4-5-2019

Negative and Positive Reappraisal After a Romantic Break-up

Scarlett Horner
sbh7pb@mail.umsl.edu

NEGATIVE and POSITIVE REAPPRAISAL After a ROMANTIC BREAK-UP

Scarlett Horner

B.S. in Psychology, Georgia Institute of Technology, 2015

A Thesis Submitted to The Graduate School at the University of Missouri-St. Louis in partial fulfillment of the requirements for the degree

Master of Science in Psychology with an emphasis in Behavioral Neuroscience

May 2019

Advisory Committee

Sandra Langeslag, Ph.D.
Chairperson

Suzanne Welcome, Ph.D.

George Taylor, Ph.D.

Abstract

Romantic break-ups can cause sadness, depression, and physical symptoms. The purpose of this study is to compare two methods of alleviating heartbreak: negative reappraisal of the ex-partner and positive reappraisal of the break-up. We expected that positive reappraisal would make people feel more positive than negative reappraisal, but that negative reappraisal would make people feel less in love than positive reappraisal. We expected that negative reappraisal would reduce motivated attention as measured by the late positive potential (LPP) and how upset people were about the break-up more than positive reappraisal. In this study, 24 participants (16 female) who were upset about a break-up viewed pictures of their ex-partner in three conditions: negative reappraisal, positive reappraisal, and no regulation. In the negative reappraisal condition, participants were prompted to think about negative aspects of their ex-partner. In the positive reappraisal condition, participants were prompted to think about positive aspects of being single. After each prompt, participants viewed the ex-partner picture and the LPP was measured. Participants rated infatuation, attachment, valence, and upsetness about the break-up. Even though many variables showed numerical differences that were in line with previous research and our hypotheses, no significant differences occurred between conditions for infatuation, attachment, valence, upsetness, or LPP amplitude about break-up in the preregistered analyses. Exploratory analyses showed that the LPP amplitude at Pz in the negative reappraisal condition was less positive than during the no regulation condition. Future research can help see if there are effects of positive and negative reappraisal over time.

Key Words: Negative Reappraisal, Positive Reappraisal, Late Positive Potential (LPP)

As a romantic relationship becomes harder to maintain, one or both partners may decide to end the relationship. Anyone who has gone through a romantic break-up knows how upsetting it can be. People in love feel dependent on their partners (Fisher, Aron, Mashek, Li, & Brown, 2002), which can have negative consequences if they go through a break-up. At its worst, heartbreak can cause insomnia, depression, and intrusive thoughts (Field, 2011), as well as loss of self-concept (Mason, Law, Bryan, Portley, & Sbarra, 2012; Slotter, Gardner & Finkel, 2010). Because being in a relationship also lowers one's stress levels (Schneiderman, Zilberstein-Kra, Leckman, & Feldman, 2011), suddenly losing that relationship may make someone feel even more stressed. Because of the negative consequences of a break-up, it would be beneficial to get over a break-up sooner rather than later.

Emotion regulation is the ability to change or maintain positive and negative emotions (Gross, 1998). Emotion regulation is used on a daily basis to try to control emotions or the expressions of emotions. One of the ways people can regulate their emotions is through cognitive reappraisal, or re-interpreting a situation. Reappraisal is antecedent focused, meaning that reappraisal happens before the emotional response (Gross, 1998). Reappraisal is commonly used in daily life, and is an effective method of emotion regulation (Gross, 2002; Nezlek & Kuppens, 2008). In one study, when participants were told to think objectively about disgusting pictures, feelings of disgust were lower than when they were told to view the picture (Goldwin, McRae, Ramel, & Gross, 2008), further supporting the idea that reappraisal is an effective emotion regulation strategy. In addition, another study showed that regardless of emotion intensity, reappraisal can decrease negative emotion (Silvers, Weber, Wager, & Ochsner,

2015). Similarly, reappraisal can decrease both positive and negative emotions (Kanske, Heissler, Schönfelder, Bongers, & Wessa, 2011). One final study supported the idea that that negative emotions can successfully be up-regulated or down-regulated using reappraisal, with up-regulation increasing negative emotions, and down-regulation decreasing negative emotions (Ochsner et al., 2003). These studies all show that reappraisal is effective at increasing or decreasing positive or negative emotions in general, and a good method of emotion regulation to decrease negative emotion.

Two previous studies have shown that negative reappraisal of the partner, the relationship, or the future decreased love feelings (Langeslag & Sanchez, 2017; Langeslag & van Strien, 2016). Infatuation is defined as a very strong attraction towards another person, while attachment is defined as an emotional bond with another person (Fisher, 1998). Langeslag and van Strien (2016) found that when participants down-regulated their love feelings, both infatuation and attachment decreased compared to no regulation, but infatuation decreased more than attachment. Unfortunately, when participants down-regulated their love feelings using negative reappraisal, they felt more unpleasant (Langeslag & Sanchez, 2017; Langeslag & van Strien, 2016). It is unclear, however, whether negative reappraisal decreased how upset people were about the break-up, as the previous studies did not measure that. Generally, love feelings after a break-up are associated with sadness (Sbarra & Ferrer, 2006) and decreased well-being (Mason et al., 2012). As these two are related, it is possible that decreasing love feelings decrease upsetness related to the break-up. If people are less upset about the break-up after negative reappraisal, that may be an advantageous strategy.

However, if negative reappraisal of the ex-partner does make people feel more negative, a different strategy may be more effective, such as positive reappraisal of the break-up. For example, in one study, participants were able to use positive reappraisal to increase amusement while watching a video (Giulani, McRae & Gross, 2008). This supports the idea that positive reappraisal when looking at stimuli can increase positive emotion. In another study, participants had to think of positive outcomes and how things get better in response to a negative stimulus, which lead to participants feeling more pleasant (Ochsner et al. 2003). The idea of this positive reappraisal of the situation making people feel more positive suggests that if people positively reappraised their feelings regarding the break-up, they would also feel more positive.

Attention to a stimulus can be used as an indicator of emotional response. Emotional stimuli are given attentional priority over neutral stimuli (Compton, 2003). One way of measuring attention is by using the late positive potential (LPP), a component of the event-related potential (ERP). The LPP measures attention in general, and increases when people see both target stimuli and love stimuli (Langeslag, Franken, & Van Strien, 2008), as well as emotional stimuli (Schupp, Flaisch, Stockberger, & Junghöfer, 2006). The more arousing a stimulus is, the larger the LPP amplitude (Hajcak, MacNamara, & Olvet, 2010; Schupp et al., 2006), and the larger the LPP amplitude is, the more someone is attending to a stimulus. This is useful in measuring how effective an emotion regulation method is because if a person perceives a stimulus as less emotionally salient, they will attend to the stimulus less. One study by Hajcak and Nieuwenhuis (2006) showed that when participants performed reappraisal, the LPP amplitude after viewing emotionally charged pictures was smaller than it was when participants passively

viewed at the picture, which supports the idea that emotion down-regulation reduces the LPP amplitude. Furthermore, when a specific descriptive prompt that requires little thinking and regulates emotion is given to someone, the LPP amplitude still changes (Hajcak et al., 2010), suggesting that changes in the LPP amplitude during emotion regulation are not brought about by cognitive load, but by the regulation effects themselves.

Because the LPP amplitude is a generalized measure of attention, it can also be used to measure attention to pictures of a beloved or ex-beloved. For example, in one study, pictures of the beloved elicited a greater LPP amplitude compared to pictures of opposite-sex friends and strangers, suggesting that attention is higher for the beloved (Langeslag, Jansma, Franken & van Strien, 2007). If love feelings can be decreased using reappraisal, the LPP should decrease as well, because the person will pay less attention to their beloved. For example, in one study by Langeslag & van Strien (2016), positive reappraisal of the beloved increased the LPP amplitude while negative reappraisal of the beloved decreased the LPP amplitude compared to passive viewing. In a previous study by Langeslag and Sanchez (2017), participants who had gone through a break-up and were upset about it viewed at pictures of their ex-partner. In the negative reappraisal condition, the LPP was also decreased, showing less attention for the beloved.

This study compared negative reappraisal of the ex-partner and positive reappraisal of the break-up, and was meant to answer four questions. The first question the study sought out to answer was if negative reappraisal of the ex-partner and positive reappraisal of the break-up differentially modulated love feelings. The second question the study sought out to answer was if negative reappraisal of the ex-partner and positive

reappraisal of the break-up differentially modulated the valence of affect. The third question the study sought out to answer was if negative reappraisal of the ex-partner and positive reappraisal of the break-up differentially modulate how upset people feel about a romantic break-up. The final question the study sought out to answer was if negative reappraisal of the ex-partner and positive reappraisal of the break-up differentially modulate motivated attention for the ex-partner, as indicated by the LPP amplitude.

We expected negative reappraisal of the ex-partner to decrease love feelings, such as infatuation and attachment, more than positive reappraisal of the break-up. We also expected positive reappraisal of the break-up to make people feel more pleasant than negative reappraisal of the ex-partner, because negative reappraisal of the beloved tends to make people feel unpleasant (Langeslag & Sanchez, 2017; Langeslag & van Strien, 2016). We also expected that negative reappraisal of the ex-partner will make people feel less upset about the break-up than positive reappraisal of the break-up, because after a break-up there is a relationship between love and negative emotion (Mason et al., 2012; Sbarra & Ferrer, 2006). Finally, we expected that negative reappraisal of the ex-partner would reduce the LPP amplitude in response to a picture of the ex-partner more than positive reappraisal of the break-up.

This study was preregistered with the Preregistration Challenge of the Center for Open Science (https://osf.io/3ngvu/). That means that the research question, hypotheses, design, and analysis were determined before the start of the data collection. Preregistration ensures that the study is confirmatory rather than exploratory. On the preregistration form, we called our conditions love regulation and emotion regulation instead of negative reappraisal of the ex-partner and positive reappraisal of the break-up,

respectively. We have changed the names in this manuscript because the new names describe the participant instructions rather than the hypothesized outcomes of the strategies, which makes it easier for the reader to parse the information. Please note that other than the names of the two regulation conditions, our research questions, hypotheses, and analyses were the same as on the preregistration form.

Methods

Participants

For this study, 28 participants were recruited from the University of Missouri – Saint Louis, Craigslist, ResearchMatch, and the greater St. Louis area. All participants had experienced a break-up and were upset about it at the time of the study, as indicated by a score of at least two on the question "how upset are you about the break-up?" (see below). Other inclusion criteria included having normal or corrected-to-normal vision, having no psychiatric or mental disorders, and not using medications that affect the central nervous system. One female participant was unable to do the study due to overactive brainwaves which could not be fixed. Three participants (one female) were excluded from the analysis, one female for being unable to complete the ratings for one condition as ePrime crashed, one for not having enough accepted trials after artifact rejection (see below), and one for not having normal or corrected to normal vision, leaving us with 24 participants (16 female) ranging from ages 28-38 years (M = 27.21, SD = 6.18). Twenty participants were right handed, two participants were left handed, and two participants were ambidextrous as determined by the handedness questionnaire (see below). The study was approved by the University of Missouri—St. Louis institutional review board. Participants provided written informed consent and received either $40 or course credit for their participation in the study.

Stimuli

Participants provided in 28 non-explicit, non-intimate pictures of their ex-partner. The pictures showed the ex-partner partially obscured or unobscured, in a variety of situations, and were allowed to contain other people. These pictures mimicked the

situations in which the participant could encounter their ex-partner. Each picture was shown in each condition to prevent confounding of regulation effects by picture content.

Procedure

Participants completed a general questionnaire about the break-up (Langeslag & Sanchez, 2017). Participants reported the gender of their ex-partner, how long the relationship had lasted, the status of the relationship (married, cohabiting, or not cohabiting), how good the relationship with their ex-partner was (1 = very bad, 9 = very good), how long ago the relationship ended, who ended the relationship, and how upset they are about the break-up (1 = not upset at all, 9 = very upset). Participants then completed the Infatuation and Attachment Scale (IAS) (Langeslag, Muris, & Franken, 2013), which measures how infatuated and attached participants were to their ex-partners on a seven-point scale. Participants then completed a handedness questionnaire (Bryden, 1982).

Participants completed a regulation task while their electroencephalogram (EEG) was recorded. The regulation task had three conditions: negative reappraisal of the ex-partner, positive reappraisal of the break-up, and no regulation. As shown in Figure 1, each trial started with a prompt (See Appendix A for list of prompts) that lasted for five seconds, followed by a fixation cross with a jittered duration of 500-700 ms before the picture appeared for one second, and finally a blank screen which appeared for one second. Before completing the task, participants completed a practice block that consisted of one trial of each condition and included prompts not used in the main task. The images in the practice block were images unrelated to the ex-partner. In the main task, each there were three blocks: one for negative reappraisal of the ex-partner, one for positive

reappraisal of the break-up, and one for no regulation. The order of the blocks was counterbalanced between participants. Each block contained 28 trials. In the negative reappraisal condition, the prompts were questions about negative traits of the ex-partner (e.g. "What is an annoying habit of your ex?") and participants were instructed to silently answer the question. In the positive reappraisal condition, the prompts were questions about positive aspects of being single (e.g. "What can you eat now that you're single?") and participants were instructed to silently answer the question. There were 28 prompts in the love down-regulation condition and 28 prompts in the emotion down-regulation condition. Every prompt was used once. In the no regulation condition, participants saw asterisks instead of prompts. After the prompts/asterisks and the fixation cross, participants passively viewed a picture of the ex-partner. At the end of each block, participants completed ratings of infatuation, attachment, valence, and upsetness about the break-up by using a slider in the middle of the screen.

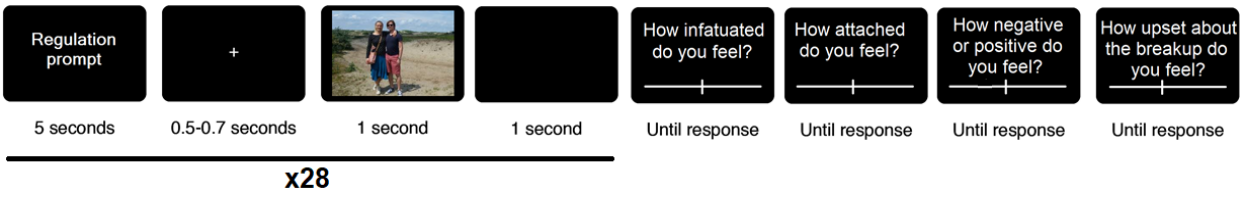

Figure 1: Trial Overview and End of Block Ratings. Participants were given a prompt for five seconds, followed by a fixation cross with a jitter of 500-700 ms, followed by a picture of the ex-partner for one second, and a blank screen for one second. The end of block ratings are the questions that were asked at the end of each block. The left side of the screen represents "not at all" and the right side of the screen represents "very much," with the exception that for valence ratings, the left side represents "negative" and the right side represents "positive."

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, 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) was recorded by attaching electrodes (UltraFlat Active electrodes, BioSemi) above and below the left eye, and at the outer canthi of both eyes. Two electrodes were also placed at the at 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 create a feedback loop. Signals were digitized using 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, Weinberg, MacNamara, & Foti, 2011). The data was 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 starting 200 ms before the onset of the ex-partner picture and ending 1000 ms after the picture's onset. The mean 200 ms before picture onset was used for baseline correction. Ocular artifact correction was applied semi-automatically according to Gratton, Coles, and Donchin (1983). Artifact rejection was performed at individual electrodes with a baseline-to-peak minimum and maximum

criterion of -75 to +75 μV. After artifact rejection, segmented data was sorted by condition. To find reliable emotional modulation of the LPP, participants must have at least 12 accepted trials per condition (Moran, Jendrusina, & Moser, 2013), so participants with fewer than 12 trials were excluded from analyses. The average waveforms for each participant were used.

Statistical Analyses

Infatuation, attachment, valence, and upsetness about break-up ratings were transformed from the slider to a scale of 0-100 (0 being far left, 100 being far right), and tested using a repeated measures analysis of variances (rmANOVA) with the factor Condition (negative reappraisal of the ex-partner, positive reappraisal of the break-up, no regulation). The LPP in response to the ex-partner picture was quantified by a mean amplitude measure in a 400–1,000 ms time window (Langeslag & Sanchez, 2017). 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, Caudality (frontal, central, parietal), and Laterality (left, center, right). Only significant effects involving factor Condition are reported. Exploratory analyses of the LPP amplitude at Pz were conducted using a rmANOVA with factor Condition.

Degrees of freedom (df) were corrected with the Greenhouse-Geisser correction. The *F* values, uncorrected *df*s, the epsilon (ε) values, corrected probability levels, and effect sizes (η_p^2) were reported. A two-sided p-value of less than 0.05 was considered statistically significant. Type I error rate was controlled for by Fisher's least significant difference (LSD) procedure, which only conducted follow-up tests for significant main

effects and interaction effects. Follow up tests used to compare the three conditions with each other were paired samples t-tests. Effect size was assessed using Cohen's *d'*.

Results

Participant Characteristics

The average length of relationships was 40.92 months (range: 11-144 months). All women reported their exes were men, while three men reported their exes were men and five reported their exes were women. On average, the quality of the relationships was rated 6.46 out of 9 (range: 4-9 out of 9). On average, the relationships ended 14.42 months ago (range: 1-132 months). On average, participants rated their upsetness about the break-up 7.17 out of 9 (range: 3-9), showing participants were upset about the break-up. The average IAS infatuation score was 4.35 out of 7 (range: 2-6.3), while The average IAS attachment score was 3.39 out of 7 (range: 1.4-6.3). There tended to be a positive association between IAS infatuation scores and how upset about the break-up participants were, $r = .373$, $p = .073$. There was no significant correlation between IAS attachment scores and how upset about the break-up participants were, $r = .091$, $p = .671$. Ten participants had initiated the breakup, eight participants were broken up with by the ex-partner, and six participants said both parties ended the relationship. Three participants had been married, nine had been cohabiting, 11 had not been cohabiting, and one did not wish to answer.

Ratings Results

See figure 2 for the ratings data in each condition. Numerically, infatuation ratings were highest in the no regulation condition, intermediate in the positive reappraisal condition, and lowest the negative reappraisal condition, but the main effect of Condition was not significant $F(2, 46) = 1.178$, $\varepsilon = .781$, $p = .309$, $\eta_p^2 = .049$. Numerically, attachment ratings also were highest in the no regulation condition,

intermediate in the positive reappraisal condition, and lowest the negative reappraisal condition, but the main effect of Condition only trended towards significance, $F(2, 46) = 3.544$, $\varepsilon = .678$, $p = .057$, $\eta_p^2 = .134$. Numerically, participants felt the most pleasant in the positive reappraisal condition, intermediately pleasant in the no regulation condition, and the least pleasant in the negative reappraisal condition, but the main effect of Condition only trended towards significance, $F(2, 46) = 3.748$, $\varepsilon = .671$, $p = .051$, $\eta_p^2 = .140$. Numerically, participants were most upset in the no regulation condition, intermediately upset in the negative reappraisal condition, and least upset in the positive reappraisal condition, but the main effect of Condition was not significant, $F(2, 46) < 1$, *ns*.

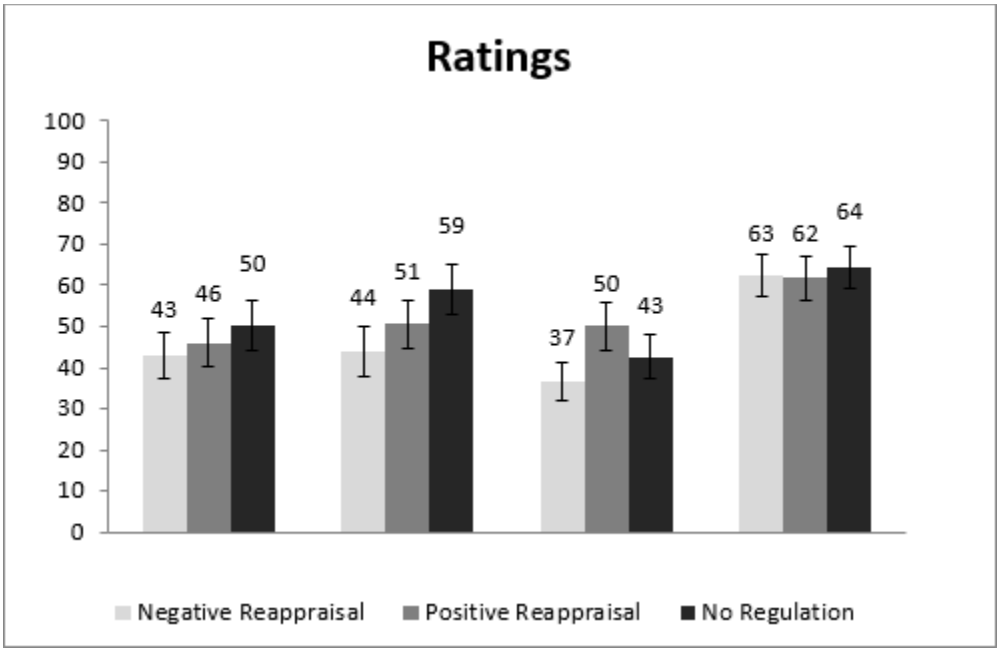

Figure 2: Average ratings in each condition for infatuation, attachment, valence, and upsetness about the break-up.

ERP Results

See figures 3 and 4 for the LPP amplitude at Pz and the scalp topography of the regulation effects. As can be seen, the ERP was less positive in the negative and positive reappraisal conditions than the no regulation conditions at electrode Pz from around 200 ms, but none of the effects involving Condition were significant, all *F*s < 1.333, all *p*s > .220.

Exploratory Analyses

Because visual inspection of the data revealed that the largest difference between conditions occurred around electrode Pz (see Figs. 3 and 4), which is the medial parietal region where the LPP is typically maximal (Hajcak & MacNamara, 2006), we performed exploratory analyses using a rmANOVA with factor Condition on the ERP amplitude at electrode Pz alone. At electrode Pz, there was a main effect of Condition, $F(2, 46) = 4.247$, $p = .021.$, $\eta_p^2 = .156$. Follow up tests showed that the LPP amplitude was less positive in the negative reappraisal (M = 2.92, SD = 3.95) than the no regulation (M = 5.45, SD = 3.28) condition, $p = .006$, Cohen's $d' = .697$. In addition, the LPP was less positive in the positive reappraisal (M = 3.68, SD = 3.81) than the no regulation condition, but this difference only trended towards significance, $p = .075$, Cohen's $d' = .498$. There was no significant difference in LPP amplitude at Pz between positive reappraisal and negative reappraisal, $p = .399$, Cohen's $d' = .196$.

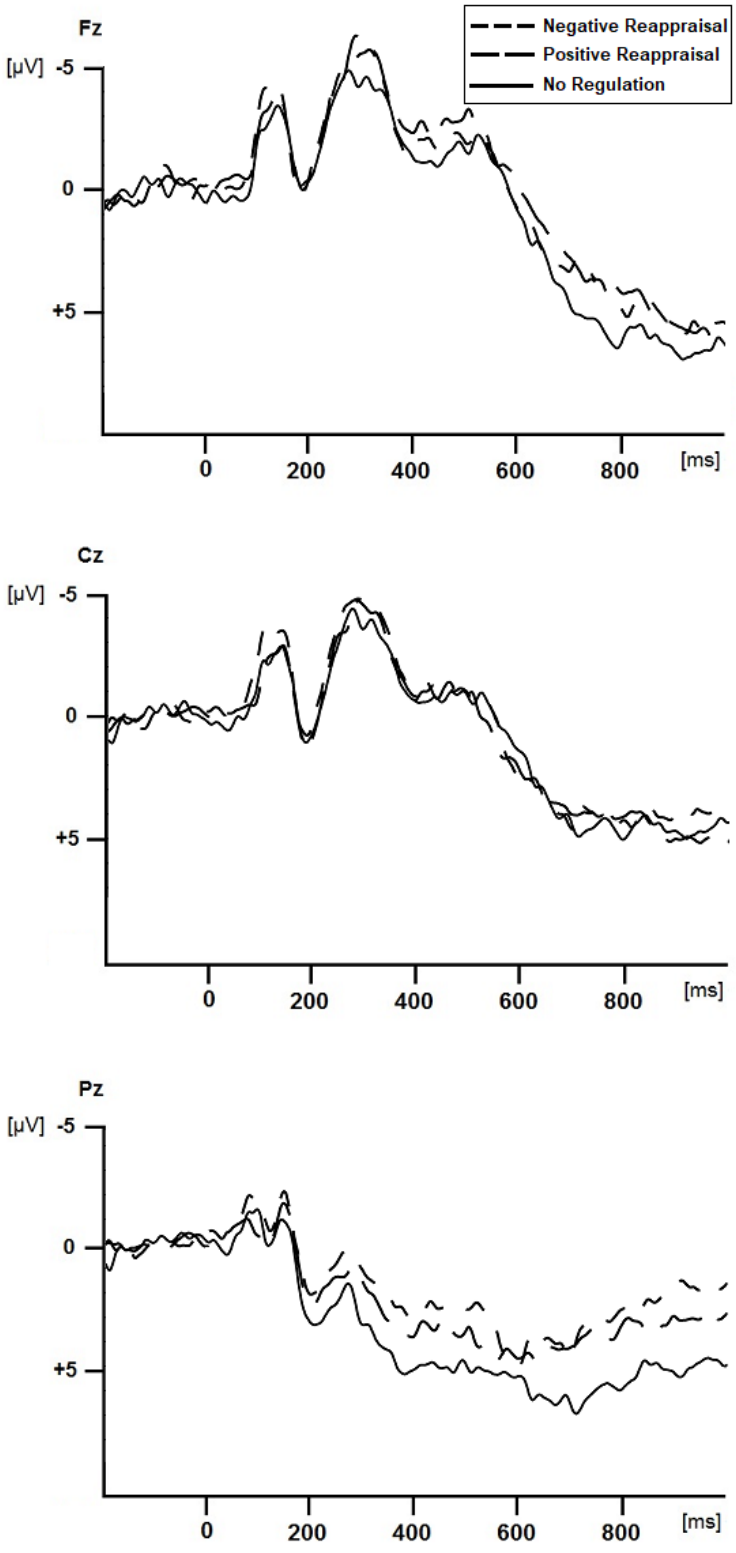

Figure 3: Event related potentials at Fz, Cz, and Pz. Positive amplitude is plotted downwards.

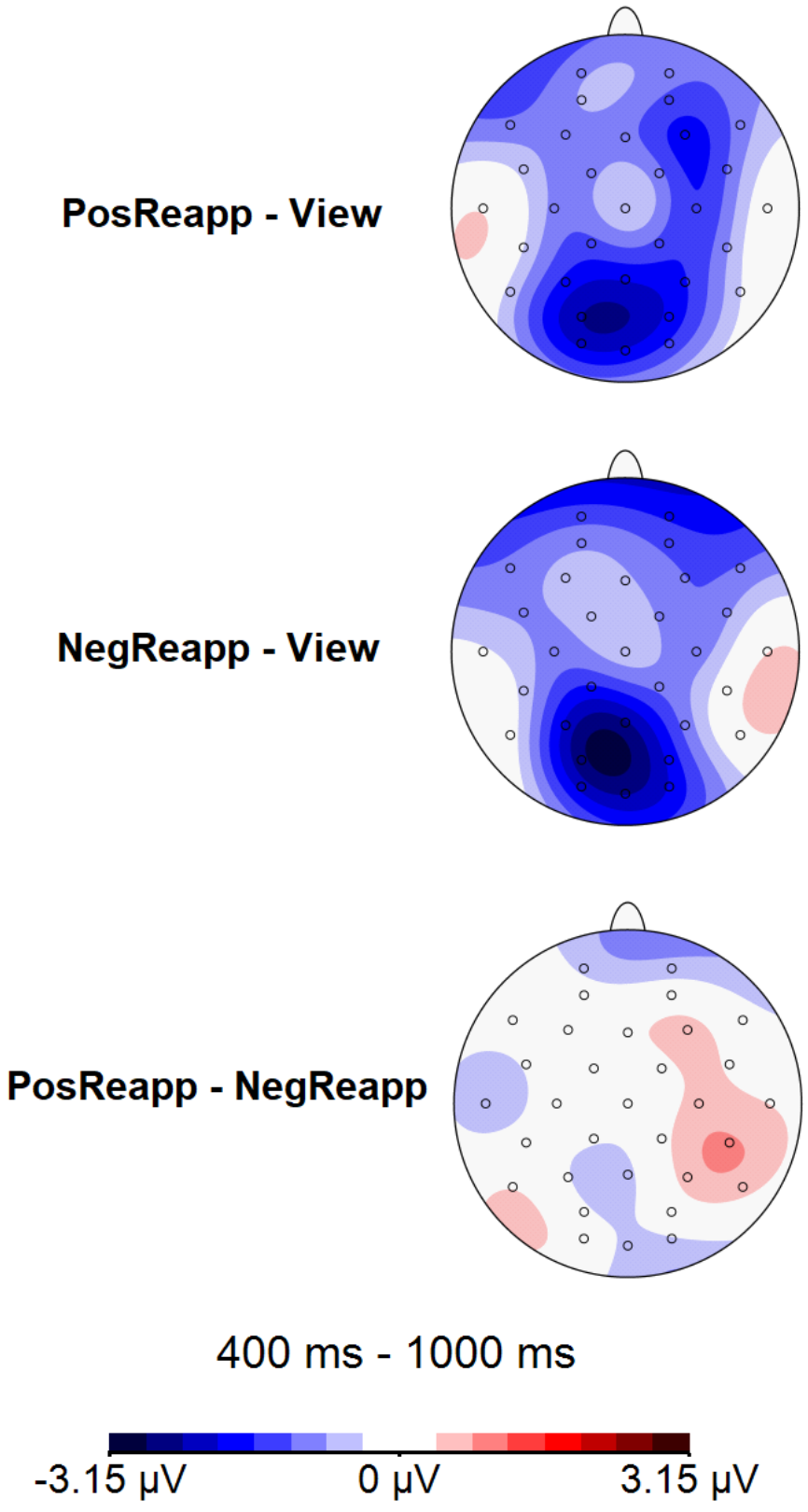

Figure 4: Scalp Topography of the Regulation Effects.

Discussion

This study sought out to answer four questions. Firstly, do love regulation and emotion regulation differentially modulate love feelings? Secondly, do love regulation and emotion regulation differentially modulate the valence of affect? Thirdly, do love regulation and emotion regulation differentially modulate how upset people feel about a romantic break-up? And finally, do love regulation and emotion regulation differentially modulate motivated attention for the ex-partner, as indicated by the LPP amplitude?

Infatuation ratings were highest in the no regulation condition, followed by the positive reappraisal condition, and lowest in the negative reappraisal condition. This pattern is in line with findings from Langeslag and Van Strien (2016) that negative reappraisal of the ex-partner, the relationship, or the future decreased feelings of infatuation compared to no regulation.This pattern is also in line with our hypothesis, that infatuation would be lower in the negative reappraisal condition than the positive reappraisal condition. However, the condition differences in infatuation ratings were not significant.

Similarly, attachment ratings were highest in the no regulation condition, followed by the positive reappraisal condition, and lowest in the negative reappraisal condition. This pattern is in line with findings from Langeslag and Van Strien (2016) that negative reappraisal of the ex-partner, the relationship, or the future decreased feelings of attachment compared to no regulation. This pattern is also in line with our hypothesis that attachment would be lower in the negative reappraisal condition than the positive reappraisal condition. In the study by Langeslag and Sanchez (2017), participants only rated love feelings, but participants considered them to be attachment. However, the

condition differences in attachment ratings only trended towards significance. The finding that positive and negative reappraisal do not differ suggests that negative reappraisal or positive reappraisal are equally effective or ineffective at decreasing love feelings.

Participants felt most pleasant in the positive reappraisal condition, followed by the no regulation conditon, and the least pleasant in the negative reappraisal condition. This pattern corresponds with previous findings (Langeslag & Sanchez, 2017; Langeslag & Van Strien, 2016) that negative reappraisal of the ex makes people feel more negative than no regulation. This pattern also corresponds with previous research that positive reappraisal can make people feel more pleasant (Kanske et al., 2011; Ochsner et al., 2003). and with our hypothesis that negative reappraisal of the ex-partner would make people feel more negative than positive reappraisal of the break-up. However, the condition differences in valence ratings only trended towards significance. It is possible that over the long run, the negative affect caused by negative reappraisal decreases due to people getting used to thinking negative qualities about the ex-partner.

Numerically, the ratings of upsetness about the break-up were very similar across all conditions, and were not significantly different between conditions. So, the hypothesis that negative reappraisal of the ex-partner would make people feel less upset about the break-up than positive reappraisal of the break-up was not supported by the data. This suggests that negative reappraisal and positive reappraisal have no effect of upsetness about the break-up. Previous research supports the idea that increased love feelings for the ex-partner leads to lower self-concept, which is in turn related to reduced well-being (Mason et al., 2012). Researchers have also found that after a break-up, love and sadness

were correlated (Sbarra & Ferrer, 2006). Similarly, in our study, IAS infatuation ratings were moderately positively correlated with upsetness about the break-up, but these findings were only marginally significant. Therefore, it would make sense that as love ratings decreased, upsetness about the break-up would decrease as well, as the upsetness was due to the heartbreak. However, it is possible that there are many other variables involved in upsetness over a break-up such as anger with the ex-partner and loneliness about being single.

One reason negative reappraisal of the ex-partner and positive reappraisal of the break-up may not work in people who have been through a romantic break-up is because break-ups can cause depression (Field, 2011). People who reappraise their emotions often feel more positive; however, in depressed populations, emotion regulation is more difficult to do. While none of our participants had diagnosed depression, they may have had some depressive symptoms due to the break-up. People who are more depressed have a harder time automatically hard time regulating their emotions, especially using reappraisal (Gross & John, 2003). This suggests that because people were heartbroken, they may have had more problems regulating their emotions and love feelings than people who are not heartbroken.

Numerically, the LPP was smallest for negative reappraisal of the ex-partner, intermediate for positive reappraisal of the break-up, and largest for no regulation. These differences were not significant in our preregistered analysis. In an exploratory analysis, there was a significant difference in LPP amplitude at Pz, particularly between negative reappraisal of the ex-partner and no regulation, suggesting that negative reappraisal decreases motivated attention to pictures of the ex-partner compared to no regulation.

Cognitive reappraisal reduces LPP amplitude of an emotionally salient stimulus (Hajcak & Nieuwenhuis 2006). The finding that positive reappraisal of the break-up marginally decreased the LPP amplitude at Pz and that negative reappraisal of the ex-partner significantly decreased the LPP amplitude at Pz is in line with previous research. Similarly, negative reappraisal of the ex-partner reduces the LPP amplitude in response to pictures of the ex-partner (Langeslag & Sanchez, 2017). However, as this was not a preregistered analysis, we cannot draw any strong conclusions. Because the difference between negative and positive reappraisal was not significant in our preregistered or exploratory analysis, we found no support for our hypothesis that LPP amplitude decreases more with negative reappraisal of the ex-partner than positive reappraisal of the break-up.

One feature of this study that differed from the previous study by Langeslag and Sanchez (2017) was that the study was event-related, while this study was blocked. The original reasoning for this change was to see find accumulating effects of positive and negative reappraisal. The previous study may have shown significant effects because ratings were asked after every trial, which would lead to less power. It is also possible that the previous study was able to see how participants felt about emotion regulation as they were doing it. It is possible that participants did not remember earlier trials or feel as strongly about them and were only focused on the last trial. While the intent of ratings at the end was to see how negative and positive reappraisal affected love feelings and emotions over the time period, it is possible that ratings were only acquired for the last trial. It is also possible that participants got used to seeing pictures of their partner over time, regardless of what condition they were in.

The results of this study suggest two things. First of all, there are no significant differences in love feelings, emotional valence, upsetness about the break-up, and general LPP amplitude between negative reappraisal of the ex-partner and positive reappraisal of the break-up. Second, it suggests that negative reappraisal of the ex-partner and positive reappraisal of the break-up are not effective in alleviating heartbreak in the short term. Future research could see if negative reappraisal of the ex-partner and positive reappraisal of the break-up would be any more effective over a long-term period in terms of getting over break-ups or look into the effects of negative and positive reappraisal over time in blocks, to see if there is an effect with practice and repetition. It is also possible that neither negative reappraisal of the ex-partner and positive reappraisal of the break-up alone can speed up the time it takes for someone to get over a break-up, suggesting other methods may need to be used to get over a break-up.

Acknowledgements

This work was supported by the University of Missouri Research Board.

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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?

Positive reappraisal of being single

What can you eat now that you're single?

What show can you watch now that you're single?

What hobby can you do now that you're single?

Who can you pursue now that you're single?

Who can you talk to more now that you're single?

What positive change can you make now that you're single?

What do you have more time to do now that you're single?

Who can you hang out with now that you're single?

What music can you listen to now that you're single?

Where can you go now that you're single?

What new things can you try now that you're single?

What do you feel more comfortable doing now that you're single?

What are you excited about now that you're single?

Where can you travel now that you're single?

What do you feel more confident about now that your single?

What do you have time to work on now that you're single?

What can you focus on better now that you're single?

What is easier now that you're single?

What is more fun now that you're single?

How can you treat yourself now that you're single?

What fun thing can you do now that you're single?

How can you meet new people now that you're single?

What can you buy for yourself now that you're single?

What new goals can you set now that you're single?

What can you spend more money on now that you're single?

What are you looking forward to now that you're single?

What is better now that you're single?

What is simpler now that you're single?