EFFICIENT EMOTION REGULATION: AN EVENT-RELATED POTENTIAL STUDY COMPARING THIRD PERSON SELF-TALK TO COGNITIVE REAPPRAISAL

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A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

Psychology – Master of Arts

2020

ABSTRACT

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Emotion regulation strategies such as cognitive reappraisal have shown to be effective but require cognitive effort. Research suggests that third person self-talk (TPST) – which is defined as using one's name to reflect on one's thoughts and feelings during introspection (Kross et al., 2014; Moser et al., 2017) – as a relatively effortless form of emotion regulation that has the potential to be more broadly applicable across contexts. Although initial research is promising, TPST has yet to be directly compared to another emotion regulation technique. Thus, the primary aim of the current study was to test the hypothesis that TPST is at least as effective as reappraisal at decreasing negative emotion while also recruiting fewer cognitive resources. In this study, 67 participants completed an emotion regulation picture-viewing task while event-related potentials were measured via EEG. Emotional arousal was measured using self-report and the Late Positive Potential (LPP). Cognitive effort was measured using self-report and the Stimulus Preceding Negativity (SPN). Findings indicated that TPST was associated with decreased self-reported emotional arousal and, although the effect was small, a reduction in the LPP relative to control. Although reappraisal resulted in decreased self-reported emotional arousal, results indicated no significant reduction in LPP relative to control. Results also indicated that despite greater self-reported effort, both TPST and reappraisal did not result in a significant increase in SPN relative to control. These results bolster support for TPST as an effective and relatively effortless emotion regulation strategy

ACKNOWLEDGEMENTS

I would like to thank my advisor Dr. Jason Moser who has been an amazing mentor and has helped me grow as a scholar. I am truly grateful for his guidance and support throughout this project. I would also like to thank Dr. Ethan Kross and Dr. Katy Thakkar for serving on my masters committee and for their insightful feedback. Additionally, I would like to thank members of my lab, Courtney Louis, Lili Gloe, and Darwin Guevarra for their mentorship. My family and friends have also been incredibly supportive and I am truly thankful to have them in my life – particularly my mother, Olfa Brown, who has always inspired me to believe in myself and to overcome obstacles. Finally, I would like to thank Diondra Straiton who has been an incredible source of motivation, support, and laughter. I truly grateful for my support system during this process.

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INTRODUCTION

Emotion regulation is defined as "the processes by which we influence the emotions we have, when we have them, and how we experience and express them" (Gross, 1998, p. 19). It is considered to be an important mechanism for maintaining mental health and well-being whereas its dysregulation has been shown to be linked to many mental health disorders (Gross & Muñoz, 1995; Gross & Thompson, 2007; Sheppes et al., 2015). Indeed, emotion regulation difficulties have been found in individuals with panic disorder, social anxiety, post-traumatic stress disorder, borderline personality disorder, eating disorders, and ADHD (Aldao et al., 2010; Gross & Jazaieri, 2014; Gross & Muñoz, 1995). Due to its implications for mental health and well-being, emotion regulation has been studied extensively in psychological research. Commonly studied emotion regulation strategies are cognitive reappraisal, suppression, and distraction (Goldin et al., 2008; Gross & John, 2003; Moser et al., 2014; Sheppes & Meiran, 2008; Thiruchselvam et al., 2011).

Cognitive Reappraisal and Distraction

Much of the research on emotion regulation to date has focused on cognitive reappraisal, which involves changing the way one thinks about an emotional experience to change the way one feels (Gross & Thompson, 2007). The tendency of an individual to use cognitive reappraisal has been associated with positive mental health outcomes, and many psychotherapies such as cognitive behavioral therapy implement a form of cognitive reappraisal (e.g., cognitive restructuring). Although cognitive reappraisal is an effective emotion regulation strategy, it has its limitations. Cognitive reappraisal relies on increases in frontally-mediated cognitive control networks to dampen subcortically-mediated emotional response regions (Ochsner & Gross, 2005, 2008; Wager et al., 2008). This dampening of emotional responses allows cognitive reappraisal to be effective at reducing negative emotions but at the cost of increased cognitive effort. Indeed, cognitive reappraisal has been shown to be cognitively demanding using self-report (Ortner et al., 2016), behavioral data (Sheppes & Meiran, 2008), and pupil dilation (Strauss et al., 2016). Strategies that rely on increased cognitive effort may not be suitable in all situations. For example, a cognitively demanding emotion regulation strategy such as reappraisal may not be as useful in highly stressful professions such as the military, police force, fire departments, and first responders. In highly stressful situations such as war or a fire, using cognitive reappraisal might drain limited cognitive resources needed to perform at a high level.

Furthermore, research has shown that in highly distressing situations individuals do not choose cognitively demanding emotion regulation techniques (Sheppes et al., 2011). In Sheppes et al. (2011), when participants were given the choice to choose between two emotion regulation strategies, reappraisal or distraction, the emotional context played a role in their decision. That is, when viewing highly arousing unpleasant images, participants chose to use distraction over reappraisal and reported greater success in down-regulating negative emotion with distraction. On the contrary, when participants viewed low arousing unpleasant images, they were more likely to choose reappraisal than distraction and were successful in implementing it. The results of this study indicate that in low arousing negative situations, reappraisal is easier to implement, but when faced with an intense negative situation it may be too difficult to use reappraisal. This provides evidence that not all emotion regulation strategies may be suitable across different contexts.

Although people often elect to use distraction over reappraisal when viewing highly arousing distressing images, using distraction may have long term negative consequences (Sheppes & Meiran, 2008; Thiruchselvam et al., 2011). Sheppes and Meiran (2008) found that engaging in distraction during an emotion picture viewing task resulted in impaired memory encoding relative to reappraisal. In Thiruchselvam et al. (2011), participants who were instructed to engage in distraction when viewing highly arousing distressing images exhibited a greater electrophysiological emotional response when re-exposed to the same images compared to participants who were instructed to use reappraisal. These results suggest that while distraction may be a helpful strategy in the short-term, there may be long-term rebound effects. Specifically, distraction may be a helpful short-term emotion regulation strategy because it allows an individual to disengage from a negative experience, but since engaging in distraction does not allow for an individual to fully process a negative experience, they exhibit a heighted emotional response when re-exposed.

Third Person Self-Talk

Given the reported strengths and limitations of reappraisal and distraction, it is important to identify other emotion regulation techniques that may be *both* effective and relatively easy to implement across contexts. A less cognitively demanding emotion regulation technique has the potential to be more broadly applicable, especially for those whose negative emotions sap the very cognitive resources needed for emotion regulation strategies. Mounting evidence suggests that third-person self-talk represents such a less cognitively demanding alternative technique (Kross & Ayduk, 2017; Kross et al., 2014, 2017; Moser et al., 2017; Orvell et al., 2019). Third person self-talk (TPST) is defined as the use of one's own name to refer to the self during introspection, rather than the first-person pronoun "I", as a method of regulating thoughts, feelings, and emotions under distress (Kross et al., 2014; Moser et al., 2017).

The mechanism of action of third person self-talk is articulated by self-distancing theory. Self-distancing theory states that individuals often fail to regulate their emotions because they tend to view their experiences from a “self-immersed” perspective (Kross & Ayduk, 2017; Kross & Ayduk, 2011; Kross et al., 2014). Taking a self-immersed perspective makes it more difficult for an individual to reason objectively about an emotionally arousing experience due to its emotional salience. Thus, it was theorized that individuals needed to “take a step back” and distance themselves from the emotional salience of the situation in order to more effectively reason about the situation. Linguistic shifts promote psychological distancing by changing the way individuals use words to reflect on their thoughts and feelings (Kross et al., 2014; Orvell et al., 2019). Linguistic shifts – such as using one’s name instead of I, allow for an individual to create psychological distance and think from an outsider’s perspective. Furthermore, it is postulated that objectively reasoning about another person’s experience is much easier than reasoning about one’s own experience because when reasoning about another person, there is a psychological distance from the other individual’s experience (Kross & Ayduk, 2017; Moser et al., 2017). For example, individuals may find it easier to give a friend advice than to cope themselves.

A growing body of literature has provided support for third person self-talk as an effortless self-distancing emotion regulation technique (Kross et al., 2014, 2017; Moser et al., 2017). Kross et al. (2014) executed a series of studies to demonstrate the effects of using third person self-talk as an emotion regulation strategy in a variety of anxiety provoking situations – i.e., making first impressions, public speaking, and appraising social-anxiety-provoking events. Results demonstrated that the use of third person self-talk can be helpful for regulating emotions in anxiety-provoking situations. Moser et al. (2017) found converging evidence of the effect of third person self-talk as an effortless emotion regulation strategy across two neurophysiological methods (electroencephalogram and fMRI). In both the EEG and fMRI study, results indicated that third person self-talk facilitated emotion regulation without recruiting fronto-parietal networks involved in cognitive control (Moser et al., 2017). Finally, in Kross et al. (2017), during the height of the Ebola scare in 2014, the use of third-person self-talk was more effective than first person self-talk at generating more fact-based reasons not to worry about Ebola. The ability to generate more fact-based reasoning regarding Ebola predicted reductions in Ebola worry and risk perception. These studies provide strong support for third person self-talk using converging evidence from self-report and psychophysiological measures.

Current Study

Although initial research suggests that third person self-talk is a relatively effortless form of emotion regulation, it has yet to be directly compared to another emotion regulation technique. Thus, the primary aim of the current study was to directly compare third person self-talk to a commonly studied emotion regulation technique – i.e., reappraisal. Specifically, the focus of this study was to test the hypothesis that third-person self-talk is more efficient than reappraisal – i.e., is at least as effective at decreasing negative emotion but does so using fewer cognitive resources. To test this hypothesis, an electrophysiological (EEG/ERP) approach was employed.

Event-related potentials measured by EEG provide researchers with objective measures of emotional reactivity and regulation (Hajcak et al., 2010; Krompinger et al., 2008; Moser et al., 2009, 2017). Two event-related potentials that are commonly used in emotion regulation studies are the Late Positive Potential (LPP) and the Stimulus Preceding Negativity (SPN). The LPP is a robust neurophysiological index of emotion processing that has been shown to be sensitive to highly arousing images, as studies have shown that the LPP's amplitude is larger when viewing highly arousing positive or negative images compared to neutral images (Cuthbert et al., 2000; Schupp et al., 2000). The LPP is commonly used in emotional regulation research because the

LPP has been shown to be sensitive to emotion regulation instructions (Hajcak et al., 2010; Moser et al., 2006). Research indicates that early LPP (400–1000ms) is related to attention allocation while the Late LPP (>1000ms) is related to memory and meaning making (Hajcak et al., 2010). The early SPN is defined as the average voltage in the 300–2300ms time window post-cue onset and the late SPN is defined as the average voltage in the 2300–3000ms time window post-cue onset (Luck & Kappenman, 2011; Moser et al., 2009, 2017). The early SPN seems to reflect an orienting response to the preceding cue whereas late SPN seems to reflect an anticipation of and preparation to act on the upcoming stimulus (Brunia et al., 2011) Given the abundance of evidence supporting the use of the LPP and SPN as neurophysiological measures of emotional reactivity and cognitive effort, respectively, these measures provide us with a more objective method for comparing the effectiveness of third person self-talk and reappraisal as emotion regulation techniques.

Hypotheses

Prediction 1. *Third person self-talk will be at least as effective as reappraisal at reducing negative emotions*. It was predicted that TPST and reappraisal would lead to decreased LPP amplitude relative to their respective control conditions.

Prediction 2. *Third person self-talk will recruit fewer cognitive resources than cognitive reappraisal.* It was predicted that participants in the TPST group exhibit a smaller SPN than the reappraisal group.

METHODS

Participants

75 undergraduates completed an emotional picture-viewing task in exchange for partial course credit. Informed consent was obtained from all participants. Eight participants were excluded from analyses because of excessive artifacts due to body movements resulting in rejection of > 60% of trials; or < 12 trials per condition as recommended by Moran et al. (2013). The final sample included 67 (76.1% female) participants. The mean age was 18.87 years *(SD* = 1.29). All participants were native English speakers. The sample consisted of predominately White (76.1%) undergraduate students (Demographic information for the sample is provided in Table 1). All procedures were performed in accordance with the relevant guidelines and regulations and approved by Michigan State University's Institutional Review Board.

This study served two purposes: as a direct replication of the TPST effect demonstrated in Moser et al. (2017) study and as a head-to-head comparison between TPST and cognitive reappraisal. Thus, the methods and instructions for the third person self-talk condition were directly taken from Moser et al. (2017) and the directions and instructions for the cognitive reappraisal condition were adapted from Moser et al., 2009).

Stimuli

The stimulus set consisted of 60 neutral and 60 negative images selected from the International Affective Picture System (IAPS; Lang et al., 1997). The following images were included: 1050, 1200, 1300, 1525, 1930, 2036, 2102, 2110, 2190, 2200, 2206, 2210, 2214, 2215, 2230, 2320, 2357, 2383, 2393, 2495, 2570, 2661, 2683, 2688, 2692, 2694, 2703, 2710, 2716, 2751, 2753, 2799, 2800, 2810, 2811, 2840, 3001, 3010, 3120, 3181, 3213, 3216, 3220, 3230, 3301, 3350, 3500, 3530, 3550, 5500, 5531, 5971, 6021, 6150, 6211, 6212, 6242, 6300, 6312, 6313, 6315, 6550, 6563, 6821, 6825, 6838, 7000, 7002, 7003, 7004, 7006, 7009, 7010, 7012, 7016, 7018, 7020, 7021, 7025, 7026, 7030, 7031, 7035, 7041, 7050, 7056, 7080, 7100, 7110, 7140, 7150, 7160, 7170, 7175, 7190, 7211, 7217, 7224, 7233, 7235, 7254, 7550, 7620, 7700, 7950, 9250, 9253, 9260, 9410, 9421, 9425, 9428, 9440, 9620, 9622, 9800, 9810, 9903, 9908, 9921.

Normative ratings indicated that negative images were rated as both more negative (Negative: $M = 2.50$, $SD = 0.73$; Neutral: $M = 4.96$, $SD = 0.41$; $t\ (118) = 22.64$, $p < .001$) and more arousing (Negative: $M = 6.06$, $SD = 0.74$; Neutral: $M = 3.04$, SD=0.68; $t\ (118) = 23.22$, $p < .001$) than neutral images. The same images were used for both the emotion regulation and control conditions across both groups and thus did not differ on either valence or arousal. The task was administered on a Pentium D class computer, using E-Prime software (Psychology Software Tools; Pennsylvania, US) to control the presentation and timing of all stimuli. Each picture was displayed in color and occupied the entirety of a 19in (48.26 cm) monitor. Participants were seated approximately 60 cm from the monitor in a brightly lit room.

Procedure

Participants were randomly assigned to either the third person self-talk group or the reappraisal group. Each participant completed a cue-picture paradigm, similar in format to previous research on emotion regulation (Moser et al., 2006; 2017). In the third-person self-talk group, participants completed two instruction blocks: third-person self-talk (emotion regulation) and first-person self-talk (control). In the cognitive reappraisal group, participants also completed two blocks: detached reappraisal (emotion regulation) and passive view (control). Detached reappraisal was used because it is the overwhelmingly more prominent technique utilized in extant studies and is most similar to third person self-talk as opposed to a different version like positive reappraisal (i.e., imagine a positive outcome). The order of instruction block was counterbalanced across participants in each group – that is, half the participants received the control instructions first and the other half received the emotion regulation instructions first.

Each block contained 60 cue-picture trials comprised of 30 neutral and 30 negative IAPS images equally represented across the two instructional cues. The order of cue-picture trials was random. For each trial, participants first viewed an instruction phrase ("First Person" or "Third Person"; "Look" or "Reappraise") for 2 s that directed them how to think about the following picture. "First Person" indicated that the participant should reflect on their feelings elicited by the pictures using the pronoun "I" as much as possible (i.e., "I am feeling sad"). "Third Person" indicated that the participant should reflect on their feelings elicited by the pictures using their own name as much as possible (i.e., [participant's name] feels sad"). "Look" indicated that the participant should simply view the following picture and to not try and change or modulate their emotions. "Reappraise" indicated that the participant should reflect on their thoughts and feelings of the following picture using a detached perspective (i.e., "this image is from a movie" or "this image is not real"). Participants were further told not to generate unrelated thoughts or images to alter their responses. For all instructions, participants were told to view the pictures for the entire display period and to not look away or close their eyes. After the instruction phrase, a blank screen was presented for 500 ms followed by a centrally presented white fixation cross lasting 500 ms. Following the fixation cross, an IAPS image was displayed for 6 s. A period of 2.5 s was inserted between the offset of images and the presentation of the next instruction phrase during which a blank screen was presented to allow participants to relax and clear their minds (See figure 1 for a visual depiction of the trial structure).

Participants completed two practice blocks before each experimental block to familiarize themselves with the timing of events and instructions. In the first practice block, participants were guided through the picture viewing task and were instructed to think about each picture out-loud. During the second practice block, participants were instructed to practice silently in order to simulate the experimental task. The first practice block consisted of 3 neutral and 3 unpleasant images and the second block consisted of 10 neutral and 10 unpleasant images. None of the images in the practice block were included in the experimental task. The experimental task included 120 cue-picture trials. In the Third Person Self-Talk group, trials consisted of 30 Neutral/First-Person, 30 Neutral/ Third-Person, 30 Negative/First-Person, and 30 Negative/Third-Person. In the Cognitive Reappraisal group, trials consisted of 30 Neutral/View, 30 Neutral/Reappraisal, 30 Negative/View, and 30 Negative/Reappraisal.

Self-report Measures

Following the experimental task, questionnaires were administered with the following measures via Qualtrics:

Self-reported participant compliance was measured by asking participants the extent to which they followed the instructions during the picture viewing task using a 1 (Not at all) to 7 (The whole time) Likert scale. Participants in the third person self-talk group were specifically asked: To what extent did you use your own name/ the pronoun 'I' when focusing on your feelings?". In the cognitive reappraise group, participants were asked: "To what extent did you use a detached perspective /respond naturally to the images?".

Ratings of self-reported emotional arousal while viewing neutral and negative images were measured for each condition (emotion regulation and control). In the third person self-talk group, participants were asked "How strong was your emotional reaction on trials in which you were asked to use (your name/ use the pronoun "I") to focus on your feelings while viewing the (unpleasant/neutral) images? In the reappraisal group, participants were asked "How strong was your emotional reaction on trials in which you were asked to (Reappraise/ Look at) the (unpleasant/ neutral) images?" Self-reported emotional arousal was measured using a 1 (Very Weak) to 7 (Very Strong) Likert scale. Additionally, ratings of effort were measured for each condition and valence (e.g., "how much effort did it take to use your name to focus on your feelings when viewing unpleasant/neutral images"). Participants were asked to rate the amount of effort they expended using each emotion regulation task on a 1 (Very Little) to 7 (Very Much) Likert scale.

The following questionnaires were administered and will be explored in future analyses. The State-Trait Anxiety Inventory – Trait Version (STAI-T; Spielberger, 1983) was administered to measure the participants' trait anxiety. The STAI-T is a self-report questionnaire consisting of 20 items. Items on this questionnaire include: "I worry too much over something that really doesn't matter" and "I am a steady person". All items are rated on a 4-point Likert scale ranging from 1 (almost never) to 4 (almost always). Higher scores on this measure indicate higher levels of trait anxiety. This measure has been commonly used in both research and clinical settings and there is considerable evidence that supports its validity (see Powers et al., 2010 for a review).

The Emotion Regulation Questionnaire (ERQ; Gross & John, 2003) was administered to measure typical usage of emotion regulation strategies. The ERQ is 10-item scale designed to measure respondents' tendency to regulate their emotions in two ways: (1) Cognitive Reappraisal and (2) Expressive Suppression. All items were rated on a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree).

The Penn State Worry Questionnaire (PSWQ; Meyer et al., 1990) was administered to measure trait worry. The PSWQ is a 16-item self-report questionnaire designed to assess symptoms related worry. It is considered the “Gold Standard” for worry assessments and has been shown to be able to reliably distinguish from depression and other anxiety symptoms (Meyer et al., 1990. Items on the PSWQ include: “Many situations make me worry” and “Once I start worrying, I cannot stop”. Items on this questionnaire are rated on a five-point Likert scale ranging from: 1 (Not at all typical of me) to 5 (Very typical of me).

The Mood and Anxiety Symptom Questionnaire (MASQ; Watson et al., 1995) was administered to measure the dimensions of Clark and Watson's tripartite model (Clark & Watson, 1991). The Clark and Watson tripartite model states that mood is made up of three components: negative affect, positive affect, and somatic arousal. The MASQ asks participants to indicate the extent in which they experienced each symptom using a 5-point Likert scale from 1 (not at all) to 5 (extremely) "during the past week, including today." The MASQ has been found to be a valid and reliable measure of mood and anxiety symptoms (Watson et al., 1995). The MASQ consists of five symptom scales: Anhedonic Depression, Anxious Arousal, General Distress, General Distress Depression, and General Distress Anxiety. For the purposes of this study, only 38 items related to anxious arousal and anhedonic depression were included.

The Life Events Checklist for DSM-5 (LEC-5; Gray et al., 2004) is a 16-item self-report questionnaire designed to screen for potentially traumatic events in an individual’s lifetime. The LEC-5 assesses exposure to 16 events known to potentially result in PTSD or distress and includes one additional item in order to screen for any other potentially traumatic events not captured in the first 16 items. Examples of life events included in the LEC-5 are: “Natural disaster”, “Sexual assault”, and “Combat or exposure to a war-zone”. The LEC-5 also assesses for the extent in which the potentially traumatic event was experienced such as: "Happened to me", "Witnessed it", "Learned about it", and "Part of my job".

Psychophysiological Recording and Data Reduction

Continuous electroencephalographic (EEG) activity was recorded using the ActiveTwo Biosemi system (Biosemi, Amsterdam, The Netherlands). Recordings were taken from 64 Ag-AgCl electrodes embedded in a stretch-lycra cap. Additionally, two electrodes were placed on the left and right mastoids as references. Electro-oculogram (EOG) activity generated by eye-movements and blinks was recorded at Fp1 and three additional electrodes placed inferior to the left pupil and on the left and right outer canthi. During data acquisition, the Common Mode Sense active electrode and Driven Right Leg passive electrode formed the ground per Biosemi design specifications. The function of the CMS-DRL loop, in addition to forming a reference, is simply to constrain the common mode voltage (i.e. the average voltage of the participant), which limits the amount of current that can possibly return to the participant. Bioelectric signals were sampled at 512Hz. Electrical signal processing was performed offline using BrainVision Analyzer 2 (BrainProducts, Gilching, Germany). Scalp electrode recordings were re-referenced to the mean of the mastoids and band-pass filtered (cutoffs: 0.01–20Hz; 12 dB/oct rolloff). Ocular artifacts were corrected using the method developed by Gratton and colleagues (1983). Cue- and picture-locked data were segmented into individual epochs beginning 500ms before stimulus onset and continuing for 3000ms and 6000ms, respectively. Physiological artifacts were detected using a computer-based algorithm such that trials in which the following criteria were met were rejected: a voltage step exceeding 50 μV between contiguous sampling points, a voltage difference of 300 μV within a trial, and a maximum voltage difference of less than 0.5 μV within 100ms intervals. The average activity in the 500ms window prior to cue and picture onset served as the baseline and was subtracted from each data point subsequent to cue and picture onset.

Data Analysis Strategy

In order to measure the effectiveness of each strategy in reducing negative emotions, online modulation of the LPP was examined. First, the early attention-related LPP amplitude elicited between 400–1000ms at electrode site CPz was analyzed using a 2 (Time: 400–700 and 700–1000ms) X 2 (Valence: Neutral and Negative) X 2 (Condition: Emotion Regulation and Control) X 2 (Group: Third Person Self-Talk and Reappraisal) X2 (Condition Block Order: Control First and Emotion Regulation First) mixed-design analysis of variance (ANOVA). Time, Valence, and Condition were entered as within subject variables while Group and Condition Block Order were entered as a between subject variable. Condition Block Order served as a control variable to control for potential order effects.

The late sustained LPP elicited after 1000 ms was analyzed using two separate mixed-design ANOVAs. First, following convention, the Late LPP amplitude at electrode site CPz was analyzed using a 5 (Time: 1–2 s, 2–3 s, 3–4 s, 4–5 s, and 5–6 s) X 2 (Valence: Neutral and Negative) X 2 (Condition: Emotion Regulation and Control) X 2 (Group: Third Person Self Talk and Reappraisal) X 2 (Condition Block Order: Emotion Regulation and Control) mixed design ANOVA. Between-subject factors included Group and Block Order and within-subject factors included Time, Valence and Condition. Additionally, in order to replicate the findings in Moser et al. (2017), the Late LPP was analyzed with a mixed design ANOVA using topographically organized clusters of electrodes. The following clusters were computed using the average amplitude of the noted electrodes: Left-Anterior-Superior (AF3, F1, F3, FC1 and FC3), Right-Anterior-Superior (AF4, F2, F4, FC2 and FC4), Left-Anterior-Inferior (AF7, F5, F7, FC5, and

FT7), Right-Anterior-Inferior (AF8, F6, F8, FC6, and FT8), Left-Posterior-Superior (CP1, CP3, P1, P3, and PO3), Right-Posterior-Superior (CP2, CP4, P2, P4, and PO4), Left-Posterior-Inferior (CP5, P5, P7, PO7, and TP7), and Right-Posterior-Inferior (CP6, P6, P8, PO8, and TP8). The Late LPP amplitude was analyzed across these topographically clustered electrodes using a 5 (Time: 1–2 s, 2–3 s, 3–4 s, 4–5 s, and 5–6 s) X 2 (Valence: Neutral and Negative) X 2 (Condition: Emotion Regulation and Control) X 2 (Hemisphere: Left and Right) X 2 (Anterior and Posterior) X 2 (Superior and Inferior) X 2 (Condition Block Order: Emotion Regulation First and Control First) X 2 (Group: Third Person Self-Talk and Reappraisal) mixed-design ANOVA. Within-subjects factors included Time, Valence, Condition, Hemisphere, Anterior/Posterior and Superior/Inferior and between-subject factors included Group and Condition Block Order. Condition Block Order served as a control variable to control for potential order effects.

In order to measure cognitive effort of each emotion regulation technique, the stimulus preceding negativity (SPN) was analyzed in two separate mixed design ANOVAs. First, the SPN was analyzed following convention, at electrode site FCz. The SPN was also analyzed using a topographically organized cluster of electrodes located at the fronto-central electrode cites (F1, Fz, F2, FC1, FCz, FC2) per Moser et al. (2017). Thus, for both electrode site FCz and the fronto-central cluster, the early and late SPN was analyzed using a 2 (Condition: Emotion Regulation and Control) X2 (Time: Early and Late) X2 (Group: Third Person Self-Talk and Reappraisal) X2 (Condition Block Order: Control Condition First and Emotion Regulation Condition First) mixed design ANOVA. Between subject factors included Group and Block Order and within subject factor included Condition and Time. Condition Block Order served as a control variable to control for potential order effects. Valence was not included in the model as the picture cues in this study did not indicate the valence of the upcoming image, thus valance cannot influence pre-stimulus onset ERPs such as the SPN.

RESULTS

Consistent with Moser et al. (2017), a manipulation check was conducted in order to determine participant compliance throughout the task. A 2 (Group) X2 (Condition) ANOVA was conducted to evaluate participant compliance. Results revealed a significant effect of condition (F (1, 65) = 8.820, p = .004), such that participant compliance was higher during the control (M = 6.297, SE = .121) conditions relative to the emotion regulation (M = 5.832, SD = .147) conditions. There was no main effect of Group (F (1, 65) = .350, p = .556) indicating that compliance did not differ between groups. Additionally, results indicated no significant interaction of Group by Condition (F (1, 65) = 2.413, p = .125). Specifically, in the Third Person Self-Talk group, mean ratings for first- and third person were M = 6.11 (SD = .979) and M = 5.89 (SD = 1.237), respectively. In the Reappraisal group, mean ratings for view and reappraisal were M = 6.48 (SD = .996) and M = 5.77 (SD = 1.146), respectively. Overall, these results suggest that despite that participant compliance was higher in the control conditions, overall compliance was high – well above the mid-point of 4 – across all conditions and both groups.

Emotional Regulation

Self-Reported Emotional Arousal. A mixed-design Condition x Valence x Group ANOVA was conducted to examine the effect of emotion regulation strategies on self-reported emotion arousal (see Table 2 for mean ratings of self-reported emotional arousal). Results indicated a significant effect of Valence (F (1, 65) = 107.24, p <.001, η^2_p = .632), such that mean self-reported emotional arousal was greater when viewing negative (M = 4.644, SE = .127) relative to neutral images (M = 2.946, SE = .158). There was a significant effect of Condition (F

(1, 65) = 47.243, p <.001, η^2_p = .632), such that the Emotion Regulation condition (M = 3.338, SE = .145) reported less self-reported emotional arousal relative to the Control condition (M = 4.252, SE = .124). These effects were not further moderated by group (Fs < 1.277, ps > .263).

There was a significant Condition by Valence interaction (F (1, 65) = 17.884, p <.001, η^2_p = .421), however, that was not further modified by Group (F (1, 65) = .154, p = .696, η^2_p = .002). (See Table 2 for mean ratings of self-reported emotional arousal). Paired sample t-test using negative versus neutral difference scores indicated that the emotion regulation condition (M = 1.28, SD = 1.65) exhibited significantly smaller mean self-reported emotional arousal relative to the control condition (M = 2.104, SD = 1.437), (t (66) = 4.239, p < .001). These results suggest that in both the Reappraisal and Third Person Self-Talk group, the emotion regulation conditions were related to decreased self-reported emotional arousal relative to the control.

Early LPP at CPz (400-1000 ms). In order to measure neural indices of early emotional attentional processes, a mixed-design ANOVA was conducted on the Early LPP at electrode site CPz (see Table 3 for mean early LPP amplitudes). Figures 2 and 3 display stimulus-locked ERP waveforms for the Cognitive Reappraisal and Self-Talk group, respectively. Consistent with emotion processing paradigms, there was a significant effect of Valence (F (1, 63) = 65.55, p <.001, η^2_p = .510), indicating that the early LPP amplitude was larger for negative (M = 5.440, SE = .732) relative to neutral (M = 1.113, SD = .575) images. There was also a significant effect of Time (F (1, 63) = 50.68, p <.001, η^2_p = .446), such that the Early LPP amplitude grew over time. There was no significant main effect of Condition on the early LPP amplitude (F (1, 63) = 1.28, p = .263). Additionally, there were no significant group interactions for any of the effects mentioned above (Fs < 2.0, ps > .185).

There was a marginal interaction of Valence by Time (F (1, 63) = 3.878, p = .053, η^2_p = .058). Paired-sample t tests using negative versus neutral difference scores indicated that the Early LPP difference score during the 700-1000 ms time window (M = 4.594 , SD = 5.085) was marginally larger than the 400-700 ms time window (M = 4.007, SD = 4.124), (t (66) = 1.707, p = .093). This interaction was further moderated by Group as there was a significant Valence by Time by Group interaction (F (1, 63) = 8.981, p = .004, η^2_p = .125). To understand this interaction, the dataset was split by group (Cognitive Reappraisal and Self-Talk), and each group was analyzed using separate mixed-design ANOVAs. In the Cognitive Reappraisal group, there was no significant interaction of Valence by Time (F (1, 30) = .453, p = .506), but in the Self-Talk group, there was a significant Valence by Time interaction (F (1, 33) = 14.414, p < .001, η^2_p = .304). Follow up paired-sample t tests using negative versus neutral difference scores indicated that in the Self-Talk group, the Early LPP difference score was significantly larger in the 700 – 1000 ms (M = 5.223, SD = 5.081) time window relative to the 400 – 700 time window (M = 3.949, SD = 4.268), (t (34) = 2.763, p = .009).

Regarding the predicted interaction of Condition by Valence, results indicated that there was no interaction effect on the Early LPP (F (1, 63) = 1.802, p = .184). There was, however, a marginal Condition by Valence by Group (F (1, 63) = 2.986, p = .089, η^2_p = .045) interaction. In order to investigate this interaction, the dataset was split by group (Reappraisal and Third Person Self-Talk) and separate mixed-design ANOVAs were computed. Figures 6 and 7 display mean emotion modulation elicited at the early LPP for the Cognitive Reappraisal and Self-Talk group, respectively. In the Cognitive Reappraisal group, there was no significant Condition by Valence interaction (F (1, 30) = .052, p = .820). In the Self-Talk group, there was a significant Condition by Valence interaction (F (1, 33) = 7.321, p = .011, η^2_p = .182). Follow-up paired sample t tests using negative versus neutral difference scores indicated that in the Self-Talk group, the Third-Person condition (M = 3.28, SD = 5.46) exhibited a significantly smaller Early LPP amplitude relative to the First-Person condition (M = 5.89, SD = 5.59; t (34) = 2.385, p = .023). These results indicate that in the Self Talk group, the Emotion Regulation condition (Third Person) had a significant dampening effect on early attentional emotion regulation processes captured in the Early LPP. Although this effect occurred earlier than predicted, the effect is in the predicted direction.

Late LPP at CPz (1s -6s). Following convention, the Late LPP was analyzed at electrode site CPz. Figures 2 and 3 display stimulus-locked ERP waveforms for the Cognitive Reappraisal and Self-Talk group, respectively. There was a significant effect of Valence (F (1, 63) = 37.492, $p < .001$, $\eta^2_p = .373$), indicating that the Late LPP amplitude was significantly larger when viewing negative (M = 5.003, SE = .927) relative to neutral (M = .101, SE = .790) images. There was also a marginal interaction of Valence by Group (F (1, 63) = 3.362, p = .071, $\eta^2_p = .051$). The dataset was split by Group (Cognitive Reappraisal and Self-Talk), and separate mixed-design ANOVAs were conducted on each group. Results indicated a significant effect of Valence in both the Cognitive Reappraisal (F (1, 30) = 9.726, p = .004, $\eta^2_p = .245$) and Self-Talk (F (1, 33) = 30.494, $p < .001$, $\eta^2_p = .480$) group, such that the Late LPP amplitude was larger for negative relative to neutral images in both groups. It should be noted, that though the valence effect was significant for both groups, effect sizes indicate that the magnitude of the negative versus neutral difference in the Self-Talk group was almost twice as large as the Cognitive Reappraisal group. Additionally, there was a significant effect of Time (F (4, 252) = 10.634, $p < .001$, $\eta^2_p = .144$), indicating that the Late LPP decreased over time. Similar to results found in the

Early LPP, there was no significant main effect of Condition on the Late LPP amplitude (*F* (1, 63) = .019, *p* = .890).

There was no significant predicated interaction between Condition by Valence (*F* (1, 63) = .243, *p* = .624), but there was a significant interaction of Condition by Valence by Group (*F* (1, 63) = 4.125, *p* = .046, η^2_p = .061). The dataset was therefore split by group (Cognitive Reappraisal and Self Talk) and separate mixed-design ANOVAs were conducted. Figures 6 and 7 display bar graphs of mean emotional modulation elicited at the Late LPP for the Cognitive Reappraisal and Self-Talk group, respectively. In the Cognitive Reappraisal group, there was no significant Condition by Valence interaction (*F* (1, 30) = 1.052, *p* = .313). In the Self-Talk group, however, results indicated that there was a marginal interaction of Condition by Valence (*F*(1, 33) =3.581, *p* = .067, η^2_p = .098). Follow-up paired sample t tests using negative versus neutral difference scores indicated that in the Self-Talk group, the Late LPP difference score in the Third Person condition (*M* = 4.14, *SD* = 8.78) was numerically, but not statistically (*t* (34) = 1.457, *p* = .154), smaller relative to the First Person condition (*M* = 7.17, *SD* = 9.91). These results suggest that the emotion regulation effect of third person self-talk may be driving the significant Condition by Valence by Group interaction.

Finally, there was a significant interaction of Condition by Valence by Time, (*F* (4, 252) = 4.069, *p* = .026, η^2_p = .061) that was not further modified by Group (*F* (4, 252) = .137, *p* = .836). Therefore, the dataset was split by time and separate 2 (Condition) X 2 (Valence) ANOVAs were conducted at each time window (see Table 3 for mean late LPP amplitudes at each time window). Results indicated that there was a significant Condition by Valence interaction in the 1-2s time window (*F* (4, 252) = 4.029, *p* = .049, η^2_p = .060), but no significant Condition by Valence interaction in all other time windows (*Fs* < 2.352, *ps* > .130). Follow-up paired sample t tests using negative versus neutral difference scores indicated that was a marginal difference in the Late LPP difference score between the Emotion Regulation (*M* = 3.62, *SD* = 6.53) and Control (*M* = 5.59, *SD* = 7.69) condition at the 1-2s time window (t (35) =1.690, $p = .096$), suggesting that the emotion regulation effect occurred early and disappeared as time passed.

Late LPP Clusters (1s-6s). As stated above, in order to replicate the Moser et al. (2017) study, the Late LPP was analyzed across topographically clustered electrodes. Results indicated a significant effect of Valence (F (1, 62) = 24.491, $p < .001$, $\eta^2_p = .238$), such that the Late LPP was larger when viewing negative (*M* = 4.66, *SE* = .756) relative to neutral (*M* = 2.95, *SE* = .67) images. There was no significant main effect of Time (F (4, 248) = .971, $p = .361$) or Condition (F (1, 62) = .023, $p = .881$).

With regard to the topographical distribution of the Late LPP, there was a main effect of Anterior/Posterior (F (1, 62) = 94.088, $p < .001$, $\eta^2_p = .603$), such that the late LPP amplitude was largest in the Anterior region of the brain. This effect was moderated by Group as there was a significant Anterior/Posterior by Group interaction (F (1, 62) = 5.909, $p < .018$, $\eta^2_p = .087$). Therefore the dataset was split by group and separate mixed-design ANOVAs were conducted. Results indicated a significant effect of Anterior/Posterior in the Cognitive Reappraisal group (F (1, 30) = 72.983, $p < .001$, $\eta^2_p = .709$) and the Self-Talk Group (F (1, 62) = 26.723, $p < .001$, $\eta^2_p = .455$), such that across time Late LPP amplitude was larger in the anterior region relative to the posterior region. Additionally, there was a significant interaction of Anterior/Posterior by Time (F (4, 248) = 21.156, $p < .001$, $\eta^2_p = .254$), such that the Late LPP amplitude in the posterior region was largest between 1-2s and decreased over time. There was also a main effect of Inferior/Superior (F (1, 62) = 4.383, $p = .04$, $\eta^2_p = .066$), such that the Late LPP was larger in the

Superior region relative to the Inferior region. These results were all in the predicted direction, as the emotion regulation effect began in the posterior region before moving towards the anterior region.

There was no significant effect of the predicted Condition by Valence interaction (F (1, 62) = .283, p = .597) and these results were not moderated by group, (F (1, 62) = 2.41, p = .126). There was, however, a significant interaction of Condition by Valence by Time (F (4, 248) = 3.790, p = .033, η^2_p = .058). This significant interaction was not moderated by Group (F (4, 248) = .133, p = .839). Therefore, the dataset was split by time and separate Condition by Valence mixed-design ANOVAs were conducted at each time window. Results indicated no significant Condition by Valence interaction at any time window (Fs < 1.994, ps > .163) and thus was not explored further.

Cognitive Effort

Self-Reported Effort. The effect of emotion regulation on self-reported cognitive effort was analyzed using a 2 (Condition) X 2 (Valence) X 2 (Group) mixed-design ANOVA (see Table 4 for mean ratings of self-reported effort). Results indicated that there was a significant effect of Valence (F (1, 65) = 74.775, p < .001, η^2_p = .535), such that participants reported greater effort during negative (M = 4.01, SE = .165) relative to neutral (M = 2.56, SE = .148) images. There was a significant effect of Condition (F (1, 65) = 18.35, p < .001, η^2_p = .220), such that participants reported greater effort during the emotion regulation (M = 3.82, SE = .173) relative to the control (M = 2.76, SE = .190) condition. Finally there was a marginal effect of Group (F (1, 65) = 2.851, p = .096, η^2_p = .042), such that the Self-Talk group (M = 3.993, SE = .160) reported greater effort relative to the Cognitive Reappraisal Group (M = 3.597, SE = .172).

There was also a significant Condition by Valence interaction (*F* (1, 65) = 8.992, *p* = .004, η^2_p = .121). This interaction was not further modified by Group (*F* (1, 65) = .025, *p* = .876). Follow up paired-sample t tests using negative versus neutral difference scores indicated that across both groups, participants reported increased cognitive effort during the emotion regulation condition relative to the control (*t* (66) = 3.006, *p* = .004) suggesting that for both Reappraisal and Third Person Self-Talk, the emotion regulation condition was rated as more effortful relative to the control.

SPN at FCz. In order to examine the effect of emotion regulation on neural indices of cognitive effort, the SPN at site FCz was analyzed using a mixed-design ANOVA (see Table 5 for mean SPN amplitudes). Figures 4 and 5 display cue-locked waveforms for the Cognitive Reappraisal and Self-Talk group, respectively. There was a significant effect of Time (*F* (1, 62) = 7.035, *p* = .01, η^2_p = .102), such that the SPN became significantly larger over time. Consistent with the prediction, there was no significant effect of Condition (*F*(1, 62) = .015 *p* = .903). The non-significant Condition effect was not moderated by Group (*F* (1, 62) = 1.367, *p* = .247), suggesting that both Self-Talk and Cognitive Reappraisal both do not result in increased cognitive effort.

There was a marginal Condition by Time interaction (*F* (1, 62) = 2.903, *p* = .093, η^2_p = .045). However, follow-up paired sample t-tests indicated there was no significant difference in SPN amplitude between the Control and Emotion Regulation condition in both the Early and Late SPN time window (*ts* < .495, *ps* > .641). Figures 8 and 9 display bar-graphs of mean early and late SPN amplitudes for the Reappraisal and Self-Talk group, respectively. This provides further evidence that across the Self-Talk group and Cognitive Reappraisal group, engaging in emotion regulation did not result in increased recruitment of cognitive resources.

SPN Fronto-Central Cluster. In order to replicate the findings in Moser et al. (2017), the SPN was also analyzed using a topographical cluster of electrodes in the Fronto-Central region of the brain. Consistent with results observed at electrode site FCz, there was a significant effect of time (F (1, 63) = 12.125 p = .001, η^2_p = .164), such that the SPN increased over time. There was no significant effect of Condition (F (1, 63) = .261 p = .612), indicating that there is no significant difference between SPN amplitude in the Emotion Regulation and Control condition. These results were not moderated by Group (*Fs* < 1.006, *ps* > .32).There was also no significant interaction of Condition by Time (F (1, 63) = .314, p = .577). This non-significant interaction modified by group (F (1, 63) = 1.408, p = .240), suggesting that both Third Person Self-Talk and Cognitive Reappraisal both do not result in increased cognitive effort.

DISCUSSION

Recent research has provided promising evidence of the benefits of third person self-talk as an effective and easily implemented emotion regulation strategy (Kross et al., 2014, 2017; Moser et al., 2017). However, third person self-talk had not been compared to an established emotion regulation strategy such as cognitive reappraisal. Thus, the primary aim of this study was to 1) directly replicate the findings found in Moser et al. (2017) and 2) to compare Third Person Self-Talk to Cognitive Reappraisal. Specifically, the focus of this study was to test the hypothesis that Third Person Self-Talk is a more efficient emotion regulation technique than Reappraisal. It was predicted that Third Person Self-Talk would be equally as effective as Reappraisal at reducing emotional arousal to negative high arousing images, as evidenced by the Late LPP amplitude, and would do so while recruiting fewer cognitive resources, as evidenced by the SPN amplitude.

Results suggested that engaging in Third Person Self-Talk facilitates emotion regulation without recruiting cognitive control. Specifically, results indicated that participants who were instructed to use Third Person Self-Talk reported less self-reported emotional arousal and, although the effect was small, exhibited a decreased LPP emotion effect relative to First Person Self-Talk. Surprisingly, the LPP emotion regulation effect was only found using the conventional CPz electrode site and not the topographically organized clusters of electrodes. While the results found in this study were generally smaller and marginal compared to the findings in Moser et al. (2017), results were in the predicted direction and supports similar findings that Third Person Self-Talk is an effective emotion regulation technique (Kross et al., 2014, 2017). In regard to cognitive effort, participants who were instructed to use Third Person Self-Talk reported higher levels of effort relative when instructed to use First Person Self-Talk, but did not exhibit an increased SPN amplitude relative to when instructed to use First Person Self-Talk. This finding was consistent whether the SPN was measured using electrode site FCz or a topographical cluster of the fronto-central electrode sites. These results bolster support that Third Person Self-Talk does not rely on fronto-mediated cognitive control processes (Moser et al., 2017), despite participants reporting it as more effortful.

The results of this study share similarities to the results found in (Moser et al., 2017), however there are a few differences. First, the emotion regulation effect was only found using the conventional CPz electrode site as opposed to the topographically clustered electrodes in the Moser et al. (2017) study. While unexpected, this difference could reflect the differences between studies regarding the effect of emotion regulation over time. Specifically, in Moser et al. (2017), the third person self-talk emotion regulation effect occurred in the late LPP and was robust across the 1-6 second time window. In the current study, the third person self-talk emotion regulation effect appeared strongest earlier, first emerging in the early LPP and briefly during the 1-2s time window of the Late LPP before waning over time. Topographically clustered electrodes are typically used when the emotion effect is seen across the entire scalp – usually beginning in the posterior region of the brain before traveling forward to the anterior region over time. Given that the emotion regulation effect only occurred in the early time windows, that could be explaining the lack of effect in the topographically clustered electrodes.

Results, unexpectedly, suggested that engaging in reappraisal did not facilitate emotion regulation. Although reappraisal led to lower self-reported ratings of emotional arousal relative to view, ERP results did not indicate that reappraisal reduced electrophysiological indices of emotional arousal. These results were surprising as they contradict extant research (Hajcak et al., 2010; Krompinger et al., 2008; Moser et al., 2009, 2014). Results also indicated reappraisal did not engage cognitive control, as evidenced by the SPN. Given that previous research has shown reappraisal to reliably reduce the Late LPP, we sought to further understand the cause of the non-significant effect. A possible reason why we did find reappraisal effects is that the study design may have had an adverse effect on the Cognitive Reappraisal group. Specifically, the study design used in this study was adapted from Moser et al. (2017), which used a different study design than of typical emotion regulation study paradigms. Conventional emotion regulation study paradigms have three characteristics that are different from this present study. (1) Conventional emotion regulation paradigms typically do not separate conditions by blocks, but instead interleave conditions. It is possible that the block design could have had an effect on the results. For instance, it may be that in the view condition, when viewing negative and neutral images for an entire block of trials, there may have been a spillover effect which decreased the Late LPP negative versus neutral difference. This decreased Late LPP difference score in the view condition seems to be washing out the emotion regulation effect in the cognitive reappraisal group. (2) Emotion regulation studies, particularly those that use cognitive reappraisal, typically have three conditions (e.g., Reappraise Negative, View Negative, View Neutral). Our study, in an attempt to match the Third Person Self-Talk study design, used four conditions (Reappraise Negative, Reappraise Neutral, View Negative, View Neutral). The Reappraise Neutral condition is typically not used in emotion regulation studies because using reappraisal when viewing neutral images is not intuitive. It is possible that the reappraise neutral condition could be having an effect on the reappraisal condition's emotion regulation effect. It is not clear how a participant would take a detached perspective when viewing a neutral image. (3) Finally, given that the Third Person Self-Talk instructions do not incorporate demand characteristics, the instructions in the Reappraisal group were modified and any demand language was removed. Demand characteristics in experimental studies have been shown to affect participant performance, as many participants desire to please the experimenter (Orne, 1962). Therefore, since most studies implement reappraisal instructions with demand characteristics, it is not clear whether the lack of demand in the reappraisal instructions may be reducing the emotion regulation effect.

Limitations

Although the results are promising, this study is not without its limitations. First, low power likely impacted our ability to detect some of the predicted interactions. A second limitation of this study is that another aspect of this study's design that is different from conventional emotion regulation studies is that the valence of the image was not provided during the picture cue (e.g., Reappraise Negative). Instead, solely the emotion regulation instruction was given (Reappraise). This could explain the null results found for the SPN in the Reappraisal group. Given that SPN occurs before stimulus onset, it is possible that without knowing whether the following image would be neutral or negative, the participant was forced to wait until the image was presented before engaging in any cognitive processes related to cognitive reappraisal. Therefore, it is possible that the SPN in this study was not capturing neural indices of cognitive effort exhibited by the reappraisal condition.

Implications

There are several implications of this study. First, while the effects were small, the results generally replicate those of the Moser et al. (2017) study. Thus, the current findings bolster support for the effectiveness of third person self-talk as an effortless emotion regulation strategy. Specifically, this study further supports evidence that suggests that linguistic shifts promotes emotion regulation through psychological distancing (Kross et al., 2014; Orvell et al., 2019). There was a discrepancy in results between self-reported effort and neural indices of cognitive effort (i.e., SPN). This discrepancy, while surprising, further highlights the importance of implementing a multimethod measurement experimental design. Specifically, the results of this study suggest that despite self-reported cognitive effort, engaging in third person self-talk did not have an effect on neurobiological indices of cognitive effort.

In regard to the implications of the methodological changes in study design, results of the cognitive reappraisal group must be taken with caution. Cognitive reappraisal is considered by many researchers to be a reliable emotion regulation strategy, and thus changes in study design such as using a blocked design or the inclusion of a Reappraise Neutral condition could have had a negative effect on the reappraisal condition. It may be possible that reappraisal's effect may not be as reliable as previously thought. Additionally, if demand characteristics are needed to achieve the reappraisal effect, that provides more support that reappraisal's effect may not be as robust as previously thought. Future studies should examine the effects of reappraisal with and without demand characteristics in the instructions.

Future Directions

This study bolsters support for Third Person Self-Talk as an effortless emotion regulation technique. Nonetheless, more replication is needed as the effects were smaller relative to previous studies that examined third person self-talk as an emotion regulation technique. Additionally, this is only the third study to examine the effects of third person self-talk on neural indices of emotion regulation and cognitive effort. Particularly, more studies are needed that directly compare third person self-talk to cognitive reappraisal and other well-established emotion regulation techniques. Given that the results in this study were not conclusive enough to determine whether third person self-talk is a more efficient emotion regulation technique than reappraisal, future studies should attempt to replicate this study using conventional emotional regulation paradigms. For example, third person self-talk can be compared to reappraisal using a study design that uses three conditions (e.g., third-person negative, view negative, view neutral) that are interleaved within each block. Additionally, instructions can include demand characteristics, similar to those found in cognitive reappraisal instructions. These design changes would allow for Third Person Self-Talk to be tested using the same standard paradigm as other emotion regulation studies. If third person self-talk's emotion regulation effect is able to be replicated using both the Third Person Self-Talk study paradigm and the conventional emotion regulation paradigm, it would provide more evidence that third person self-talk is an effective and effortless emotion regulation strategy.

Although there is some initial support for the use of third person self-talk in more real-world situations (Kross et al., 2017), future research should apply third person self-talk to other real world stressors. Specifically, studies need to be designed that can examine the extent to which third person self-talk can be implemented in highly stressful, cognitively taxing environments. In addition, since this study's sample consisted of college-aged undergraduate students, future studies need to be conducted using community populations. More importantly, future studies should examine the effectiveness of third person self-talk on reducing negative emotions in clinical populations. Research indicates that individuals with mental health conditions such as depression, anxiety, PTSD, and borderline personality disorder struggle implementing emotion regulation skills. A possible reason for their difficulties in implementing emotion regulation strategies is that they may not have the cognitive resources available to use cognitively taxing emotion regulation strategies. If third person self-talk is shown to be effective within these populations, it could set a precedence for its use within psychotherapy.

APPENDICES

APPENDIX A: Tables

Table 1. Participant Demographics

	N	%	M (SD)
Age (years)	67	100	18.97 (1.29)
Gender			
Female	51	76.1	-
Male	16	23.9	-
Race			
Asian	7	10.4	-
American Indian/Alaskan Native	1	1.5	-
Black/African American	6	9	-
Middle Eastern	2	3	-
White	51	76.1	-
Ethnicity			
Hispanic/Latinx	0	0	-

Table 2. Self-Reported Emotional Arousal

	Control		Emotion Regulation	
	Neutral Images	Negative Images	Neutral Images	Negative Images
Group	M (SD)	M (SD)	M (SD)	M (SD)
Cognitive Reappraisal	3.03 (1.43)	5.23 (1.12)	2.42 (1.48)	3.71 (1.32)
Third Person Self-Talk	3.36 (1.33)	5.39 (1.08)	3.06 (1.43)	4.37 (1.29)

Note. Total *n* = 67, Cognitive Reappraisal *n* = 32, Third Person Self-Talk *n* = 35. Self-Reported emotional arousal reported using means and standard deviations.

Table 3. Late Positive Potentials at electrode site CPz

	Control		Emotion Regulation	
	Neutral Images	Negative Images	Neutral Images	Negative Images
Time Window	M (SD)	M (SD)	M (SD)	M (SD)
Cognitive Reappraisal Group				
400-700ms	-0.157 (6.22)	3.716 (6.46)	-.574 (5.42)	3.696 (7.34)
700-1000ms	1.661 (7.11)	5.599 (6.65)	1.490 (5.51)	5.364 (6.88)
1-2s	.875 (6.48)	4.996 (6.89)	1.170 (5.95)	5.563 (6.59)
2-3s	-.014 (7.14)	3.540 (8.51)	.625 (7.07)	4.849 (7.94)
3-4s	.196 (7.94)	3.317 (9.56)	-.167 (8.78)	3.853 (9.24)
4-5s	1.396 (9.32)	2.967 (10.01)	-.968 (9.76)	3.775 (10.59)
5-6s	1.389 (9.12)	2.686 (9.30)	-1.947 (10.19)	3.936 (12.02)
Self-Talk Group				
400-700ms	.607 (4.14)	5.562 (6.64)	.401 (5.65)	3.344 (5.34)
700-1000ms	2.337 (4.82)	9.155 (8.80)	2.776 (5.59)	6.403 (5.19)
1-2s	1.538 (5.21)	8.466 (9.18)	3.05 (6.55)	5.966 (5.50)
2-3s	-.147 (7.42)	8.244 (9.64)	1.973 (8.29)	5.781 (7.51)
3-4s	-1.001 (8.19)	7.363 (10.52)	.566 (8.89)	5.534 (7.44)
4-5s	-.671 (8.97)	5.558 (10.99)	-.025 (9.30)	4.624 (7.36)
5-6s	-1.238 (10.01)	4.724 (12.74)	.197 (9.49)	4.536 (8.45)

Note. Total *n* = 67, Cognitive Reappraisal *n* = 32, Third Person Self-Talk (TPST) *n* = 35. Late LPP amplitudes at each time window reported using means and standard deviations.

Table 4. Self-Reported Effort

	Control		Emotion Regulation	
	Neutral Images	Negative Images	Neutral Images	Negative Images
Group	M (SD)	M (SD)	M (SD)	M (SD)
Cognitive Reappraisal	1.71 (1.68)	3.84 (1.95)	1.94 (1.59)	4.77 (1.63)
Third Person Self-Talk	2.78 (1.64)	2.69 (1.81)	4.03 (1.40)	4.77 (1.54)

Note. Total *n* = 67, Cognitive Reappraisal *n* = 32, Third Person Self-Talk *n* = 35. Self-reported effort reported using means and standard deviations.

Table 5. Stimulus Preceding Negativity at FCz

	Cognitive Reappraisal		Third Person Self-Talk	
	Control	Emotion Regulation	Control	Emotion Regulation
Time Window	M (SD)	M (SD)	M (SD)	M (SD)
Early SPN	-0.876 (4.24)	-0.133 (4.71)	-0.162 (4.37)	-0.277 (4.54)
Late SPN	-1.875 (7.39)	-1.198 (6.47)	-1.265 (6.62)	-2.494 (6.77)

Note. Total *n* = 67, Cognitive Reappraisal *n* = 32, Third Person Self-Talk *n* = 35. SPN amplitudes at each time window reported using means and standard deviations.

APPENDIX B: Figures

Figure 1. Trail Sequence

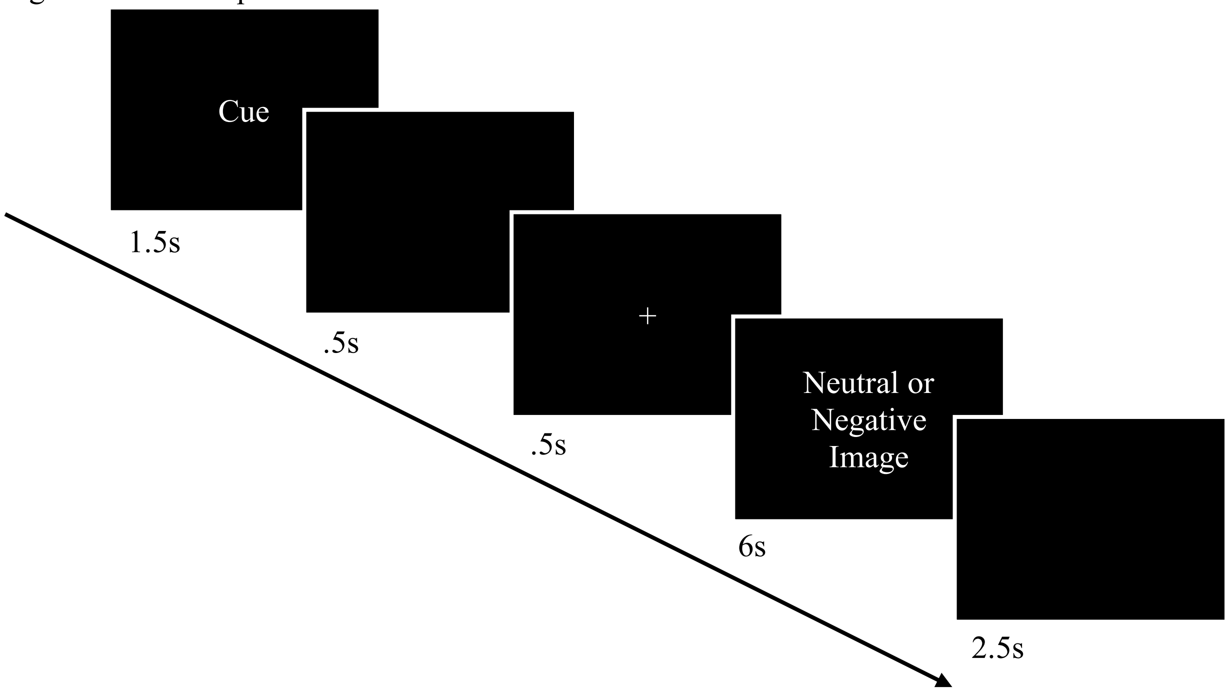
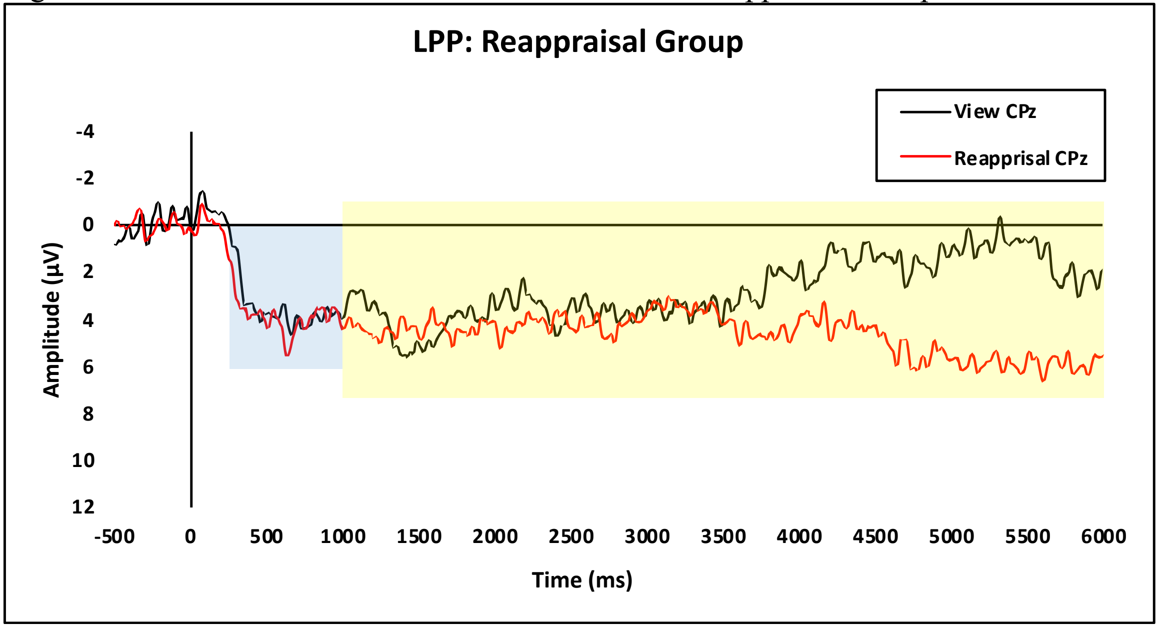
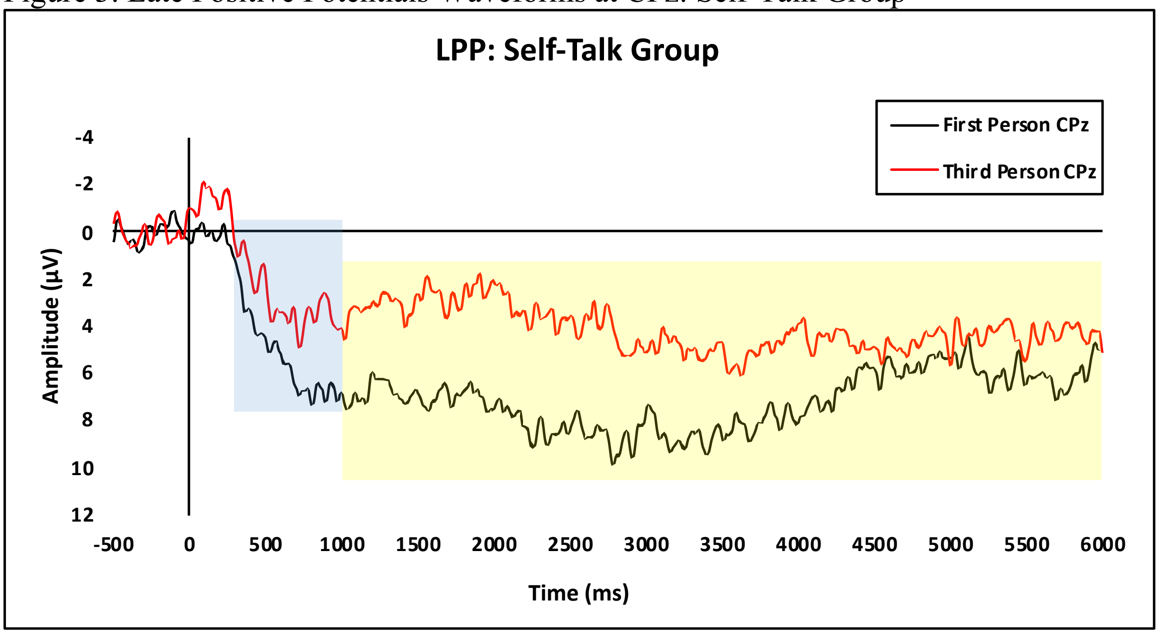


Figure 2. Late Positive Potentials Waveforms at CPz: Reappraisal Group



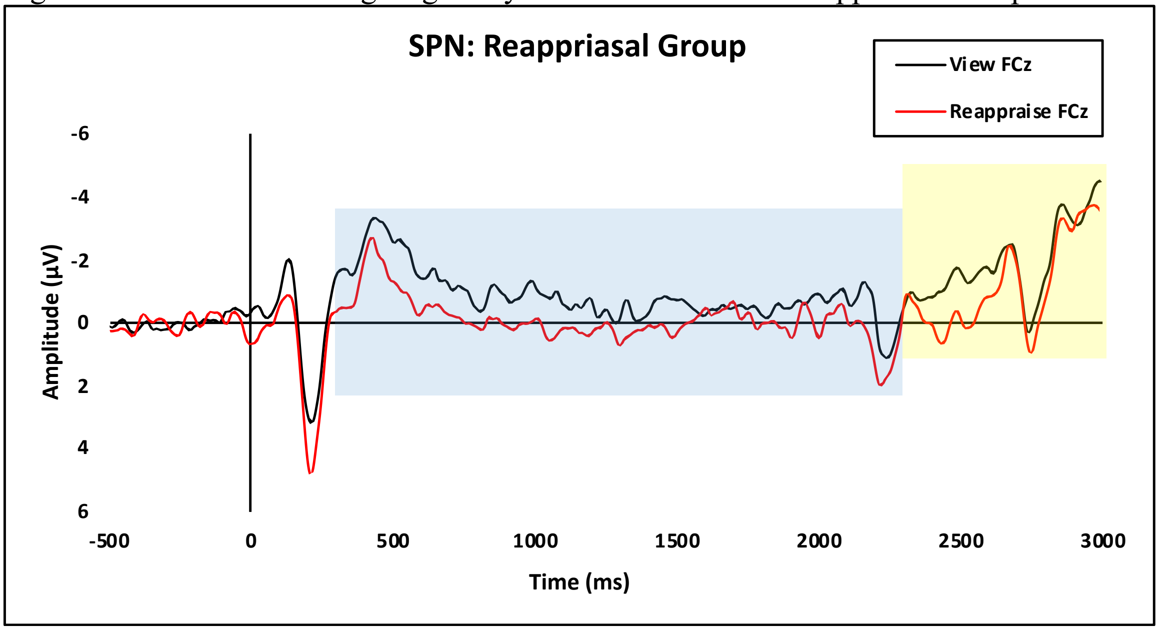
Note. Stimulus-locked ERP waveforms at electrode site CPz depicting no significant difference in negative-neutral LPP difference wave between the Reappraise and View condition. Blue shaded area represents the early LPP time window, while the yellow shaded area represents the late LPP time window.

Figure 3. Late Positive Potentials Waveforms at CPz: Self-Talk Group



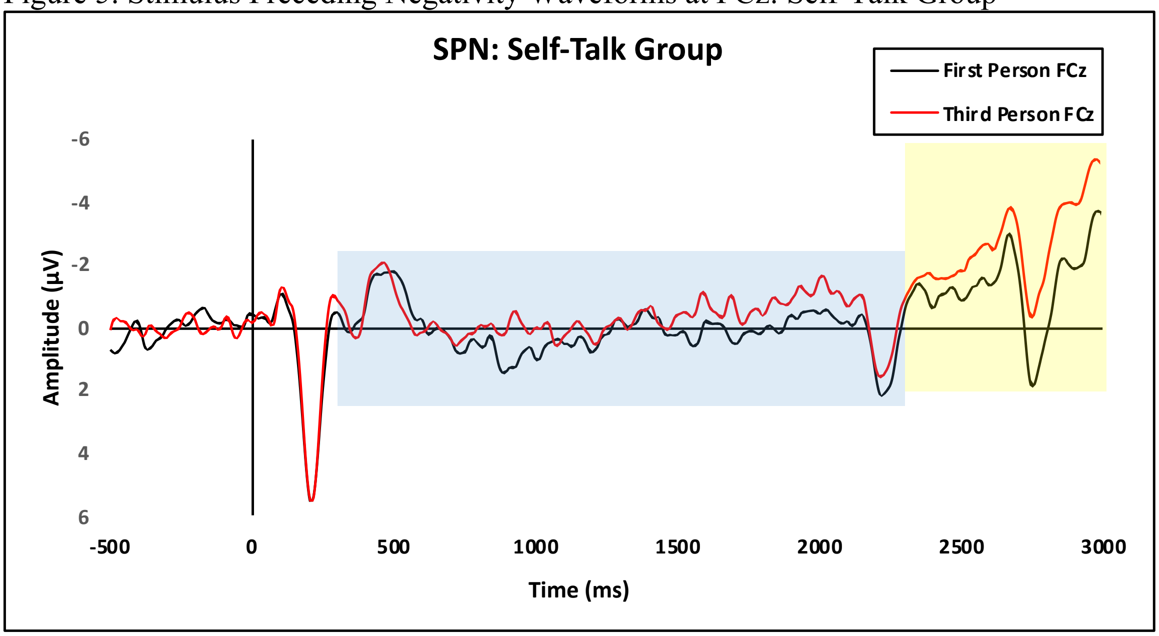
Note. Stimulus-locked ERP waveforms at electrode site CPz depicting a larger early late negative-neutral LPP difference wave in the First-Person compared to Third-Person condition. Blue shaded area represents the early LPP time window, while the yellow shaded area represents the late LPP time window.

Figure 4. Stimulus Preceding Negativity Waveforms at FCz: Reappraisal Group



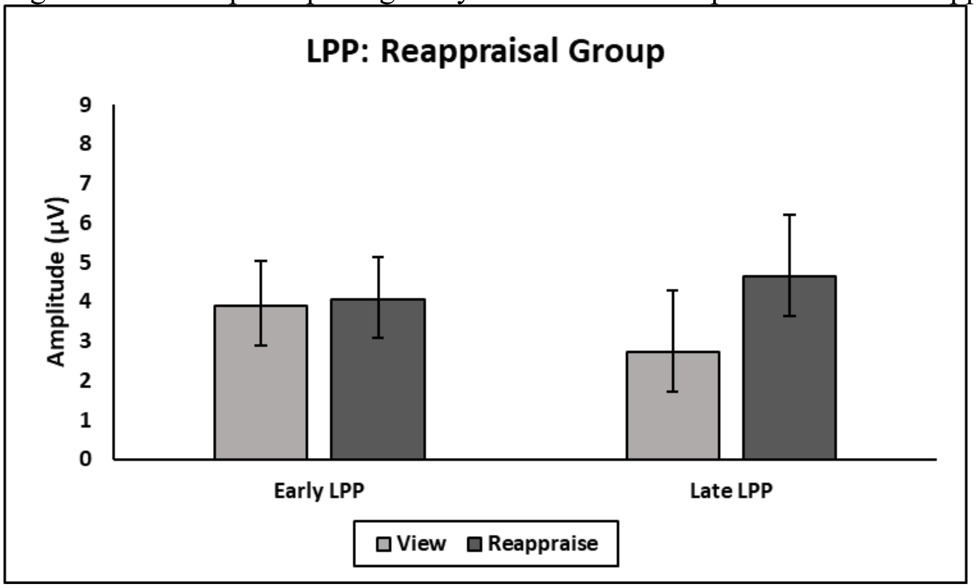
Note. Cue-locked ERP waveforms at electrode site FCz depicting no significant difference in SPN amplitude between the Reappraise and View condition. Blue shaded area represents the early LPP time window, while the yellow shaded area represents the late LPP time window.

Figure 5. Stimulus Preceding Negativity Waveforms at FCz: Self-Talk Group



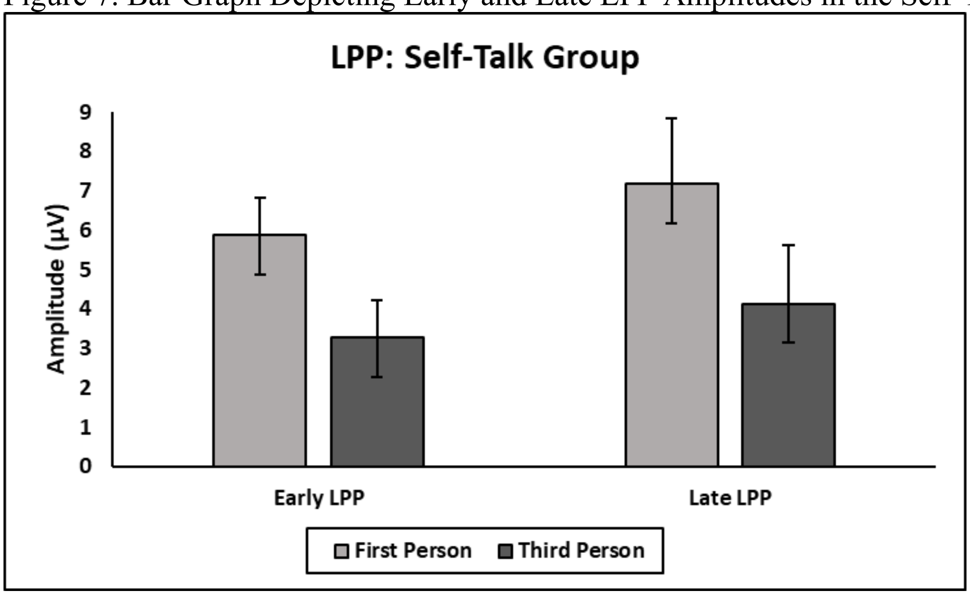
Note. Cue-locked ERP waveforms at electrode site FCz depicting no significant difference in SPN amplitude between the Third-Person and First-Person condition. Blue shaded area represents the early LPP time window, while the yellow shaded area represents the late LPP time window.

Figure 6. Bar Graph Depicting Early and Late LPP Amplitudes in the Reappraisal Group



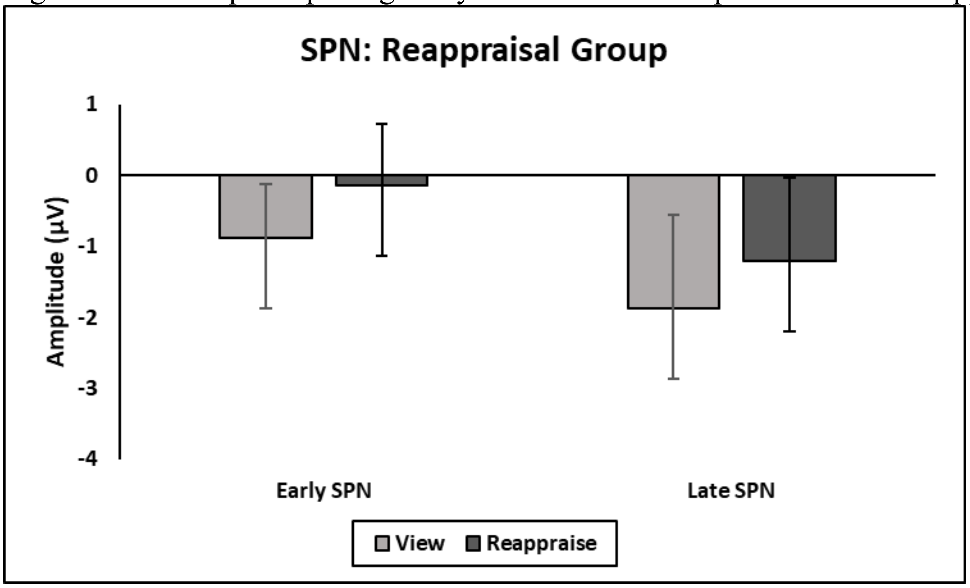
Note. Bar-graphs depicting no significant difference in early or late LPP negative-neutral difference scores in the Reappraise condition compared to the View condition. Error bars reflect +/− 1 SEM.

Figure 7. Bar Graph Depicting Early and Late LPP Amplitudes in the Self-Talk Group



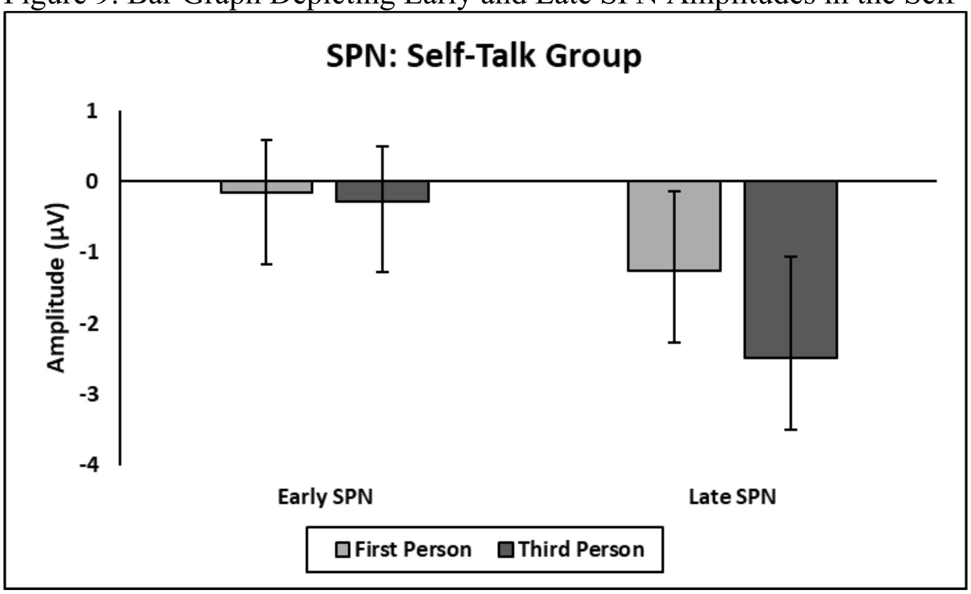
Note. Bar-graphs depicting a significantly smaller early and late LPP negative-neutral difference score in the Third Person condition compared to the First Person condition. Error bars reflect +/− 1 SEM.

Figure 8. Bar Graph Depicting Early and Late SPN Amplitudes in the Reappraisal Group



Note. Bar-graphs depicting no significant difference in early or late SPN amplitude in the Reappraise condition compared to the View condition. Error bars reflect +/− 1 SEM.

Figure 9. Bar Graph Depicting Early and Late SPN Amplitudes in the Self-Talk Group



Note. Bar-graphs depicting no significant difference in early or late SPN amplitude in the Third Person condition compared to the First Person condition. Error bars reflect +/− 1 SEM.

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