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Abstract

Because remaining love feelings for an ex-partner are negatively associated with recovery from a romantic break-up, it may be helpful to decrease those love feelings. Love regulation is the use of behavioral or cognitive strategies to change the intensity of current feelings of romantic love. This study evaluated three regulation strategies: 1) negative reappraisal of the ex-partner, 2) reappraisal of love feelings, and 3) distraction. It was tested how these regulation strategies change love feelings for the ex-partner, valence of affect, and motivated attention for the ex-partner. Participants who were upset about a romantic break-up performed these regulation strategies before passively viewing a picture of their ex-partner, during which their electroencephalogram was recorded. Negative reappraisal decreased love feelings and made participants feel more unpleasant. Love reappraisal did not change how in love or pleasant/unpleasant participants felt. Distraction did not change love feelings, but made participants feel more pleasant. This suggests that in the context of a romantic break-up, negative reappraisal is an effective love down-regulation strategy, while distraction is an effective positive emotion up-regulation strategy. Furthermore, all three strategies decreased motivated attention for the ex-partner, as indicated by a reduced amplitude of the late positive potential. This reduced motivated attention for the ex-partner could make it easier to deal with encounters of (reminders of) the ex-partner. Love regulation is a promising phenomenon with important everyday life and clinical implications.

Keywords: Love regulation; relationship dissolution; romantic love; late positive potential; heartbreak

Introduction

Romantic break-ups are very common (Bramlett & Mosher, 2002; Carver, Joyner, & Udry, 2003) and elicit negative emotions such as sadness, anger, and shame (Baumeister, Wotman, & Stillwell, 1993; Leary, Koch, & Hechenbleikner, 2001). Even though such negative emotions following a break-up may seem normative, romantic break-ups can have serious consequences including insomnia, reduced immune function, broken heart syndrome, depression, and suicide (T. Field, 2011; Monroe, Rohde, Seeley, & Lewinsohn, 1999; Skopp, Zhang, Smolenski, & Reger, 2016). The literature on romantic relationships and social rejection suggests several strategies to cope with a romantic break-up, including reducing negative cognitions about oneself (Boelen & Reijntjes, 2009), recovering the self-concept (Larson & Sbarra, 2015; Mason, Law, Bryan, Portley, & Sbarra, 2012), focusing on personal growth (Tashiro & Frazier, 2003), and taking acetaminophen (DeWall et al., 2010). It is not uncommon for people to still have love feelings for their ex-partner (H. E. Fisher, Brown, Aron, Strong, & Mashek, 2010; Langeslag & Van Strien, 2016), which is positively associated with sadness (Sbarra & Ferrer, 2006) and negatively associated with self-concept recovery (Mason et al., 2012). Therefore, another way to cope with a romantic break-up may be to decrease the intensity of love feelings for the ex-partner.

Love regulation is "the use of behavioral or cognitive strategies to change the intensity of current feelings of romantic love" (Langeslag & Van Strien, 2016, p. 2). Love regulation is closely related to the well-established concept of emotion regulation (Gross, 2002, 2013). In natural language, love is often considered to be an emotion (Fehr & Russell, 1984; P. Shaver, Schwartz, Kirson, & O'Connor, 1987). Even though some researchers also consider love to be an

emotion (P. R. Shaver, Morgan, & Wu, 1996), other researchers have argued that love is not an

emotion, for several reasons. To start with, there are different types of love (Berscheid, 2010; H.

E. Fisher, 1998; Hatfield, 1988; Sternberg, 1986), including infatuation (or passionate love) and

attachment (or companionate love). Infatuation is the overwhelming, amorous feeling for one

individual that is typically most intense during the early stage of love, while attachment is the

comforting feeling of emotional bonding with another individual that takes some time to develop

(H. E. Fisher, 1998; Hatfield, 1988; Langeslag, Muris, & Franken, 2013). There being different

types of love is one reason to assume that love as a whole is not an emotion (Langeslag, 2006).

Because the word 'love' does not have a plural form, we use the term 'love feelings' to describe

the collection of different love types. Please note that the term 'feeling' does not necessarily refer

to an emotion (Thoits, 1989). There are also reasons to assume that the individual types of love

are not emotions either. That is, love feelings elicit different emotions depending on the

situation. Reciprocated infatuation, for example, may elicit the emotion joy (H. E. Fisher, Aron,

Mashek, Li, & Brown, 2002), while unreciprocated infatuation may elicit the emotion sadness

(Leary et al., 2001). This example also shows that love feelings are not inherently pleasant or

unpleasant. Valence is the term used to describe (un)pleasantness (Russell, 2003). Another

reason why love feelings are not emotions is that love feelings can be very long lasting, whereas

emotions are usually shorter lasting. For example, it is not uncommon for infatuation to last for

weeks or months and for attachment to last for years or decades (Hatfield, Pillemer, O'Brien, &

Le, 2008; Langeslag et al., 2013), whereas emotions typically last for a half hour up to several

days (Verduyn & Lavrijsen, 2015). Instead of an emotion, some researchers have classified love

as an attitude (Rubin, 1970) or a script (Skolnick, 1987). Other researchers, including us, classify

love feelings as motivations (or drives) (such as craving, lust, hunger, and thirst) (Aron & Aron,

2016; H. Fisher, Aron, & Brown, 2005; Lamy, 2016; Langeslag, 2006). So, even though love and emotion regulation are closely related, they are conceptually different in the sense that love regulation targets love feelings (such as infatuation and attachment), while emotion regulation targets emotions (such as joy, sadness, fear, and anger) (Langeslag & Van Strien, 2016). It has been shown that even though people generally think that love feelings cannot be regulated, love regulation is actually feasible (Langeslag & Van Strien, 2016).

Cognitive reappraisal is a well-known emotion regulation strategy that entails reinterpreting the emotional stimulus (Gross, 2002; Ochsner & Gross, 2005). For example, after receiving a job application rejection, you could remind yourself that the salary was very low in order to feel less sad about the rejection. In a meta-analysis, cognitive reappraisal was shown to be effective for regulating emotions (Webb, Miles, & Sheeran, 2012) and it is considered beneficial for mental and social functioning (Gross, 2002; Gross & John, 2003). Reappraisal of emotional stimuli is an important aspect of Cognitive-Behavioral Therapy, which is a common treatment of emotional disorders (Hofmann & Asmundson, 2008). Several studies have shown that cognitive reappraisal is also effective for regulating motivations such as food and drug craving. For example, non-dieting women reported decreased food craving after thinking about the negative consequences of eating the presented food than after thinking about its delicious smell, taste, and texture (Siep et al., 2012). Likewise, when alcohol-dependent and social drinkers were instructed to think about the long-term negative consequences of repeated consumption of depicted alcoholic beverages, subjective craving decreased in both groups (Nagvi et al., 2015). Finally, cigarette smokers reported reduced cigarette and food craving after thinking about the long-term consequences of smoking and eating high-fat foods compared to when thinking about the immediate feelings associated with smoking or eating (Kober et al.,

2010). So, reminding yourself of the negative qualities of your ex-partner might decrease your love feelings and help you feel less bad about the break-up. In a previous study (Langeslag & Van Strien, 2016), participants indeed reported to use such negative reappraisal when they were heartbroken. In addition, in a love regulation task, infatuation and attachment were decreased by thinking about negative aspects of the beloved or the relationship, or imagining negative future scenarios. This shows that negative reappraisal of the situation is an effective love regulation strategy. Because participants were free to choose between three strategies (i.e., negative reappraisal of the beloved, the relationship, or the future), it remains unclear which of those is effective for decreasing love feelings.

If love down-regulation would help people cope with a break-up, then it would be expected that decreasing love feelings after a break-up would make people feel better. In the previous study, however, participants who had recently experienced a romantic break-up felt more unpleasant after negative reappraisal than after no regulation (Langeslag & Van Strien, 2016). It is likely that love down-regulation by negative reappraisal has the short-term effect of making people feel more unpleasant because it involves thinking negative thoughts. Even though this adverse effect of negative reappraisal was unexpected and awaits replication, it does indicate that love down-regulation after a break-up is not just the down-regulation of negative emotions. Importantly, it has been shown that frequent thoughts about negative aspects of the ex-partner or the relationship are positively associated with recovery of the self (Brenner & Vogel, 2015), which suggests that negative reappraisal may be an adaptive strategy to cope with a break-up despite the short-term adverse effect.

Another form of cognitive reappraisal involves reappraising the emotion rather than the emotional stimulus (Webb et al., 2012). For example, after receiving a job application rejection,

you could tell yourself that it is normal to feel sad and accept that sadness without judgement. Reappraisal of emotions is part of Acceptance and Commitment Therapy (ACT) and mindfulness, and works by counteracting maladaptive response-focused emotion regulation strategies such as suppression (Gross & John, 2003; Hofmann & Asmundson, 2008). Meta-analyses showed that reappraisal of emotions is effective for regulating emotions (Webb et al., 2012) and that mindfulness treatment is effective for decreasing drug craving and drug use (Li, Howard, Garland, McGovern, & Lazar, 2017). In one study, the effect of mindfulness treatment on drug craving was mediated by a latent factor representing acceptance, awareness, and nonjudgment (Witkiewitz, Bowen, Douglas, & Hsu, 2013), which suggests that reappraisal of emotions was the underlying mechanism. So, telling yourself that it is normal to still love your ex-partner and to accept those love feelings without judgement might decrease your love feelings and help you feel less bad about the break-up. A previous study has shown that a combination of Hatha yoga and mindfulness meditation reduced rumination associated with a romantic break-up (Harris, 2015). To our knowledge, it has not yet been tested whether reappraisal of love feelings for an ex-partner decreases love feelings.

Distraction is an emotion regulation strategy that involves performing a distracting secondary task to limit attention to emotional stimuli (Ochsner & Gross, 2005). For example, after receiving a job application rejection you could play a video game to distract yourself. In a meta-analysis, distraction was found to be effective for regulating emotions (Webb et al., 2012), although it might be maladaptive in the long term (Thiruchselvama, Blecherta, Sheppes, Rydstromb, & Gross, 2011). Several studies have shown that distraction is effective for regulating motivations as well. For example, distraction reduced food craving (Van Dillen & Andrade, 2016) and interest in alternative romantic partners (Van Dillen, Papies, & Hofmann,

2013). So, playing a video game or watching a movie to distract yourself from a break-up might decrease love feelings and help you feel less bad about the break-up, at least in the short term. In the previous study, many participants reported to use distraction when they were heartbroken (Langeslag & Van Strien, 2016). To our knowledge, it has not yet been tested whether distraction decreases love feelings for an ex-partner.

Emotions and emotion regulation have been studied extensively using event-related potentials (ERPs). The late positive potential (LPP) reflects multiple, overlapping positivities over the posterior scalp beginning in the time range of the classic P300, i.e., around 300 ms after stimulus onset. Because the LPP amplitude is typically enhanced for both negative and positive compared to neutral stimuli (Hajcak, Weinberg, MacNamara, & Foti, 2011), it is considered to be modulated by arousal (i.e., intensity) rather than valence. The LPP amplitude is thought to reflect motivated attention for emotional information (Schupp, Flaisch, Stockburger, & Junghöfer, 2006). The LPP is enhanced in response to pictures of the beloved (Langeslag, Franken, & Van Strien, 2008; Langeslag, Jansma, Franken, & Van Strien, 2007). This effect occurred regardless of whether people were in a relationship with their beloved or whether the relationship had ended (Langeslag & Van Strien, 2016), which shows that people typically still display motivated attention for their ex-partner. Several mental disorders involve increased attention for disorder-related information. For example, depression patients have increased attention for negative information (Everaert, Koster, & Derakshan, 2012), social phobia patients have increased attention for socially threatening information (Musa & Lépine, 2000), and substance use disorder patients have increased attention for substance-related information (M. Field & Cox, 2008). Because this increased attention has been linked to the maintenance of these disorders, some treatments focus on reducing the increased attention for disorder-related

information (Hakamata et al., 2010). Therefore, reducing motivated attention for an ex-partner may be helpful after a romantic break-up.

Importantly, the LPP amplitude is modulated by emotion regulation instructions according to the regulatory goal: emotion up-regulation typically enhances the LPP amplitude, whereas emotion down-regulation typically reduces it (Hajcak, MacNamara, & Olvet, 2010). This shows that emotion regulation reduces motivated attention for emotional information. In the previous study (Langeslag & Van Strien, 2016), love down-regulation by negative reappraisal of the beloved, the relationship, and/or the future reduced the LPP amplitude, albeit more in participants who were in a relationship with their beloved rather than in participants who had experienced a break-up (because the latter group had greater individual variability). The reduced LPP due to love down-regulation shows that negative reappraisal decreased motivated attention for the beloved, which may help people recover from a romantic break-up.

The current study aimed to extend the findings of the previous love regulation study (Langeslag & Van Strien, 2016) in several ways. First, to increase specificity and to avoid any effects of strategy selection (Baur, Conzelmann, Wieser, & Pauli, 2015), this study focused on negative reappraisal of the ex-partner rather than letting participants choose freely between negative reappraisal of the ex-partner, the relationship, or the future. Second, besides negative reappraisal of the ex-partner (hereafter: negative reappraisal), we also evaluated the strategies reappraisal of love feelings (hereafter: love reappraisal), and distraction. Third, to reduce demand characteristics (Orne, 1962), participants were never informed that the goal was to decrease love feelings. Fourth, in order to improve the signal-to-noise ratio of self-report data, we used an event-related design rather than a blocked design (cf. Moser, Krompinger, Dietz, & Simons, 2009; Moser, Most, & Simons, 2010), which allowed us to collect love and valence ratings at the

end of each trial. Finally, participants performed regulation before viewing a picture of the ex-partner rather than during picture presentation. This task mimics daily life situations in which people regulate their feelings at one point and subsequently encounter (stimuli related to) the ex-partner. This task was based on previous emotion regulation studies that have shown that presenting descriptions that make a subsequent picture more or less emotional changes the emotional response and the LPP amplitude in response to that picture (Foti & Hajcak, 2008; MacNamara, Foti, & Hajcak, 2009; Peng, Qu, Gu, & Luo, 2013).

The first research question of the current study was: are negative reappraisal, love reappraisal, and distraction effective for down-regulating love feelings after a romantic break-up? Based on the previous research described above, it was hypothesized that all three regulation strategies would decrease love feelings. Because love is not inherently positive or negative, it is important to assess the effect of different regulation strategies on pleasantness. Therefore, the second research question was: how do negative reappraisal, love reappraisal, and distraction after a romantic break-up modulate the valence of affect? We expected to replicate the previous finding that negative reappraisal made people feel more unpleasant (Langeslag & Van Strien, 2016). Love reappraisal, in contrast, was expected to have no effect on valence because the love reappraisal thoughts are neutral. And, because the distraction strategy in the current study involved thinking about positive things, it was hypothesized that distraction would make people feel more pleasant.

The final research question was: how do negative reappraisal, love reappraisal, and distraction influence motivated attention for the ex-partner, as indicated by the LPP amplitude? Based on the previous study (Langeslag & Van Strien, 2016), we hypothesized that negative reappraisal would decrease the LPP amplitude in response to a picture of the ex-partner. In

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another study, emotion reappraisal initially enhanced the LPP in response to emotional stimuli, but reduced the LPP when stimuli were repeated (Uusberg, Uusberg, Talpsep, & Paaver, 2016). Each picture in the current study depicted the ex-partner, which essentially resulted in a repetition of the ex-partner, so it was expected that the net result would be that love reappraisal would reduce the LPP amplitude. Finally, based on previous emotion regulation studies that have shown that distraction reduces the LPP amplitude (Littel & Franken, 2011; Schönfelder, Kanske, Heissler, & Wessa, 2013; Shafir, Schwartz, Blechert, & Sheppes, 2015), it was expected that distraction would reduce the LPP amplitude as well. Reduced LPP amplitudes after regulation would imply that regulation reduced the motivated attention for the ex-partner.

Methods

Participants

Twenty-four participants ($M = 27.8$, $SD = 5.6$, range = 20-37 yrs, 4 men) were recruited from the University of Missouri - St. Louis and through Craigslist. Sample size was based on power analyses using G*Power 3.1.9.2 (Faul, Erdfelder, Lang, & Buchner, 2007). The effect sizes of negative reappraisal on self-reported love feelings in the previous study (Langeslag & Van Strien, 2016) were large: for infatuation Cohen's $d = -1.01$ and for attachment Cohen's $d = -1.23$. A power analysis showed that a sample size of 10 would yield 80% power to detect effects with Cohen's $d = 1.01$ with a two-sided significance level of 5%. However, to account for the possibility that the effects of love reappraisal and distraction would be smaller, and because ERP studies typically have at least 20 participants, a larger sample size was used. A power analysis showed that a sample size of 24 would yield a power of 80% to detect effects with Cohen's $d = 0.60$ with a two-sided significance level of 5%, so that is the sample size we used.

Only participants who had experienced a romantic break-up and were upset about it, as indicated by a score of two or higher on the question "how upset are you about the break-up?" (see below), were included. Additional inclusion criteria, which were assessed by self-report over email or the phone, were: normal or corrected-to-normal vision, no neurological or psychiatric disorders, and no current use of medications known to affect the central nervous system. All participants were right-handed as determined by a handedness questionnaire (Bryden, 1982). The study was approved by the University of

Missouri - St. Louis institutional review board. Participants provided written informed consent and were compensated with course credit or $40.

Stimuli

Participants provided 28 digital pictures of their ex-partner. There were no requirements other than that the pictures had to contain the ex-partner and had to be non-intimate/non-explicit (for ethical reasons). Therefore, the pictures could display parts of the ex-partner (e.g., just the face) or the whole body of the ex-partner, people other than the ex-partner, a variety of facial expressions, objects, and scenery (cf. Langeslag & Van Strien, 2016). These pictures were used to mimic reminders of the ex-partner (e.g., pictures on social media) as well as real life encounters with the ex-partner. It is important to note that the variety of information on the pictures does not confound the regulation effects, because each picture was presented in each regulation condition.

Procedure

Participants first completed some general questions about the ex-partner and the relationship (cf. Langeslag & Van Strien, 2016). Participants reported their ex-partner's gender, and how in love they currently felt with the ex-partner on a 9-point scale (1 = not in love at all, 9 = very much in love). They also reported the duration of the relationship, as well as the status (married, cohabitating, not cohabitating) and the quality (1 = very bad, 9 = very good). Participants also reported the time since break up and who ended the relationship (participant, ex-partner, joint decision). Finally, participants reported how upset they currently were about the break-up on a 9-point scale (1 = not upset at all, 9 = very upset).

Next, participants completed the new Love Control Questionnaire II (LCQ-II) (Chronbach's alpha = .81), which was modified from our previous Love Control Questionnaire (LCQ) (Langeslag & Van Strien, 2016). Where the previous LCQ assesses perceived control of love feelings regardless of the regulation direction, the new LCQ-II assesses perceived ability to up- and down-regulate love feelings separately. Only the items concerning love down-regulation are reported, because that is the topic of the current study. Like the previous LCQ, items measured the perceived ability to regulate love in general, and infatuation and attachment specifically. Items were also phrased to measure one's perceived ability to regulate one's own love feelings and the perceived ability of others to regulate their love feelings. Participants rated their agreement with the statements on a 9-point scale (1 = totally disagree, 9 = totally agree). Then, participants completed the Infatuation and Attachment Scales (IAS) (Langeslag et al., 2013) (Chronbach's alpha = .85) to assess the current intensity of infatuation and attachment for their ex-partner. The average score on each of the IAS scales can range from 1 to 7. Finally, participants completed the Emotion Regulation Questionnaire (Gross & John, 2003) (Chronbach's alpha = .82) to assess habitual use of reappraisal and suppression to regulate emotions.

Then, participants completed a love regulation task while their electroencephalogram (EEG) was recorded. There were four conditions: 1) negative reappraisal of the ex-partner, 2) reappraisal of love feelings, 3) distraction, and 4) no regulation. Each trial consisted of a regulation prompt (see below) for five seconds, a fixation cross jittered for 500-700 milliseconds, a picture of the ex-partner for one second, love and valence ratings until responses were made, and a blank screen for one second, see Fig. 1.

The regulation prompts in the negative reappraisal condition were questions about negative aspects of the ex-partner (e.g., What is an annoying habit of your ex?). Participants were instructed to silently think about the answer to the question while it was presented on the screen. The regulation prompts in the love reappraisal condition were statements that reinterpreted love feelings, for example by accepting them without judgement (e.g. "It's ok to love someone I'm no longer with."). Participants were instructed to repeatedly and silently read the statement and to try to believe it for the duration it was presented on the screen. The regulation prompts in the distraction condition were questions about positive things unrelated to the break-up or ex-partner (e.g., What is your favorite food? Why?). Participants were instructed to silently think about the answer to the question while it was presented on the screen. There were 28 different prompts per condition, see Appendix A, and each prompt was presented once. In the no regulation condition, the prompt consisted of three asterisks and participants were not instructed to think about anything in particular.

After the regulation prompt and the fixation cross, a picture of the ex-partner was presented and participants were instructed to passively view it. Participants were asked to limit movements and to try not to blink during the presentation of the fixation cross and the picture. After each picture, participants used sliders to complete love (i.e., how in love they felt) and valence (i.e., how negative or positive they felt) ratings. The love slider ranged from "not at all" on the left to "completely" on the right and the valence slider ranged from "negative" on the left to "positive" on the right. The use of a slider yielded continuous measures of subjective love feelings and valence, which allows for the detection of more subtle effects of regulation than the 5-point scale used in our previous study (Langeslag & Van Strien, 2016). To reduce the effect of anchoring bias, which is the tendency of people to make insufficient adjustments from an initial

starting point (Tversky & Kahneman, 1974), the starting position of the slider was varied

between trials. This also reduced the ability of participants to deliberately select the same

response as, or a different response than a previous trial. The starting positions of the sliders

were balanced between conditions to prevent them from confounding regulation effects.

The love regulation task consisted of a practice block and four main blocks. In the

practice block, participants performed four practice trials (one of each condition) with prompts

and pictures that were not used in the main blocks. The main blocks consisted of seven trials of

each condition, for a total of 28 trials per block. Trials were presented in a pseudorandom order

with no more than two trials of the same condition in a row. Each ex-partner picture was

presented once in each block, which ensured that the regulation effects were not confounded by

ERP old/new effects (Rugg & Allan, 2000).

After completion of the love regulation task, participants completed a likelihood of

strategy use questionnaire. Participants indicated how likely they were to use negative

reappraisal (i.e., "Think of some negative aspect of my ex" and "Talk negatively about my ex"),

love reappraisal (i.e., "Accept my love feelings without judgement" and "Tell myself that it's ok

to still love my ex"), and distraction (i.e., "Do something fun to distract myself" and "Think of

something pleasant to distract myself"), when they are heartbroken on a 4-point scale (1 = very

unlikely, 2 = somewhat unlikely, 3 = somewhat likely, 4 = very likely).

Electroencephalogram (EEG) recording and signal processing

The EEG was recorded using a 32-channel amplifier and data acquisition software (ActiveTwo

System, BioSemi). The 32 Ag-AgCl active electrodes were connected to the scalp through a head

cap (BioSemi), according to the 10–20 International System (Fp1/2, AF3/4, Fz, F3/ 4, F7/8,

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FC1/2, FC5/6, Cz, C3/4, T7/8, CP1/2, CP5/6, Pz, P3/4, P7/8, PO3/4, Oz, O1/2). Vertical

electrooculogram (VEOG) and horizontal electrooculogram (HEOG) were recorded by attaching

additional electrodes (UltraFlat Active electrodes, BioSemi) above and below the left eye, and at

the outer canthi of both eyes. Additionally, two electrodes were placed on the left and right

mastoids (M1/2). An active electrode (CMS - common mode sense) and a passive electrode

(DRL - driven right leg) were used to comprise a feedback loop for amplifier reference. Signals

were digitized with a sampling rate of 512 Hz, a 24-bit A/D conversion, and a low pass filter of

134 Hz.

Data were analyzed with BrainVision Analyzer 2 (Brain Products, Gilching, Germany).

A maximum of one bad electrode per participant was corrected using spherical spline

topographic interpolation. Offline, an average mastoids reference was applied because that is the

preferred reference when studying the emotional modulation of the LPP (Hajcak et al., 2011).

The data were filtered using a 0.10-30 Hz band pass filter (phase shift-free Butterworth filters; 24

dB/octave slope) and a 60 Hz notch filter. Data were segmented in epochs from 200 ms before

the onset of the ex-partner picture until 1000 ms post-picture onset. Ocular artifact correction

was applied semi-automatically according to Gratton, Coles, and Donchin (1983). The mean 200

ms pre-stimulus period was used for baseline correction. Artifact rejection was performed at

individual electrodes with a baseline-to-peak minimum and maximum criterion of -75 to +75 µV.

At least 12 trials are needed to obtain a reliable emotional modulation of the LPP (Moran,

Jendrusina, & Moser, 2013). Every participant had at least 22 trials available in each regulation

condition at each of the nine electrodes included in the analyses (see below), so no participants

had to be excluded. At the electrodes used in the analyses, the average number of accepted trials

per condition ranged from 27.5 to 27.9 out of 28.

Statistical analyses

For the love and valence ratings, the slider responses were converted to a value ranging from 0 (i.e., far left) to 100 (i.e., far right). Love and valence ratings were analyzed using repeated measures analyses of variance (rmANOVAs) with the factor Condition (negative reappraisal, love reappraisal, distraction, no regulation). The LPP in response to the ex-partner picture was quantified by a mean amplitude measure in a 400-1000 ms time window (cf. Zhang, Li, Qin, & Luo, 2012). Mean amplitude measures at electrodes F3, Fz, F4, C3, Cz, C4, P3, Pz, and P4 for each condition were submitted to a rmANOVA with factors Condition (negative reappraisal, love reappraisal, distraction, no regulation), Caudality (frontal, central, parietal), and Laterality (left, midline, right). Only effects involving the factor Condition are reported because those are relevant to the research questions. The mean score on the down-regulation items of the LCQ-II was subjected to a one-sample *t*-test against 5, to test if it differed from neutral. In addition, the LCQ-II down-regulation item scores were analyzed using an rmANOVA with the factors Person (self, people) and Feeling (love, infatuation, attachment). The mean negative reappraisal, love reappraisal, and distraction scores on the likelihood of strategy use questionnaire were subjected to one-sample *t*-tests against 2.5 (= midpoint of the scale) to test if participants were unlikely or likely to use that particular strategy.

When applicable, degrees of freedom were corrected with the Greenhouse–Geisser correction. The *F* values, the uncorrected *df*s, the epsilon (ε) values, corrected probability levels, and effect sizes (η_p^2) are reported. A significance level of 5% (two-sided) was selected and Fisher's least significance difference (LSD) procedure was applied. This procedure controls type I error rate by conducting follow-up tests for significant main and interaction effects only. The follow-up tests were planned paired-samples *t*-tests comparing each of the three regulation

conditions with the no regulation condition, because those comparisons were relevant to the

research questions. Effect sizes (Cohen's *d*) are reported for all *t*-tests.

Results

Participant characteristics

Twenty-two participants (91.7%) had an opposite-sex ex-partner and two female participants (8.3%) had a same-sex ex-partner. The average relationship duration was 31.2 months (SD = 27.8, range = 2.0-96.0) and average quality of the relationship was 6.5 (SD = 1.6, range = 3.0-9.0). Three participants (12.5%) had been married to their ex-partner, six participants (25.0%) had been cohabiting with but had not been married to their ex-partner, and 15 participants (62.5%) had not been married to or cohabiting with their ex-partner. The average time since the break-up was 6.0 months (SD = 10.0, range = 0.3-50.0). Eight break-ups (33.3%) had been initiated by the ex-partner, ten (41.7%) by the participant, and six break-ups (25.0%) had been a joint decision. The mean ERQ reappraisal score was 5.0 (SD = 1.0) and the mean ERQ suppression score was 3.4 (SD = 1.3).

The mean rating of how upset participants were about the break-up was 6.5 out of 9 (SD = 2.0, range = 3.0-9.0). These data confirms that all participants were upset about a romantic break-up to some degree at the time of the testing session and show that the average heartbreak intensity was medium-high. The mean intensity of love for the ex-partner was 5.6 out of 9 (SD = 1.8, range = 2.0-8.0), the mean IAS infatuation score was 4.2 out of 7 (SD = 1.3, range = 2.2-6.0), and the mean IAS attachment score was 3.8 out of 7 (SD = 1.2, range = 1.2-6.7). These data show that participants experienced medium levels of love for their ex-partner at the time of the testing session.

Self-reported love intensity correlated positively with the IAS attachment score, $r(22)$ = .56, p = .005. The correlation between self-reported love intensity and the IAS infatuation score

was in the same direction but was not significant, $r(22) = .28$, $p = .19$. This suggests that a one-item assessment of 'love' is a proxy of feelings of attachment. Importantly, the degree to which participants were upset about the break-up correlated positively with self-reported love intensity, $r(22) = .72$, $p < .001$, the mean IAS infatuation score, $r(22) = .56$, $p = .005$, and the mean IAS attachment score, $r(22) = .62$, $p = .001$. This suggests that the more intense the love feelings (both infatuation and attachment) for the ex-partner, the more upset about the break-up participants were.

Love and valence ratings

See Fig. 2 for the love and valence ratings. For the love ratings, the main effect of Condition was significant, $F(3,69) = 18.6$, $\varepsilon = .60$, $p < .001$, $\eta_p^2 = .45$. Follow-up tests showed that participants felt less in love after negative reappraisal than after no regulation, $p < .001$, Cohen's $d = -0.96$. Love reappraisal did not change love feelings compared to no regulation, $p = .23$, Cohen's $d = .25$, and neither did distraction, $p = .98$, Cohen's $d < 0.00$. Relationship duration and time since break-up were not correlated with any of the regulation effects in love ratings, $-.16 <$ all rs(22) $<$ .29, all ps > .17.

For the valence ratings, there was a main effect of Condition as well, $F(3,69) = 19.8$, $\varepsilon = .64$, $p < .001$, $\eta_p^2 = .46$. Follow-up tests showed that participants felt more unpleasant after negative reappraisal than after no regulation, $p < .001$, Cohen's $d = -0.88$, but more pleasant after distraction than after no regulation, $p = .010$, Cohen's $d = 0.57$. Love reappraisal did not change how pleasant participants felt compared to no regulation, $p = .97$, Cohen's $d = -0.01$.

In the negative reappraisal condition, the change in love ratings was positively correlated with the change in valence ratings, $r(22) = .60$, $p = .002$. This implies that the more love feelings

decreased as a result of negative reappraisal, the more unpleasant participant felt as a result of negative reappraisal. The change love ratings did not correlate with the change in valence ratings in the love reappraisal condition, $r(22) = .32$, $p = .14$, or the distraction condition, $r(22) = -.09$, $p = .68$.

Event-related potentials

See Fig. 3 for the ERPs in response to the ex-partner picture at the midline electrodes and Fig. 4 for the scalp topographies of the regulation effects. In the 400-1000 ms time window, the Condition * Caudality interaction was significant, $F(6,138) = 6.6$, $\varepsilon = .42$, $p = .001$, $\eta_p^2 = .22$, which was modulated by a significant Condition * Caudality * Laterality interaction, $F(12,276) = 2.1$, $\varepsilon = .62$, $p = .046$, $\eta_p^2 = .08$. Follow-up tests revealed that the ERP in response to the ex-partner picture was less positive after negative reappraisal than after no regulation at all three parietal electrodes, all ps < .040, all Cohen's ds < -0.44. In addition, the ERP in response to the ex-partner picture was less positive after love reappraisal than after no regulation at lateral parietal electrodes, both ps < .037, both Cohen's ds < -0.45. Lastly, the ERP in response to the ex-partner picture was less positive after distraction than after no regulation at all three parietal electrodes and at electrode C3, all ps < .042, all Cohen's ds < -0.44. Relationship duration and time since break-up were not correlated with any of the regulation effects averaged across electrodes P3, Pz, and P4, -.30 < all rs(22) < .09, all ps > .16. To summarize, all three regulation strategies decreased the ERP between 400-1000 ms at parietal electrodes.

Perceived ability to down-regulate love

The mean score on the love down-regulation items of the LCQ-II was 4.8 ($SD = 1.3$), which was

not significantly different from 5 (= neutral), $t(23) = -0.52$, $p = .61$, Cohen's $d = -.011$. This

suggests that participants thought that love down-regulation was neither possible, nor impossible.

See Table 1 for the mean score on each of the love down-regulation items of the LCQ-II. The

main effect of Person was significant, $F(1,23) = 8.9$, $p = .007$, $\eta_p^2 = .28$, which indicated that

participant felt they were worse at love down-regulation than people in general. The main effect

of Feeling was significant as well, $F(2,46) = 5.4$, $\varepsilon = .98$, $p = .008$, $\eta_p^2 = .19$. Follow-up tests

showed that participants thought it was easier to down-regulate attachment than love feelings in

general, $p = .006$, Cohen's $d = 0.63$, with down-regulation of infatuation non-significantly

different in-between, both ps > .096, both Cohen's ds < 0.36.

Likelihood of strategy use

The mean score on the negative reappraisal items of the likelihood of strategy use questionnaire

was 3.0 ($SD = 0.7$), which was significantly higher than 2.5 (= midpoint of the scale), $t(23) = 3.5$,

$p = .002$, Cohen's $d = 0.72$. The likelihood of using negative reappraisal of the ex-partner when

heartbroken did not correlate with the habitual use of reappraisal for regulating emotions as

indicated by the ERQ reappraisal score, $r(22) = -.23$, $p = .28$. The mean score on the love

reappraisal items was 2.5 ($SD = 0.7$), which was not significantly different from 2.5, $t(23) = 0.30$,

$p = .77$, Cohen's $d = 0.06$. Finally, the mean score on the distraction items was 3.3 ($SD = 0.6$),

which was significantly higher than 2.5, $t(23) = 6.6$, $p < .001$, Cohen's $d = 1.35$. In short,

participants were likely to use negative reappraisal and distraction, but were neither likely nor

unlikely to use love reappraisal.

Discussion

This study focused on three different regulation strategies that could be used after a romantic break-up: 1) negative reappraisal of the ex-partner (hereafter: negative reappraisal), 2) reappraisal of love feelings (hereafter: love reappraisal), and 3) distraction. Our goal was to test the effects of these three regulation strategies on love feelings for the ex-partner, valence of affect, and motivated attention for the ex-partner. Participants who were upset about a romantic break-up performed these three regulation strategies and no regulation before passively viewing a picture of their ex-partner. This task mimicked everyday life in the sense that people may encounter (reminders of) their ex-partner after regulating love feelings.

In a previous study, relationship duration and time since break-up were not associated with how upset people were about a romantic break-up, but whether the participant initiated the break-up or not was (Wrape, Jenkins, Callahan, & Nowlin, 2016). In the current study, relationship duration, time since break-up, and who initiated the break-up varied greatly between participants, but relationship duration and time since break-up were not associated with any of the regulation effects on love ratings or the LPP amplitude discussed below. Importantly, all participants were upset to some degree about the break-up at the time of the testing session. Interestingly, the more participants reported to still be experiencing love feelings for their ex-partner, the more upset about the break-up they reported to be. This corresponds with previous findings that love feelings for the ex-partner are positively associated with sadness (Sbarra & Ferrer, 2006) and negatively associated with self-concept recovery (Mason et al., 2012). These current and previous findings provide support for our suggestion that down-regulation of love feelings may help people cope with a break-up.

In line with the hypothesis, negative reappraisal decreased love feelings, which shows that negative reappraisal of the ex-partner is an effective love down-regulation strategy. Because a single item asking about "love" correlated with attachment rather than with infatuation, the love ratings may have tapped into attachment mostly. Therefore, the current data suggests that negative reappraisal decreases attachment and are less informative about the effect of negative reappraisal on infatuation. In a previous study, however, negative reappraisal decreased both infatuation and attachment (Langeslag & Van Strien, 2016), so negative reappraisal appears to down-regulate several types of love feelings. In that previous study, participants were free to choose between negative reappraisal of the beloved, the relationship, or the future, so it remained unclear which of those strategies was effective for love down-regulation. In addition, in the previous study participants were explicitly instructed to decrease love feelings, which may have introduced demand characteristics (Orne, 1962). The current finding replicates and extends the previous finding (Langeslag & Van Strien, 2016) by showing that even in the absence of explicit instructions to decrease love feelings, reappraisal of the beloved specifically is effective for love down-regulation. Future studies could test whether negative reappraisal of the relationship and/or imagining negative future scenarios specifically are effective for love down-regulation as well.

Besides reducing love feelings, negative reappraisal also made people feel more unpleasant, which is a replication of the unexpected effect in the previous study (Langeslag & Van Strien, 2016). It probably occurs because negative reappraisal involves having negatively-valenced thoughts. So besides being an effective love down-regulation strategy, negative reappraisal is also an effective negative emotion up-regulation strategy. This confirms that love down-regulation after a break-up is not just down-regulation of negative emotions and supports the notion that love regulation is conceptually distinct from emotion regulation. The changes in

love and valence ratings as a result of negative reappraisal were positively correlated. Correlation does of course not imply causation, but this finding does raise the question whether the change in love feelings is caused by the change in (un)pleasantness or vice versa. Because love feelings were positively correlated with how upset participants were about the break-up, it seems unlikely that a decrease in love feelings would cause people to feel more unpleasant. Even though love is not inherently pleasant or unpleasant, it seems more plausible that increasing unpleasantness would cause a decrease in love feelings. This idea could be tested in future studies, for example by instructing participants to up-regulate negative emotions unrelated to the beloved or the relationship, and testing whether and how that affects their love feelings.

If negative reappraisal decreases love feelings but increases unpleasantness, it might not be a helpful strategy to cope with a romantic break-up. Nevertheless, participants reported to be likely to use negative reappraisal when heartbroken. In the previous study (Langeslag & Van Strien, 2016), several participants spontaneously reported to use this strategy when they were heartbroken, albeit more to decrease love feelings than to feel better, which aligns with the previous and current findings regarding self-reported love and valence. Even though negative reappraisal may result in negative affect at this moment, it might decrease how upset someone is about the break-up. Unfortunately, we only assessed how the regulation strategies affected love and valence rather than how upset participants felt about the break-up. It would be good to add that outcome variable in future studies about love regulation after a romantic break-up. In addition, it could be that the reduced love feelings due to negative reappraisal have favorable long-term effects after a break-up. It has been shown that thinking negative thoughts about the relationship indeed has adaptive features when recovering from a romantic break-up (Brenner &

Vogel, 2015). So, negative reappraisal has an unfavorable short-term effect on affect, but may have favorable long-term effects when used after a break-up.

In contrast to the hypothesis, love reappraisal did not change love feelings. So even though emotion reappraisal is an effective emotion regulation strategy (Webb et al., 2012), love reappraisal does not seem to be an effective love regulation strategy. Because the love rating probably assessed attachment mainly, it would be interesting to test whether love reappraisal is effective for decreasing love feelings other than attachment, such as infatuation, in future studies. Love reappraisal did not change valence either, which was expected because the love reappraisal prompts induced neutral thoughts. Participants reported to be neither unlikely nor likely to use love reappraisal, perhaps because it is ineffective and/or less well-known. Perhaps people could use reappraisal of negative emotions rather than reappraisal of love feelings to cope with a romantic break-up. For example, you could tell yourself that it is normal to feel sad after a break-up and try to accept that sadness without judgement. It would be interesting to test in future studies whether emotion reappraisal would be beneficial after a break-up.

Unexpectedly, distraction did not change how in love people felt with their ex-partner. Love is a long-lasting state that may still be present when the mind is occupied, which could explain why distraction does not decrease love feelings. Distraction did make people feel more pleasant, which was expected because the distraction prompts elicited positively-valenced thoughts. The dissociation between the effects of distraction on love feelings and valence shows that changes in (un)pleasantness are not always accompanied by changes in love feelings. Participants reported to be likely to use distraction when heartbroken. In the previous study, many participants spontaneously reported to use distraction when they were heartbroken, albeit more to feel better than to decrease love feelings (Langeslag & Van Strien, 2016), which

corresponds with the current findings regarding self-reported love and valence. In short, even though positive distraction may not be an effective love regulation strategy, it is an effective positive emotion up-regulation strategy. It has been suggested, though, that distraction has maladaptive long-term effects. For example, although the LPP amplitude is reduced when participants distract themselves while viewing unpleasant pictures, the LPP amplitude is actually increased in response to those same pictures when they are shown again later (Thiruchselvama et al., 2011). Distraction is a form of cognitive avoidance (Moos & Schaefer, 1993) and it has been shown that a combination of behavioral and cognitive avoidance was associated with the use of more negative words when describing the break-up (Boals & Klein, 2005) and with feeling more upset about it (Wrape et al., 2016). Thus, it seems that distraction has favorable short-term effects on affect, but unfavorable long-term effects when used after a break-up.

All three regulation strategies decreased the ERP amplitude in response to a subsequent picture of the ex-partner between 400-1000 ms after stimulus onset at parietal electrodes. The latency and scalp topography of this effect confirms that the regulation strategies decreased the LPP amplitude (Schupp et al., 2006). The current findings are in line with the general notion that emotion down-regulation decreases the LPP amplitude in response to emotional information (Hajcak et al., 2010) and with the previous finding that negative reappraisal decreased the LPP amplitude in response to a picture of the beloved (Langeslag & Van Strien, 2016). The current findings extend those previous findings by showing that negative reappraisal of the ex-partner specifically decreases the LPP amplitude, that it does so in people who are upset about a romantic break-up, and that love reappraisal and distraction decrease the LPP amplitude as well. Because the LPP amplitude reflects motivated attention (Schupp et al., 2006), the current results show that negative reappraisal, love reappraisal, and distraction reduce motivated attention for

the ex-partner. Just like reducing attention for disorder-related information could ameliorate the

disorder (Hakamata et al., 2010), reducing motivated attention for an ex-partner may reduce

heartbreak. For example, the reduced motivated attention for the ex-partner may make it easier to

cope with running into the ex-partner or coming across reminders of the ex-partner, such as

pictures on social media, because those stimuli will now attract less attention.

Because all three regulation strategies decreased the LPP amplitude, it could be that

presenting any prompt before a picture will reduce the LPP amplitude in response to that picture.

That is unlikely though, because presenting positive descriptions before neutral pictures (Peng et

al., 2013) and negative descriptions before unpleasant and neutral pictures (MacNamara et al.,

2009) increased the LPP amplitude in previous studies. Nevertheless, the LPP amplitude

difference between the regulation conditions and the passive viewing condition could have been

confounded by cognitive control. That is, high cognitive load decreases the LPP amplitude to

emotional pictures compared to low cognitive load (MacNamara, Ferri, & Hajcak, 2011) and the

regulation prompts could have increased cognitive load compared to the three asterisks that were

shown in the passive viewing condition. It is unlikely, however, that the decreased LPP in the

current study is (mainly) the result of increased cognitive load, for three reasons. First,

participants were instructed to think about the prompts while they were on the screen and to

subsequently passively view the pictures. Assuming that participants followed the instructions,

cognitive control while viewing the pictures would have been low and comparable between the

regulation and the passive viewing conditions. Second, the negative reappraisal or distraction

conditions may have required more cognitive control than the love reappraisal condition. That is,

the negative reappraisal and distraction prompts were questions that participants had to answer,

while the love reappraisal prompts were statements that participants had to repeat and try to

believe. Despite potential differences in cognitive control between the regulation conditions, additional analyses showed that there were no differences in LPP amplitude between the regulation conditions[1]. Third, instructing participants to up-regulate emotions using cognitive reappraisal typically increases the LPP amplitude (Moser et al., 2009; Moser et al., 2010), even though it requires cognitive control as well. Future studies could test whether prompts to up-regulate love feelings increase the LPP amplitude, which would provide additional support for the idea that the change in LPP amplitude after love regulation reflects motivated attention rather than cognitive control.

Besides the effects of different regulation strategies on love feelings, valence, and motivated attention, we also tested participants' beliefs about love down-regulation. Participants thought that love down-regulation was neither possible nor impossible, that other people were better at down-regulating love than they, and that feelings of attachment were easiest to down-regulate. These findings replicate previous findings about beliefs about love regulation in general (Langeslag & Van Strien, 2016) and extend those finding by revealing people's beliefs about love down-regulation specifically. Importantly, the current and previous study (Langeslag & Van Strien, 2016) show that people can actually regulate their love feelings using cognitive reappraisal of the situation, so beliefs that love regulation is impossible are incorrect. Because people's beliefs about love regulation will probably influence how likely they are to apply love regulation in daily life, psychoeducation about the feasibility of love regulation may be needed to encourage people to perform love regulation in daily life or clinical settings.

One of the strengths of the current study is the experimental manipulation of strategy use. Rather than assessing associations between spontaneous strategy use and outcome variables related to recovery from a break-up, we manipulated strategy use within participants in a

regulation task and tested how that affected the outcome variables, which allows for demonstrating causality (Goodwin, 1998). A limitation of manipulating strategy use within participants, however, is that it only allowed for assessment of the short-term effects of regulation. In order to evaluate which regulation strategies would best help people cope with a break-up, it would be essential to consider both the short-term and long-term effects. Another limitation of the current study is that the majority of participants were women. It was difficult to recruit men who were upset about a romantic break-up, which could have been due to men being less upset by romantic break-ups (Wrape et al., 2016) and/or less likely to participate in a study about heartbreak than women. We had to sacrifice gender balance in favor of reaching the intended sample size. A meta-analysis has revealed that emotion regulation effects are greater in women than in men (Webb et al., 2012), so it would be good to test whether there are any gender differences in love regulation in future studies.

To conclude, because love feelings for an ex-partner are negatively associated with recovery from a romantic break-up (Mason et al., 2012; Sbarra & Ferrer, 2006), down-regulation of love feelings for the ex-partner might help people cope with a romantic break-up. In this study, negative reappraisal of the ex-partner decreased love feelings and made people feel more unpleasant. Love reappraisal did not change how in love or how unpleasant/pleasant participants felt. Distraction did not change love feelings either but did make people feel more pleasant. All three strategies reduced motivated attention for the ex-partner, which may make it easier for people to deal with encounters of (reminders of) the ex-partner. Despite beliefs that love regulation was not particularly possible, participants reported to already use negative reappraisal and distraction when heartbroken. Because different strategies may have different and even opposing effects on love feelings and/or valence, it would be important for people to use the

strategy that has the desired effect rather than a mix of strategies that might cancel each other out. Notably, down-regulation of love feelings has many more potential applications than just in the context of a romantic break-up. For example, people may experience unreciprocated love feelings for someone they have never been in a relationship with. Or, people may be in love with the 'wrong' person, such as someone in a power position at work or school, or someone who is abusive. Also, people who are happily married sometimes develop an unwanted crush on someone other than their spouse. Finally, romantic love is valued less in collectivistic compared to individualistic societies because it plays a smaller role in partner selection (Dion & Dion, 1993; Simmons, Vom Kolke, & Shimizu, 1986). In situations like these, people may want to decrease the intensity of their love feelings. Love down-regulation could ameliorate heartbreak, could help people to stop pursuing an inappropriate partner, or could help people to put an end to a dysfunctional relationship. In addition, it has been show that positive reappraisal of the situation can increase love feelings (Langeslag & Van Strien, 2016), which could be helpful in functional long-term relationships. It may be clear that the phenomenon of love regulation has important implications for everyday life and clinical settings and deserves further investigation.

Context

Our research program focuses on the interaction between love and cognition. We study how love influences cognition, such as attention and memory (e.g., Langeslag et al., 2008; Langeslag et al., 2007; Langeslag, Olivier, Köhlen, Nijs, & Van Strien, 2015). We also study how cognition influences love (Langeslag, Van der Veen, & Röder, 2014; Langeslag & Van Strien, 2016), which includes love regulation. The current study is part of that second line of research. We are currently conducting studies to examine the similarities and differences between love regulation and emotion regulation in more detail.

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Author note

Footnote

1 Paired samples t-tests showed that there were no significant differences between the three regulation conditions in the ERP amplitude at any of the three parietal electrodes (P3, Pz, and P4), all ps > .51.

Figures

Regulation prompt	+		How in love do you feel?	How negative or positive do you feel?	
5 seconds	0.5-0.7 seconds	1 second	Until response	Until response	1 second
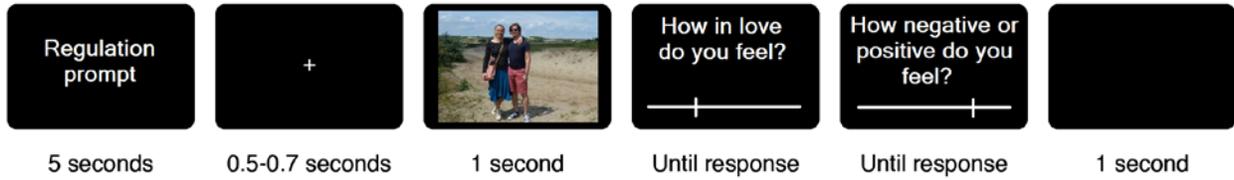
Fig. 1 Trial overview. The slider for the love ratings was labeled "not at all" on the left and "completely" on the right. The slider for the valence ratings was labeled "negative" on the left and "positive" on the right.
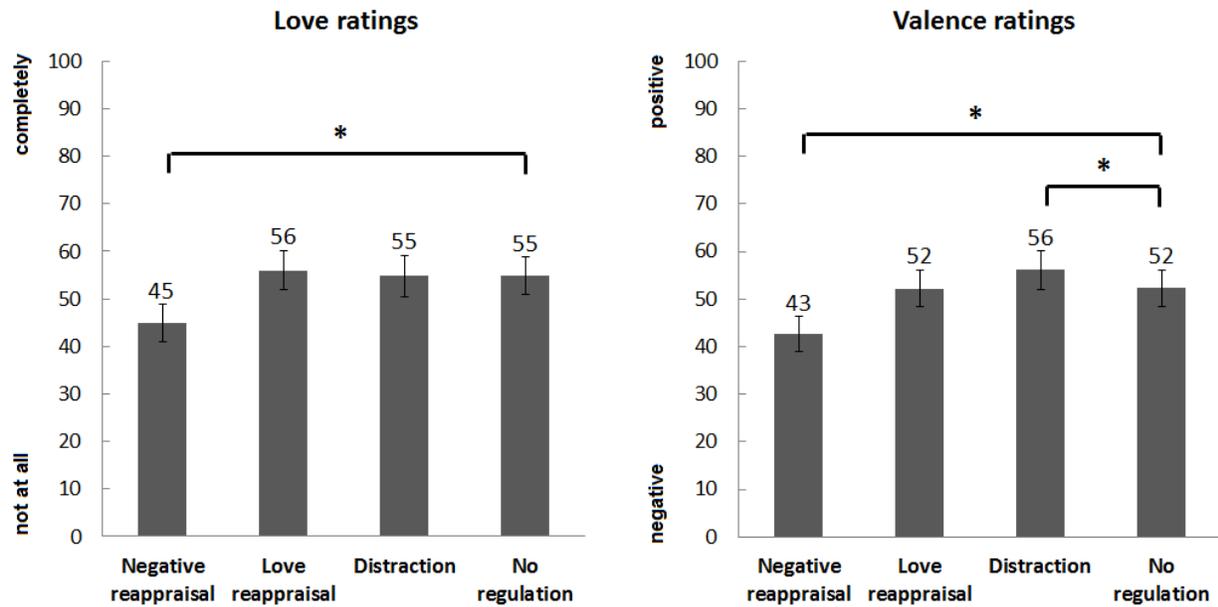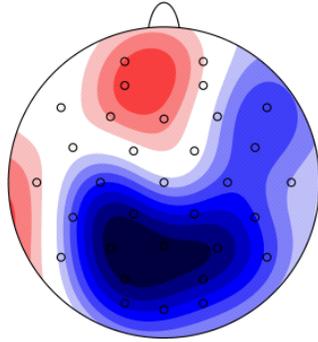

Fig. 2 Mean love and valence ratings, error bars indicate standard errors of the mean. Regulation strategies were only compared to the no regulation condition, not to each other, * indicates $p < .05$
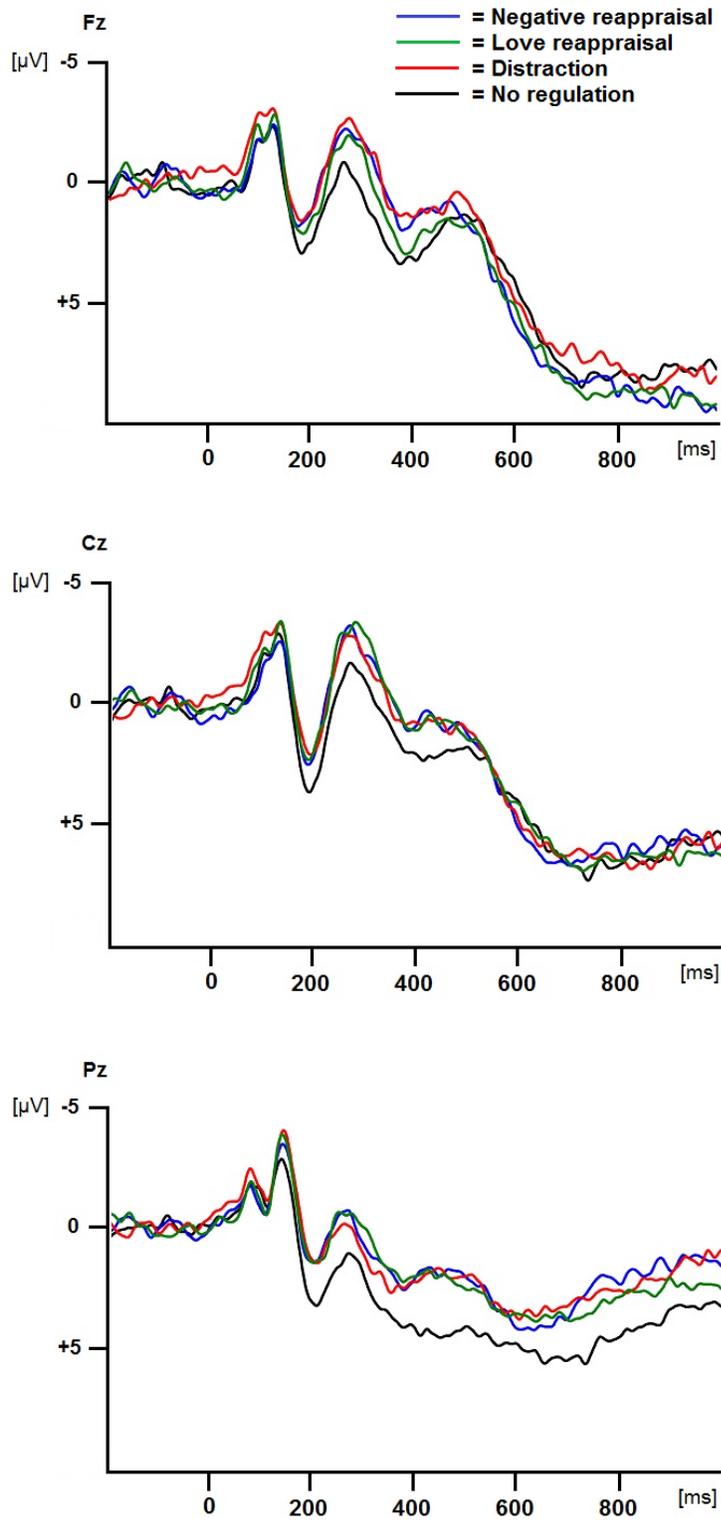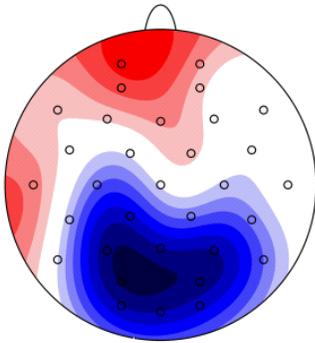
Fig. 3 ERPs in response to the ex-partner picture at electrodes Fz, Cz, and Pz, in each the four regulation conditions. Positive plotted downwards.
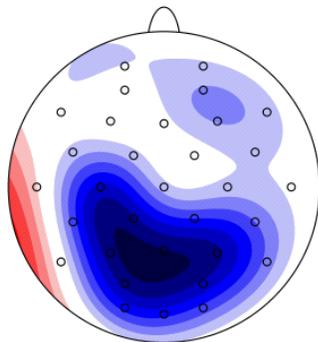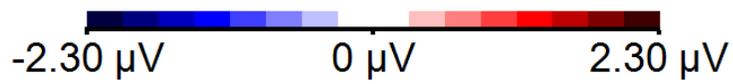
Negative reappraisal - View

Love reappraisal - View

Distraction - View

400 ms - 1000 ms

-2.30 µV   0 µV   2.30 µV

Fig. 4 Scalp topographies of the regulation effects in the 400-1000 ms time window.

Table 1 Mean scores on the love down-regulation items of the new Love Control Questionnaire

(LCQ-II)

Item	*M* (*SD*)
I can purposefully decrease how in love I am.	4.1 (2.1)
People can deliberately decrease how in love they are.	4.3 (2.0)
I can reduce the intensity of infatuation at will.	4.0 (1.9)
People can make feelings of infatuation less intense.	5.8 (2.0)
I can make feelings of attachment less intense.	5.2 (2.2)
People can intentionally reduce the intensity of attachment.	5.8 (2.2)

Note. The items were presented to the participants in a pseudorandom order, 1 = totally disagree,

9 = totally agree.

Appendix A Regulation prompts

Negative reappraisal of the ex-partner

What is a bad way your ex acted?

What is a bad way your ex behaved?

What is a bad way your ex sounded?

What is a time your ex looked bad?

What is an annoying habit of your ex?

What is a bad personality trait of your ex?

What bad values does your ex have?

What bad belief does your ex have?

What is your ex's bad habit?

What is a bad way your ex talked to you?

What is a bad way your ex looked at you?

What is something stupid your ex said?

What is something stupid your ex did?

What is something annoying your ex did?

What is something mean your ex did?

What is something mean your ex said?

Who is the annoying friend of your ex?

Who is the annoying family member of your ex?

What is an annoying hobby of your ex?

What is something gross your ex ate?

What is something dumb your ex thought?

What is something annoying your ex watched?

What is something disrespectful your ex did?

What is something disrespectful your ex said?

What is something your ex didn't understand?

What is something your ex didn't support?

What is something your ex wouldn't participate in?

How did your ex not fit into your future plans?

Reappraisal of love feelings

"It's ok to love someone you're no longer with."

"Many people still love their ex."

"People won't always feel love for an ex."

"People still love their ex; that's fine."

"Experiencing unrequited love is normal."

"Loving someone is normal."

"If I'm still in love with my ex; that's ok."

"People are still attached to their ex; that's ok."

"People won't always be attached to their ex."

"People won't always want their ex."

"People love; that's what they do."

"Love is simply a brain process."

"Love will pass."

"Love is part of life."

"Love is just hormones."

"Love is only a chemical process."

"People don't have to feel bad about their love feelings."

"It's understandable to love an ex."

"It's ok to love an ex."

"It's normal to love an ex."

"It's fine to love an ex."

"Love feelings are temporary."

"It's ok to desire to be loved."

"It's ok to want to be loved."

"It's ok to desire someone."

"Love hurts sometimes and that's normal."

"It's ok to love someone even when apart."

"It's ok for people to still love an ex."

Distraction

What is your favorite song? Why?

What is your favorite food? Why?

What is your favorite holiday? Why?

What is your favorite color? Why?

What is your favorite movie? Why?

What is your favorite season? Why?

What is your favorite TV show? Why?

What is your favorite drink? Why?

What is your favorite hobby? Why?

What is your favorite animal? Why?

What is your favorite meal? Why?

What is your favorite joke? Why?

Who is your best friend? Why?

What is your favorite restaurant? Why?

What is your favorite city? Why?

What would you do if you won the lottery?

What is your favorite state? Why?

What is your favorite candy? Why?

Who is your favorite family member? Why?

What is your favorite piece of clothing? Why?

What is your passion? Why?

What is your favorite vacation destination? Why?

Who is your role model? Why?

Who is your favorite teacher? Why?

What is your favorite game? Why?

What is your favorite sport? Why?

What is your ideal job? Why?

What is your ideal career? Why?