time, $F(1, 134) = 64.04, p < .001$, and condition, $F(1, 134) = 29.27, p < .001$, and a significant interaction effect between time and condition, $F(1, 134) = 135.24, p < .001$. No significant effects of attachment avoidance were found.

**Self-reported intensity of positive emotions**

We explored associations between attachment styles and self-reported intensity of positive emotions after frustration induction. In the analysis testing interactions with attachment anxiety, only a significant main effect of time, $F(1, 134) = 67.89, p < .001$, was found. Across conditions, the intensity of positive emotions decreased over time.

In the analyses testing interactions with attachment avoidance, a significant main effect of time, $F(1, 134) = 68.18, p < .001$, and a two-way condition $\times$ attachment avoidance interaction effect, $F(1, 134) = 4.66, p = .03$, were found. Follow-up LMMs for each condition separately showed that individuals scoring

| Table 1. Descriptives and correlations among all variables at baseline for Study 1. |
|-------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 1. Attachment anxiety | – |
| 2. Attachment avoidance | .54*** |
| 3. Gender | .08 |
| 4. Baseline negative emotions (S) | .40*** |
| 5. Baseline positive emotions (S) | .04 |
| 6. Baseline negative emotions (E) | .08 |
| 7. Baseline positive emotions (E) | .07 |
| M | 2.90 |
| SD | 0.75 |
| N | 134 |

Note: S = self-reported, E = expressed.

*p < .05.

**p < .01.

***p < .001.
higher on attachment avoidance showed a trend towards reporting lower intensity of positive emotions in the neutral condition, \(F(1, 67) = 3.77, p = .056\), but not in the frustration condition, \(F(1, 67) = 0.02, p = .90\).

**Expressed intensity of negative emotions**
We furthermore examined associations between attachment styles and expressed intensity of negative emotions after frustration induction. No effects were found for attachment styles. Significant main effects of time, \(F(1, 110) = 28.04, p < .001\), condition, \(F(1, 110) = 18.88, p < .001\), and a two-way time \(\times\) condition interaction effect, \(F(1, 110) = 20.91, p < .001\), were found. Simple effects tests indicated that expressed intensity of negative emotions increased in the frustration condition, \(M_{\text{difference}} = 0.24, F(1, 110) = 48.76, p < .001\), but not in the control condition, \(M_{\text{difference}} = 0.02, F(1, 110) = 0.25, p = .62\).

**Expressed intensity of positive emotions**
We also explored effects of attachment styles in relation to expressed positive emotions after frustration induction. These analyses also revealed no effects for attachment styles. Significant main effects of time, \(F(1, 110) = 34.47, p < .001\), and condition, \(F(1, 110) = 16.66, p < .001\), and a two-way interaction effect between time and condition, \(F(1, 110) = 9.87, p = .002\), were found. Simple effects tests showed that expressed intensity of positive emotions increased significantly in the frustration condition, \(M_{\text{difference}} = 0.34, F(1, 110) = 40.42, p < .001\), and marginally significantly in the control condition, \(M_{\text{difference}} = 0.10, F(1, 110) = 3.64, p = .059\).

**Discussion**
Contrary to expectations, self-reported and expressed intensity of negative emotions increased during performance of the frustration task across all levels of attachment anxiety and attachment avoidance. These findings might indicate that individuals do not apply emotion regulation strategies aimed at maximising or minimising the distance from others when they perform a cognitive frustration task. Unexpectedly, a stronger intensity of positive emotions was observed after frustration induction, which suggests that people may become more expressive, both with respect to negative and positive emotions, when performing a mildly stressful task with no serious consequences. Moreover, we found unexpected “flattenning” effects in the neutral condition, for self-reported negative and positive emotions. We wonder if the low intensity of experienced emotions might be the result of the fact that a high concentration is needed to perform the cognitive anagram task.

**Study 2**
Study 2 was designed to examine whether reliance on the secure base schema can attenuate emotional reactivity after frustration induction. We examined effects of priming of the secure base schema on emotional reactivity, also after controlling for attachment styles and gender. Guided imagination of the secure base script was used as a priming method (cf. Mikulincer & Shaver, 2001). Emotional reactivity was measured in the form of experienced total mood disturbance after induction of attachment-unrelated frustration, for which the anagram task of Study 1 was used. Secure base priming was hypothesised to decrease total mood disturbance after frustration induction, independent of attachment style (e.g. Mikulincer & Arad, 1999; Mikulincer & Shaver, 2001). The effect of secure base priming was expected to extinguish over time (Carnelley & Rowe, 2007; Rowe & Carnelley, 2003).

**Method**
We report how we determined our sample size, all data exclusions (if any), all manipulations, and all measures in the study.

**Participants**
The sample consisted of 73 Dutch undergraduate psychology students (62 first-year students; 19 men, 54 women), ranging in age from 18 to 37 years (\(M = 20.37, SD = 2.81\)). A power analysis using G*Power 3.1 (Faul et al., 2009) suggested 60 participants to detect medium effects (\(f = .25\)) in analysis of variance repeated measures within–between interaction design, with a statistical power equal to .95 and a significance level set at .05 (4 groups, 3 measurements). Medium effects were expected based on previous secure base priming research (Mikulincer & Shaver, 2001). Men were somewhat older (\(M = 21.74\)) than women (\(M = 19.89\), \(t(71) = 2.56, p = .01\)). The majority of the participants (91.8%), as well as their mothers (80.8%) and fathers (83.3%), were of Dutch origin. Three participants (4.2%) had children, 90.4% had at least one sibling, and 51.4% were involved in a romantic relationship of up to 10 years (\(M = 26.34\) months,
Almost half of the participants (47.9%) lived with their parents, 8.2% lived with their partner, 13.7% lived alone, and 30.1% lived elsewhere. Students voluntarily enrolled in the study, receiving course credits for participation.

**Procedure**

Participants were randomly assigned to and tested individually in one of four conditions according to a 2×2 between-subjects factorial design for prime (secure base, neutral) and task (frustration, neutral). General instructions and informed consent were identical to those described in Study 1. After having completed a questionnaire, assessing mood (Time 1), the participant was consciously primed by asking him or her to recall a particular situation, after which he or she performed an anagram task and again completed the mood questionnaire (Time 2). Finally, questionnaires were filled out, the last one assessing mood (Time 3).

**Materials**

**Questionnaire measures**

The same questionnaire as in Study 1 was used for attachment styles (ASQ-SF; Karantzas et al., 2010), assessing attachment avoidance (α = .87) and attachment anxiety (α = .84). We measured mood states at three points in time with the 32-item version of the Profile of Mood States (POMS, McNair, Lorr, & Droppleman, 1971; Dutch shortened version Wald & Mellenbergh, 1990). Respondents were asked to rate on a 5-point scale how well a particular mood state described their actual mood state (e.g. “nervous”). The scale ranges from 0 (not at all) to 4 (very well). Five subscales were measured with adequate psychometric qualities (Wald & Mellenbergh, 1990): (1) depression (8 items), (2) anger (7 items), (3) fatigue (6 items), (4) tension (6 items), and (5) vigour (5 items). Cronbach’s alpha values of the subscales at the three time points were ≥ .78. At Time 3, the items of the POMS were administered in a different order to check on recency effects. The variable total mood disturbance was computed according to the standard method by calculating the sum of the scores for depression, anger, fatigue, and tension minus the score for vigour.

**Secure base prime**

The secure base script was primed using an imagination task (Mikulincer & Shaver, 2001), in which the participant was asked to recall a particular situation. In the secure base prime condition, the participant was instructed:

> Try to recall a problematic situation which you cannot solve on your own. You are surrounded by people who are sensitive and understand the situation, who want to help you only because they love you and who set aside their own activities to assist you.

In the neutral prime condition, the instruction was:

> “Try to recall that you go to the store to buy things for your house, where other people are also buying things. They talk with each other about daily situations, inspect new brands and compare different products.”

In each condition, the participant was asked to let his or her mind wander for two minutes, for which an alarm was set. Next, the participant indicated how vivid he or she imagined the situation on a 7-point Likert type of scale, from “not at all” to “very”, and to write down the situation and the thoughts they had when recalling the situation.

**Frustration task**

The anagram task described in Study 1 was used.

**Statistical analyses**

To examine the effects of secure base priming, we conducted an LMM, applying the same procedure as in Study 1. Total mood disturbance from Time 1 to Time 3 was the outcome variable. Time, prime (neutral, secure base), and task (neutral, frustration) were included as factors. We tested all interactions: time × prime, time × task, prime × task, and time × prime × task. Next, an LMM was conducted to test whether the effects of secure base priming were independent of attachment style and gender. We performed the same LMM, adding gender as a factor and attachment anxiety and attachment avoidance as covariates. We tested the same interactions as in the first analysis: time × prime, time × task, prime × task, and time × prime × task. To decompose three-way interaction effects, follow-up LMMs were conducted for each prime condition separately.

**Results**

**Descriptive analyses**

Visual inspection of box plots revealed no outliers. The descriptives and correlations between the variables at baseline are presented in Table 2. T-tests showed that
the secure base prime condition and the neutral prime condition did not differ significantly with respect to total mood disturbance at Time 1, \(t(61.55) = 1.00, p = .32\), gender, \(t(69.66) = 1.26, p = .21\), attachment avoidance, \(t(71) = -0.96, p = .49\), and attachment anxiety, \(t(71) = 0.17, p = .87\). Moreover, the neutral task condition and the frustration task condition did not differ significantly on gender, \(t(71) = -0.72, p = .47\), and attachment anxiety, \(t(71) = -1.60, p = .11\), and marginally significantly on mood disturbance at Time 1, \(t(71) = -1.70, p = .09\), and attachment avoidance, \(t(71) = -2.00, p = .05\). ANOVA comparing the four combinations of conditions (i.e. neutral prime-neutral task, secure base prime-neutral task, neutral prime-frustration task, and secure base prime-frustration task) also showed no significant differences in attachment avoidance, \(F(3, 69) = 1.51, p = .22\), attachment avoidance, \(F(3, 69) = 2.09, p = .11\), and marginally significant differences in total mood disturbance at Time 1, \(F(3, 69) = 2.53, p = .06\), and attachment anxiety, \(F(3, 69) = 2.09, p = .11\), \(F(3, 69) = .08\) and marginally significant differences in total mood disturbance at Time 1, \(F(3, 69) = 2.53, p = .06, \eta^2_p = .10\). There were also no gender differences among conditions, \(\chi^2(3) = 2.91, p = .41\). ANCOVA revealed a significant effect of the frustration task on total mood disturbance at Time 2, after controlling for total mood disturbance at Time 1, \(F(1, 68) = 11.85, p = .001, \eta^2_p = .15\), indicating that our manipulation was successful. There was no main effect of the secure base prime, \(F(1, 68) = 0.39, p = .53, \eta^2_p = .01\), neither an effect of gender, \(F(1, 68) = 0.14, p = .71, \eta^2_p = .002\).

**Secure base priming and total mood disturbance after frustration induction**

LMM examining effects of secure base priming on total mood disturbance from Time 1 to Time 3 revealed a main effect of task, \(F(1, 73) = 6.80, p = .01\), indicating that total mood disturbance was higher in the frustration condition than in the neutral task condition. A significant two-way interaction between time and task, \(F(2, 146) = 6.95, p = .001\), was found. Simple effects tests showed that total mood disturbance increased from Time 1 to Time 2 in the frustration condition only. Furthermore, a significant three-way interaction among time, prime, and task, \(F(2, 146) = 3.66, p = .03\), was found. Follow-up LMMs for each prime condition separately showed a main effect of task in the secure base prime condition, \(F(1, 37) = 6.47, p = .02\). Thus, across time points, individuals in the secure base prime condition experienced higher total mood disturbance in the frustration condition than in the neutral task condition. There was a significant interaction effect between time and task in the neutral prime condition, \(F(2, 72) = 9.14, p < .001\), but not in the secure base prime condition, \(F(2, 74) = 0.31, p = .73\). Simple effects tests revealed that after having performed the frustration task, individuals in the neutral prime condition experienced an increased total mood disturbance from Time 1 to Time 2, \(M_{\text{difference}} = 7.06, p = .01\), which marginally significantly decreased after Time 2, \(M_{\text{difference}} = -5.06, p = .096\), \(F(2, 72) = 4.94, p = .01\). In contrast, individuals in the secure base prime condition did not experience a change in total mood disturbance after having performed the frustration task from Time 1 to Time 2, \(M_{\text{difference}} = 0.83, p = 1.00\), or from Time 2 to Time 3, \(M_{\text{difference}} = -1.61, p = 1.00, F(2, 74) = 0.31, p = .74\). Priming the secure base script thus attenuated the immediate effect of frustration induction on total mood disturbance. After having performed the neutral puzzle task, individuals who were not primed with the secure base schema experienced a marginally significant decrease in total mood disturbance from Time 1 to Time 2, \(M_{\text{difference}} = -5.17, p = .09\), and increased total mood disturbance from Time 2 to Time 3, \(M_{\text{difference}} = 6.94, p = .01, F(2, 72) = 4.86, p = .01\). In contrast, individuals who were primed with the secure base schema who performed the neutral puzzle task, experienced no change in total mood disturbance from Time 1 to Time 2, \(M_{\text{difference}} = -0.90, p = 1.00\), and from Time 2 to Time 3, \(M_{\text{difference}} = 0.53, p = 1.00, F(2, 74) = 0.10, p = .90\). These effects are displayed in Figure 1.

The LMM testing whether the effects of secure base priming on total mood disturbance from Time 1 to Time 3 were independent of attachment style and gender, showed that the two-way time × task interaction effect, \(F(2, 146) = 6.95, p = .001\), and three-way time × prime × task interaction effect, \(F(2, 146) = 3.66, p = .03\), were still significant after inclusion of

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**Table 2.** Descriptives and correlations among all variables at baseline for Study 2.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Attachment anxiety</td>
<td>–</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Attachment avoidance</td>
<td>.39**</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>3. Gender</td>
<td>–.07</td>
<td>–.09</td>
<td>–</td>
</tr>
<tr>
<td>4. Baseline total mood disturbance</td>
<td>.52**</td>
<td>.23*</td>
<td>.04</td>
</tr>
</tbody>
</table>

**M**: 2.97, 2.93, 0.74, 3.08

**SD**: 0.81, 0.72, 0.44, 12.73

Note: \(N = 73\).

*\(p < .05\)

**\(p < .01\)

***\(p < .001\)
attachment anxiety, attachment avoidance, and gender in the analysis.

Discussion

Consistent with our hypothesis, priming the secure base script did attenuate the immediate effect of frustration induction on total mood disturbance, also after controlling for attachment styles and gender. These findings show that addressing an individual’s cognitive–affective representation of a secure base, which can easily be done in every person (Baldwin, 1992; Mikulincer & Shaver, 2001), can also positively influence emotions independent of attachment styles.

General discussion

In two studies we examined whether attachment styles predicted emotional reactivity after frustration induction and whether secure base priming could affect emotional reactivity after frustration induction. In both studies, we used an unsolvable anagram task. Attachment styles were examined in relation to emotional reactivity when performing a cognitive frustration task because the distress an individual experiences when (s)he has to deal with disappointment and fear of failure (Harrington, 2005; Zimmermann et al., 2001) likely triggers attachment-related emotion regulation tendencies (Shaver & Mikulincer, 2002). However, the role of attachment in the context of frustration management is still rather unknown. The generally proposed pattern of deactivating strategies in avoidantly attached individuals might not apply to individuals who deal with emotions in the context of task performance because the cognitive load possibly interferes with suppression (Mikulincer et al., 2000; Szasz et al., 2011). Therefore, our study aimed to examine attachment-related emotional responses to a cognitive frustration task.

We found that individuals experienced and expressed emotions during the performance of a cognitive frustration task independent of their attachment styles. These findings show the need to further explore the underexamined emotion frustration, as attachment-related emotion reactivity might not pertain to frustration. Conscious priming of the secure base script nevertheless seemed to attenuate self-reported emotional reactivity after frustration induction independent of individuals’ attachment styles. In sum, although individuals’ attachment anxiety and attachment avoidance did not predict emotional reactivity, activation of the sense of having a secure base appeared useful in reducing mood disturbance in the context of a frustrating performance task.

When performing a difficult, frustrating cognitive task, individuals might not be able to suppress or exaggerate emotion experience and expression, because the task requires attention and other self-regulatory capacities, resulting in a depletion of self-regulatory resources (Baumeister, Vohs, & Tice, 2007).
Besides interfering with suppression (Mikulincer et al., 2000; Szasz et al., 2011), the cognitive load might also interfere with hyperemotional responses. This could explain why participants did not show indications for deactivating or hyperactivating regulation strategies related to attachment avoidance or anxiety, whereas they did benefit from the activation of attachment security as they experienced reduced mood disturbance after having performed a frustration task, probably because they had the sense of being supported by others. Although frustration could be regarded as attachment-unrelated as the associated anger is not directed to others (Lawrence, 2006), the results of the second study suggest that it is not the case that attachment styles do not matter for emotional reactivity after frustration induction. Instead, the frustrating cognitive task might overrule the attachment-related self-regulation strategies of individuals, but when secure attachment is activated in individuals applying an imagination practice, this can help them to regulate their emotion experience.

During the frustration task, individuals not only experienced and expressed a stronger intensity of negative emotions; they also expressed a stronger intensity of positive emotions. In prior research, people have been found to smile when frustrated, perhaps as an emotion regulation strategy to reduce frustration (Hoque & Picard, 2011). Facial expressions that are incongruent with the emotional situation have also been considered as reflecting individuals’ confusion and emotional dysregulation or the attempt to block the experience and expression of negative emotions (Roisman et al., 2004; Sonnby-Borgström & Jönsson, 2004). During the performance of the neutral cognitive task, individuals experienced a decreased intensity of negative and positive emotions, possibly because concentration is needed to fulfil the task and the task does not make an appeal to specific emotions.

Previous studies on anger in more social contexts have reported findings indicative of attachment-related emotional reactivity after anger induction (e.g. Diamond & Hicks, 2005; Mikulincer, 1998). Frustration during the performance of a difficult cognitive task might differ from anger in a social context in that it is to a greater extent motivated by constructive instead of destructive goals, elicits more positive responses expressed in functional ways, and has fewer positive and negative effects on social relationships. These aspects could relate to our findings that individuals also expressed more intense positive, besides negative, emotions during the frustration task, and that emotional reactivity scores were not related to attachment styles. On the other hand, some individuals might experience fear of failure when performing a difficult task (Harrington, 2005), which might relate to attachment styles. More research on attachment and frustration in different situations is needed to draw any conclusions about associations and mechanisms between attachment styles and emotional reactivity after frustration induction.

Most prior studies examined effects of secure base priming specifically in the context of interpersonal relationships (Mikulincer & Arad, 1999; Mikulincer & Shaver, 2001; Pierce & Lydon, 1998). Future studies should examine the mechanisms by which activation of the secure base script helps to regulate emotions in situations that are less obviously of a social nature, since this procedure has been found to serve other self-protective functions, such as increasing cognitive openness and boosting self-views (Carnelley & Rowe, 2007; Mikulincer & Arad, 1999; Rowe & Carnelley, 2003). As imagination of the secure base schema is a relatively easy to apply technique, research needs to find out how it could be used by individuals in daily frustrating situations.

The present research has several limitations which should be noted and which could be addressed in future research. First, the samples consisted of college students. In order to be able to generalise the results, they should be replicated in a community sample. Second, the measures for emotional reactivity were different in the two studies, fitting the study aims but making it difficult to compare the study findings. Third, emotional reactivity over time should be more thoroughly studied. Only in Study 2, we measured mood at three points in time. The results revealed that individuals got their emotions soon under control. Further research could examine individual differences in the course of emotions after frustration induction. Moreover, effects of repeated priming of the secure base should be studied, as this could yield longer lasting effects in diminishing emotional reactivity after stressful experiences (Carnelley & Rowe, 2007). Fourth, because of power considerations, we did not examine interactions between secure base priming and attachment styles when investigating emotional reactivity in Study 2. Fifth, frustration was induced in the laboratory, by means of a cognitive task. Frustration can also be examined in interpersonal contexts and/or daily life situations. Sixth and finally, the studies did not reveal how attachment styles
and emotional reactivity scores were related to actual behaviours, as well as responses from and to other people, such as task persistence and performance when being frustrated or receiving support when exerting negative or positive emotions. Future studies could continue this line of research by examining behavioural consequences of attachment style differences and emotional reactivity scores to further our understanding of emotional processes.

Despite these limitations, this study is one of the few attempts to gain insight into attachment-related emotional responses to an unsolvable cognitive task, which is of clinical relevance. Frustration is not directed to other people but to the individual him/herself and in that sense it is not a social emotion (Lawrence, 2006). More knowledge on the role of attachment in managing emotions induced by a frustration task could help explaining why certain individuals who are anxiously attached and avoidantly attached develop and maintain psychopathology symptoms, including internalising and externalising symptoms (Bekker & Croon, 2010; Bekker et al., 2007; Marazziti et al., 2007; Shorey & Snyder, 2006). This knowledge could be used in the treatment of specific processes.

In conclusion, this research extended prior study findings by showing that individuals experienced and expressed emotions during the performance of a cognitive frustration task independent of their attachment styles. These results suggest that the mechanism of deactivation strategies applied by avoidantly attached individuals and hyperactivating strategies applied by anxiously attached individuals might not pertain to emotions induced by an unsolvable cognitive task. However, conscious priming of the secure base script reduced self-reported emotional reactivity when performing a cognitive frustration task, suggesting that activating attachment security using a simple practice can help to regulate emotions. More research is needed to unravel the role of attachment styles in emotional reactivity in response to frustration induction.

Note

1. The statistics reported are the results of the analysis including interactions with attachment anxiety. The effects were also significant in the analysis including interactions with attachment avoidance.

Disclosure statement

No potential conflict of interest was reported by the authors.

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