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With a Little Help From My Friends: Selective Social Potentiation of Emotion Regulation

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Decades of research has pointed to emotion regulation (ER) as a critical ingredient for health, well-being, and social functioning. However, the vast majority of this research has examined ER in a social vacuum, despite the fact that in everyday life individuals frequently regulate their emotions with help from other people. The present collection of preregistered studies examined whether social help increases the efficacy of reappraisal, a widely studied ER strategy that involves changing how one thinks about emotional stimuli. In Study 1 (N = 40 friend pairs), we compared the efficacy of reinterpreting the content of negative stimuli alone (solo ER) to listening to a friend reinterpret the stimuli (social ER). We found that social ER was more effective than solo ER, and that the efficacy of these strategies was correlated within individuals. In Studies 2 and 3, we replicated effects from Study 1, and additionally tested alternate explanations for our findings. In Study 2 (N = 40 individuals), we failed to find evidence that social ER was more effective than solo ER due to a difference in the quality of reinterpretations, and in Study 3 (N = 40 friend pairs), we found that social help did not significantly attenuate negative affect in the absence of reappraisal. In sum, we found that social help selectively potentiates the efficacy of reappraisal, and that this effect was not merely the outcome of social buffering. Together, these results provide insight into how social relationships can directly lend a hand in implementing ER strategies.

Keywords: emotion regulation, relationships, friendship, social regulation, reappraisal

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Emotion regulation (ER) is defined as the process by which individuals control the experience and expression of their emotions (Gross, 1998a). While emotions are generally functional in shaping how individuals communicate, learn, and respond to their environments (Keltner & Haidt, 1999), the inability to effectively regulate emotions underlies a host of mood and anxiety disorders (Aldao, Nolen-Hoeksema, & Schweizer, 2010; Campbell-Sills & Barlow, 2007), and can severely disrupt individuals' ability to navigate relationships (Eisenberg, Hofer, Sulik, & Spinrad, 2014; Gross, 1998b). Given the importance of ER in individuals' health, well-being, and social functioning, extensive research has investigated how individuals implement ER strategies across a variety of contexts (English, Lee, John, & Gross, 2017; Sheppes et al., 2012; Troy, Ford, McRae, Zarolia, & Mauss, 2017).

One widely studied strategy for controlling emotional states, cognitive reappraisal, involves reinterpreting how we think about a stimulus in order to change how we feel about it (Gross, 1998a; Uusberg, Taxer, Yih, Uusberg, & Gross, 2019). For example, if someone fails to get their dream job, they might tell themself that there are other great opportunities out there and that they will succeed in finding a desirable job eventually. Such reframing of negative events is thought to decrease negative emotions by increasing engagement of executive control centers of the brain and decreasing engagement in regions of the brain that are associated with heightened emotionality (Buhle et al., 2014; Ochsner & Gross, 2005). From a clinical perspective, this strategy is considered to be so effective in managing emotions that it is a critical component of cognitive–behavioral therapy (CBT), a widely implemented clinical treatment program for individuals suffering from a range of psychopathologies including depression, anxiety, and substance abuse that involves behavioral interventions alongside cognitive restructuring (A. Beck, Emery, & Greenberg, 2005; Dimidjian & Davis, 2009).

Though individuals can and often do reappraise alone, they also often receive help in reframing negative events (Gross, Richards,

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Our data are hosted on Open Science Framework and can be accessed upon e-mail request to Razia S. Sahi at rsahi1@ucla.edu.

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& John, 2006; Niven, Totterdell, & Holman, 2009, 2011; 2015). Imagine getting the call saying you did not get the job. What would you do? Many people may turn to a close friend or relative to share the distressing news. In turn, the support giver may say something like "don't worry—there are a lot of great opportunities out there and you're going to find a job that's the right fit for you." Hearing this reinterpretation of the event may be more effective than trying to reinterpret it alone because it provides an outside perspective of events that already feel negative from the experiencer's perspective. While there are several theoretical frameworks for interpersonal ER suggesting that people effectively use reappraisal to regulate each other's emotions (Niven et al., 2009; Reeck, Ames, & Ochsner, 2016; Zaki & Williams, 2013), the vast majority of empirical research on ER has examined how individuals regulate on their own.

Existing research suggests that social relationships can facilitate ER processes through implicit and explicit forms of social support. In terms of implicit emotional support, the presence of close others has repeatedly been shown to be a simple yet powerful means of buffering against negative emotions across species and across the life span (Bowlby, 2002; Hazan & Shaver, 1987). For example, simply looking at a picture of a loved one has been shown to decrease negative affect (Eisenberger et al., 2011; Master et al., 2009). When the presence of a close other is accompanied by touch (e.g., holding the hand of a close other), there seems to be even greater buffering against negative affect. For example, research suggests that holding the hand of a romantic partner decreases physical pain relative to their mere presence (Coan, Schaefer, & Davidson, 2006). Indeed, research suggests that these effects of social support on negative affect can be leveraged to develop and treat psychopathology (Brewin, Andrews, & Valentine, 2000; Kilpatrick et al., 2007; Ozer, Best, Lipsey, & Weiss, 2003; Pietrzak et al., 2010). Notably, such forms of implicit social support do not require close others to directly engage with individuals' efforts to regulate their emotions. Instead, such support provides a source of comfort, potentially facilitating a calmer baseline from which individuals can manage their own emotions (Beckes & Coan, 2011; Gee et al., 2014).

In terms of explicit emotional support, research suggests that people often share their experiences with others in order to receive socioaffective or cognitive support (Rimé, 2009). Whereas socioaffective support involves receiving comfort and validation from another person, cognitive support involves receiving help with reappraisal (i.e., reinterpreting the meaning of negative events). While socioaffective support tends to make people feel better in the short term, cognitive support is thought to be more useful in terms of long-term outcomes (Brans, Van Mechelen, Rimé, & Verduyn, 2014; Rimé, 2009, Nils & Rimé, 2012). Although some research has investigated the differential benefits of these two forms of explicit emotional support in terms of how individuals evaluate such support and those who offer it (Niven, Garcia, van der Löwe, Holman, & Mansell, 2015; Pauw, Sauter, van Kleef, & Fischer, 2018), no work to date has directly compared how reappraisal differs across intrapersonal and interpersonal contexts. In other words, it remains unknown whether reappraising with help from others is more effective than reappraising alone.

The Present Investigation

The present collection of studies builds on prior work to examine whether the efficacy of ER strategies are selectively enhanced by social support in three preregistered studies. In Study 1, we compared the efficacy of reinterpreting negative stimuli alone (solo ER) to the efficacy of listening to a friend reinterpret the stimuli (social ER). We tested three competing hypotheses regarding the efficacy of social ER: (a) social ER is more effective than solo ER, (b) solo ER is more effective than social ER, or (c) social and solo ER are equally efficacious. We additionally examined whether social ER and solo ER were correlated within individuals to assess whether the efficacy of social ER, like solo ER, varies as a function of individual differences in ER ability (Gross & John, 2003). Finally, we conducted exploratory analyses to examine whether individual differences in social and emotional tendencies and qualities predicted the efficacy of social ER.

A key finding from Study 1 was that social ER was significantly more effective than solo ER in downregulating negative affect. However, this study did not elucidate why social ER was more effective than solo ER. Thus, in Studies 2 and 3 we aimed to replicate results from Study 1, and additionally followed up on our results to test alternate explanations for this finding. In Study 2, we examined whether the observed difference between social ER and solo ER was due to a difference in the quality of reinterpretations between the two tasks. We hypothesized that the quality of reinterpretations generated by participants in the lab for a solo ER task would not be significantly different from the quality of reinterpretations used in the social ER task. In Study 3, we assessed one possible mechanism that could explain the observed difference between social ER and solo ER: social buffering. Specifically, we examined whether social ER was more effective than solo ER because of the comforting or distracting nature of the social versus the solo task, regardless of implementing the ER strategy, by including a counting condition in our task. We hypothesized that listening to a friend count slowly (social counting) would not be more effective in reducing negative affect than counting slowly alone (solo counting), suggesting that the observed difference between social ER and solo ER was not merely the result of a social buffering effect.

Research Overview

Across three experiments, we studied how social ER shapes negative affective experiences. We utilized the same exclusion criteria, justification of sample size, analytic approach, and primary outcome measure across all three studies, described below. All procedures were approved by the local institutional review board committee. All data, analysis materials, and stimuli are hosted on Open Science Framework and can be accessed upon e-mail request to the first author (rsahi1@ucla.edu; Sahi, Ninova, & Silvers, 2020).

Exclusion criteria. Participants individually completed e-mail screenings to ensure their eligibility before coming to the lab. Prospective participants who reported being younger than 18 or older than 39, were not proficient in English, reported having any developmental disability or neurological disorder, any serious physical or psychological illness, or uncorrected vision or hearing were not enrolled in the study. Because previous research indicates that there may be gender differences in reappraisal implementation (McRae, Ochsner, Mauss, Gabrieli, & Gross,

2008) and in social support provision (Neff & Karney, 2005), we restricted our sample to female participants.

Sample size. The rationale for our sample size of 40 across all three studies derives from previous work examining reappraisal using similar reinterpretation paradigms (McRae et al., 2008; Ochsner et al., 2004; Ray et al., 2005). Since these studies found an effect of reappraisal using this type of paradigm with a sample of 20–25 participants, we approximately doubled the sample size to account for our two within-subjects conditions of interest (i.e., social ER and solo ER).

Analytic approach. All analyses were conducted using the statistical package R (Version 1.2.1335; R Core Team, 2013). For each study, we created linear mixed-effects models (LMMs, i.e., multilevel regression) with participant ID as the group level variable. This analytic approach allowed us to account for nonindependence of errors due to our repeated-measures design, which would result in underestimated standard errors and inflated risk of Type I error, while also providing more modeling flexibility than repeated-measures analysis of variance (ANOVA). Since repeated-measures ANOVA only uses list-wise deletion, multilevel regression is additionally better at accounting for missing data (such as trials missed by participants), and therefore has greater statistical power than repeated-measures ANOVA.

Measures. Our primary outcome measure across studies was self-reported negative affect on each trial. To measure negative affect, we asked participants how bad they felt on a scale of 1 to 4 (1 = *not bad at all* to 4 = *very bad*), on each trial. We additionally collected exploratory measures during Study 1 relating to social and emotional tendencies and qualities, including measures of relationship quality (Inventory of Peer Attachment; Armsden & Greenberg, 1987; Social Provisions Scale; Cutrona & Russell, 1987; 2-Way Social Support Scale; Shakespeare-Finch & Obst, 2011), ER frequency and ability (Emotion Regulation Questionnaire; Gross & John, 2003; Reappraisal Capacity; Troy et al., 2017; Interpersonal Regulation Questionnaire; Williams, Morelli, Ong, & Zaki, 2018), self-regulation tendency (Self-Regulation Scale; Diehl, Semegon, & Schwarzer, 2006), empathic tendency (Interpersonal Reactivity Index; Davis, 1983), loneliness (UCLA Loneliness; Russell, 1996), traits/mood (Beck Depression Index; A. T. Beck, Steer, & Carbin, 1988; Perceived Stress Scale; Cohen, Kamarck, & Mermelstein, 1983; State Trait Anxiety Inventory; Spielberger, Gorsuch, & Lushene, 1983), and personality (Eysenck Personality Inventory; Eysenck, 1968). Since these exploratory measures did not significantly correlate with any of our outcome variables during Study 1 ($ps > .05$), we used the questionnaire portions of Studies 2 and 3 to collect data for a separate study on ER capacity and tendency (Guassi Moreira, Sahi, Ninova, Parkinson, & Silvers, 2020).

Study 1

In Study 1, our primary aim was to examine whether social ER was more effective than solo ER. To test this question, we created a novel social reappraisal paradigm based on a widely used paradigm for measuring solo reappraisal ability that involves reinterpreting the content of negative stimuli (Ochsner et al., 2004). Our social reappraisal paradigm modified this task such that participants would listen to a close friend reinterpreting the negative stimuli, allowing us to directly compare the efficacy of using this strategy alone to receiving help with it. In order to maintain consistency in the quality of reinterpretations across dyads, the reinterpretations provided by the friend during the social ER task were scripted ahead of time by the research team.

In addition to comparing negative affect during the social versus the solo ER task, we tested whether the efficacy of social ER was correlated with individuals' ability to regulate alone. In doing so, we aimed to examine whether (a) ER works better for some individuals than others, regardless of social help (i.e., the efficacy of social ER and solo ER are correlated); or (b) social help is more effective for some people than others in enhancing the effects of ER (i.e., the efficacy of social ER and solo ER are not correlated).

Method

Participants. We recruited pairs of female friends ($N = 44$ dyads, $N = 88$ participants) that reported having a close relationship from the University of California Los Angeles (UCLA) campus through flyers and e-mails. Four dyads were excluded during data collection due to technical difficulties during the session, leaving a final sample of 40 dyads ($N = 80$ participants). The mean age of this sample was 19.4 years, and the sample was approximately 55% Asian, 24% White/Caucasian, 10% Latino/Hispanic, and 2% Black/African American. The remaining participants identified as multiracial or another identity.

Task development. Visual stimuli for our tasks (social task and solo task) were drawn from the International Affective Picture System (Lang, Bradley, & Cuthbert, 2008), the Open Affective Standardized Image Set (Kurdi, Lozano, & Banaji, 2017), and from freely available online sources. First, a total of 127 images were selected: 91 negative and 36 neutral. Next, two members of the research team generated reinterpretations meant to decrease negative affect for the 91 negative images. Then, all images and the negative image reinterpretations were independently rated online on Amazon Mechanical Turk by 45 participants. Participants viewed each image and provided a negative affect rating in response to the question "How bad do you feel?" on a scale of 1 (*not bad at all*) to 4 (*very bad*). Neutral images were rated only once, while negative images were presented a second time along with the reinterpretation generated by the research team. During the second presentation, participants were asked to read the reinterpretation and provide a negative affect rating using the same scale as the first rating.

The rating on the first negative image presentation (without reinterpretation) was subtracted from the rating from the second negative image presentation (with reinterpretation). We used this difference score to determine which negative images could be successfully reinterpreted, and would thus be appropriate for our reinterpretation task. The 72 negative image-reinterpretation pairs that resulted in the greatest reduction in negative affect were distributed into four scripts with 18 images per script such that the average affect ratings did not significantly differ between scripts. All neutral images were also distributed into two scripts with 18 images per script. Using these four negative image sets and two neutral image sets, we created four versions of the tasks that counterbalanced image sets across the social and solo tasks (e.g., V1 solo task: negative image Set 1—reinterpret, negative image Set 2—look, neutral image Set 1—look; V1 social task: negative

image Set 3—reinterpret, negative image Set 4—look, neutral image Set 2—look).

Procedure. Upon arriving, one participant from each dyad was randomly assigned to be the "experiencer" in the study and the other participant was assigned to be the "helper." After assignment and consenting, the friend pairs were separated for the remainder of the study. As each participant completed their tasks, they were reminded of each other's role in the study. Experiencers were reminded that the helpers were trying to help them decrease their negative response to some of the images, and helpers were reminded that their job was to help their friend feel less negatively about some of the images they would see. Both participants completed the same set of questionnaires.

Experiencer. The experiencer began by completing questionnaires. Next, the experiencer completed a brief training using Powerpoint designed to prepare them for two computerized tasks: the solo task and the social task. As part of this training, experiencers saw sample negative images (which were not used in the experimental task) and were instructed on how to respond to different cues. Next, the experiencers completed these two tasks using E-Prime (Version 2.0.10; Schneider, Eschman, & Zuccolotto, 2012) in counterbalanced order. The solo task utilized a standard reinterpretation paradigm (Ochsner et al., 2004), and the social task utilized a slightly modified version of this task created for this study.

Each of these two tasks included three conditions with 18 trials each: negative-reinterpret, negative-look, and neutral-look. While it was important for us to include a neutral-look condition to give participants a break from looking at negative images and to obtain a comparison condition for the negative-look condition, we did not include a neutral-reinterpret condition in either task primarily because this condition would not make sense from the participants' perspective (i.e., there was no negative content to reinterpret). Thus, we had an incomplete 2 (valence: negative vs. neutral) × 2 (instruction: reinterpret vs. look) × 2 (task: solo vs. social) design with six conditions total. We accounted for this incomplete design with our subsequent modeling choices.

In the solo task, participants were first presented with an instructional cue to look or reinterpret for 2 s, followed by a negative or neutral social image for 8 s. Following the look cue, participants were instructed to look and let themselves respond naturally to the image, and following the reinterpret cue, they were instructed to think about the image in a way that would reduce their negative emotional response to it (e.g., "They look upset at each other, but they are finally coming to terms about something they've disagreed about"). Next, they provided a negative affect rating (3 s), and then relaxed while viewing a fixation cross before the next trial (Figure 1a). The social task followed a similar procedure, except that instead of seeing a cue to "reinterpret" they saw a cue to listen. Following the listen cue, the experiencer was instructed to listen to the helper describe the image in a way that was meant to help reduce their negative emotional response to the image. During the listen trials, images were presented for an additional 1 s to allow participants to view the image briefly before hearing the audio clip of the reinterpretation (Figure 1b). In between the two tasks, experiencers took a 5-min break to watch a video meant to provide a brief nonemotional distraction (https://www.youtube.com/watch?v=qed4ynPYVIA).

Unbeknownst to the experiencers, the reinterpretations that the experiencers heard during the listen trials were not generated by the helpers. Instead, the helpers read reinterpretations from a script that was generated by the research team for the purpose of standardizing the reinterpretations in the social task across dyads. Thus, at the end of both tasks, experiencers were asked about their perceptions of the study and debriefed on the details of the study.

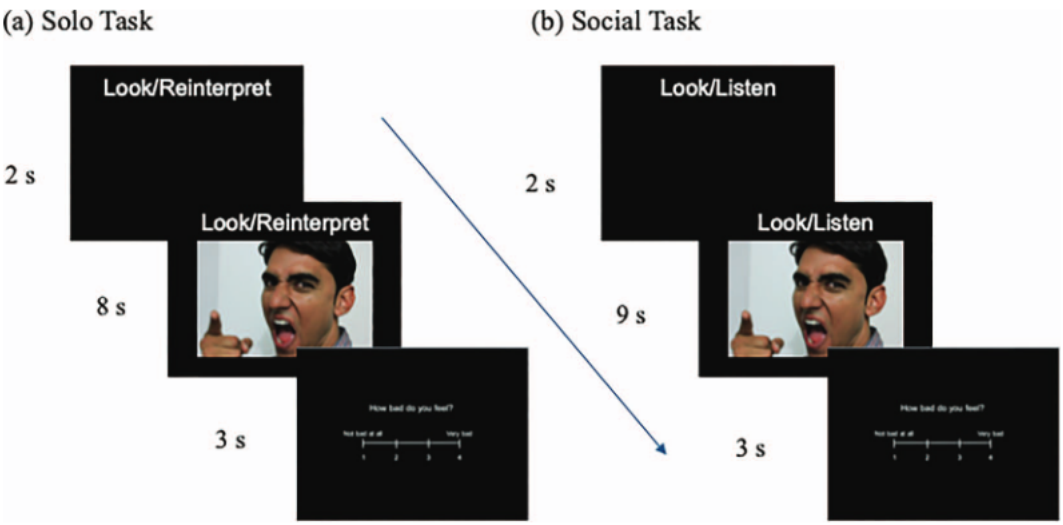

Figure 1. (a) The solo task in Study 1 began with a 2 s cue to "look" or "reinterpret," followed by an image presentation for 8 s, and a rating screen for 3 s. (b) The social task in Study 1 followed a similar procedure, except that instead of seeing a cue to reinterpret they saw a cue to "listen," and image presentation lasted an additional 1 s to allow for sufficient time to view the image and listen to the audio clip. The image included in Figure 1 came from CC search: https://search.creativecommons.org/photos/296e1565-c7ed-455f-a737-c48f88039b99. See the online article for the color version of this figure.

Helper. The helpers began by completing a relationship salience task (i.e., "Take a moment to think about some memories that you have with the friend you came with today. When you are finished, please pick one memory and write a paragraph describing it"). Since the helpers would not be in the presence of their friend throughout the study, this salience task was designed to prompt them to think about their friendship with the experiencer before completing the helping task. In other words, this salience task was meant to make the helping task feel more social, despite the physical absence of the friend during the task.

After the salience task, the helper moved on to the helper task where they recorded 18 reinterpretations from the script generated by the research team (e.g., "I'm sure that person will recover from the accident quickly"). Each reinterpretation was one sentence and took about 4 s to read out loud. Helpers were instructed to read the reinterpretations in a natural way so that the reinterpretations of the images would feel helpful to their friend as they viewed negative images. These reinterpretations were not read to the experiencers live during the task, but were rather spliced into the task after all the recordings were completed. After the helper completed the recordings, they filled out questionnaires. At the end of the study, helpers were asked about their perceptions of the study.

Analyses. Since we used an incomplete design, it would have been difficult to interpret results when modeling main effects and interactions using the complete dataset. Thus, we analyzed the data in two stages. First, we filtered the data for look trials only and ran an LMM (i.e., a multilevel regression model) with valence of the images (negative vs. neutral) as the predictor variable, self-rated negative affect (trial-level) as the outcome variable, and participant ID as the group-level random variable. This model allowed us to check our manipulation and ensure that participants had greater negative affect in response to the negative images than the neutral images.

Next, we filtered the full dataset for negative image trials only, and ran an LMM with instruction type (reinterpret vs. look) and task (solo vs. social) as the predictor variables, self-rated negative affect as the outcome variable, and participant ID as the group-level random variable. Since our primary comparison of interest was between the solo-reinterpret (i.e., solo ER) and social-reinterpret (i.e., social ER) conditions, we included an interaction term between instruction and task and followed up with Tukey-adjusted pairwise comparisons to specifically compare social ER versus solo ER. For both of these models, we initially included the version of the task (1–4) and which task they completed first (solo vs. social) as predictors of no interest in the model, but since they did not significantly predict the outcome variable ($ps > .05$), they were removed.

To examine the relationship between the efficacy of social ER and solo ER, we first calculated difference scores between look-negative and reinterpret-negative for the social task (i.e., social ER efficacy) and solo task (i.e., solo ER efficacy) for each participant. Then, we calculated the Pearson correlation coefficient between social ER efficacy and solo ER efficacy.

Results

Our analysis of look trials suggested that there was a significant effect of valence, $b = -1.55$, $t(2748.83) = -61.09$, $p < .0001$, 95% CI [−1.60, −1.50], on participants' negative affect, such that participants reported higher negative affect on the negative-look trials ($M = 2.65$, $SD = 0.96$) than the neutral-look trials ($M = 1.09$, $SD = 0.33$). Our analysis of negative trials revealed that there was no main effect of task (solo vs. social), $b = 0.06$, $t(2724.24) = 1.36$, $p = .17$, 95% CI [−0.03, 0.14], on participants' negative affect, but there was a significant main effect of instruction, $b = -1.15$, $t(2724.30) = -27.02$, $p < .0001$, 95% CI [−1.23, −1.07], such that participants reported higher negative affect on the negative-look trials ($M = 2.65$, $SD = 0.96$) than the negative-reinterpret trials ($M = 1.60$, $SD = 0.75$). There was also a significant interaction between task and instruction, $b = 0.21$, $t(2724.22) = 3.44$, $p < .001$, 95% CI [0.09, 0.32], such that participants reported greater negative affect during solo-reinterpret ($M = 1.73$, $SD = 0.81$), than social-reinterpret ($M = 1.47$, $SD = 0.65$), $t(2724) = -6.22$, $p < .0001$ (Figure 2a). By contrast, there was no difference between the solo-look and social-look conditions, $t(2724) = 1.36$, $p = .17$. Additionally, there was a strong correlation between social ER efficacy and solo ER efficacy, $r = .73$, $t(38) = 6.53$, $p < .0001$, 95% CI [0.54, 0.85] (Figure 2b).

Study 2

One question that arose from the Study 1 findings was whether the quality of reinterpretations differed between the solo and social tasks. In other words, were the reinterpretations generated by the research team inherently better in quality than those participants generated themselves during the solo task? If so, social ER may have been more effective than solo ER because of the reinterpretations themselves, and not because of an effect of social help on the efficacy of the ER strategy. Thus, in Study 2, an independent sample of participants ($N = 40$ individuals) completed the social task from Study 1 that included 18 negative-reinterpret trials where they listened to someone provide reinterpretations of negative images, 18 negative-look trials where they responded naturally to negative images, and 18 neutral-look trials where they responded naturally to neutral images. The negative-reinterpret condition was modified for Study 2 to use a mix of reinterpretations generated by the research team for Study 1 (9 trials) and reinterpretations generated by participants from a separate pilot study (9 trials; details provided in the Task development subsection), while holding the total number of trials for the task consistent with Study 1 (54 trials). A post hoc analysis of the Study 1 data suggested that nine trials for each reinterpretation type were sufficient for obtaining a reliable estimate of social reappraisal (Chakrabartty, 2013; Lord & Novick, 1968; Rudner & Schafer, 2001; see the online supplemental materials for details).

Since the focus of this study was not to compare social versus solo ER, but rather to evaluate whether experimenter-generated reappraisals were more effective than participant-generated reappraisals during social ER, we did not have participants complete the solo task from Study 1. Additionally, participants heard a stranger's voice during the social ER task rather than a friend's voice since this simplified the study procedure for the purpose of comparing the efficacy of the reinterpretations generated by the research team to those generated by participants. While we did not assess the quality of reinterpretations between the social and solo tasks in Study 1, Study 2 evaluated whether solo ER and social ER reinterpretations likely differed in quality.

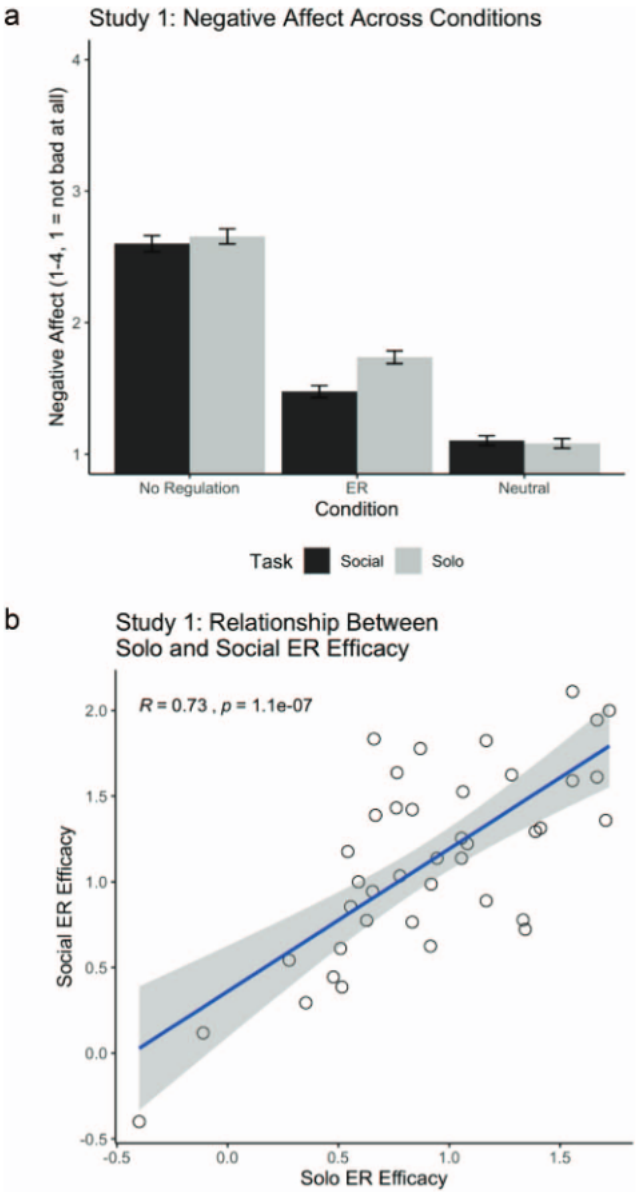

Figure 2. In Study 1, (a) there were no significant differences between the solo and social tasks for the no regulation and neutral conditions, but social emotion regulation (ER) was associated with lower negative affect than solo ER, $p < .0001$; and (b) social ER efficacy was highly correlated with solo ER efficacy, $p < .0001$. See the online article for the color version of this figure.

Method

Participants. We recruited individual female participants ($N = 42$ individuals) through the UCLA online-participant pool (SONA). Two participants were excluded during data collection due to technical issues during the session, leaving a final sample of 40 participants. The mean age of this sample was 18.8 years, and the sample was approximately 32.5% Asian, 27.5% White/Caucasian, 25% Latino/Hispanic, 10% Black/African American. The remaining participants identified as multiracial or another identity.

Task development. To develop the modified social task used in Study 2, we adapted the reinterpretation portion of the solo task from Study 1 using Qualtrics to allow participants to write down the reinterpretations they used for the task as they viewed and responded to each negative image (18 trials). We administered this task to 24 female participants recruited through the UCLA online-participant pool. A total of six participants completed each of the 4 versions of the modified solo task. Then, we randomly selected reinterpretations from each participant in this study to use in new scripts that included nine participant-generated reinterpretations and nine researcher-generated reinterpretations. Finally, a female member of the research team used each of these new scripts to record four sets of audio clips (one for each version of the task) using complete sentences for every reinterpretation. These audio clips would be used for the modified social task in Study 2. Aside from this difference in the reinterpretation scripts, and the fact that participants would hear a stranger rather than a friend, this modified social task was exactly the same as the social task completed in Study 1 and was administered using E-Prime.

Procedure. Study 2 followed a similar procedure as Study 1, except that individuals were recruited instead of pairs of friends, and participants did not complete a solo task. After consenting, participants completed a set of questionnaires. Next, they completed a brief Powerpoint training designed to prepare them for the social ER task. Participants were reminded that during the task they would hear someone trying to help them decrease their negative response to some of the images. Then, they completed the modified social ER task described above. At the end of the task, participants were asked about their perceptions of the study.

Analyses. Similar to Study 1, Study 2 utilized an incomplete 2 × 2 design. Thus, we analyzed the data in stages. First, we filtered the data for look trials only and ran an LMM (i.e., a multilevel regression model) with valence of the images (negative vs. neutral) as the predictor variable, self-rated negative affect (trial-level) as the outcome variable, and participant ID as the group-level random variable. Next, we examined whether social ER was effective in reducing negative affect by filtering the data for only the negative image trials and running an LMM with instruction type (reinterpret vs. look) as the predictor variable, self-rated negative affect as the outcome variable, and participant ID as the group-level random variable. To specifically examine whether there was a difference between the participant-generated and researcher-generated reinterpretations in terms of efficacy in reducing negative affect, we filtered the data for only the reinterpretation trials and created an LMM with source of the reinterpretations (participant vs. researchers) as the predictor variable, self-rated negative affect as the outcome variable, and participant ID as the group-level random variable. As with Study 1, we began by including the version of the task (1–4) as a covariate in these models, but since it did not significantly predict the outcome variable ($ps > .05$), it was removed from the models.

Given our explicit interest in testing the null hypothesis in this study, we additionally conducted equivalence testing to examine whether the difference in negative affect associated with participant-generated reinterpretations and researcher-generated reinterpretations is statistically equivalent to zero. Specifically, we used the TOSTER package in R to conduct two one-sided signif-

icance tests (Lakens, 2017; Lakens, McLatchie, Isager, Scheel, & Dienes, 2020). Since we did not have enough prior information to use a data-driven approach to determine the smallest effect size of interest, we used a medium effect size of $d = 0.3$.

Results

Our analysis of "look" trials suggested that there was a significant effect of valence, $b = -1.61$, $t(1343.84) = -41.34$, $p < .0001$, 95% CI [−1.69, −1.53], on participants' negative affect, such that participants reported higher negative affect on the negative-look trials ($M = 2.72$, $SD = 1.01$) than the neutral-look trials ($M = 1.11$, $SD = 0.37$). Our analysis of negative trials revealed that there was a significant effect of instruction, $b = -0.75$, $t(1341.74) = -14.73$, $p < .0001$, 95% CI [−0.84, −0.65], on participants' negative affect such that participants reported higher negative affect on the negative-look trials ($M = 2.72$, $SD = 1.01$) than the negative-reinterpret trials ($M = 1.97$, $SD = 1.02$; Figure 3a). Finally, our analysis of reinterpret trials indicated that there was not a significant effect of source of the reinterpretations (participant vs. researchers), $b = 0.02$, $t(650.64) = 0.33$, $p = .75$, 95% CI [−0.11, 0.16], on participants' negative affect (Figure 3b). In examining the results of the two one-sided significance tests, given an alpha of 0.05, we found that the null-hypothesis test was not significant, $t(39) = -0.35$, $p = .73$, indicating that the observed difference between participant reinterpretations and researcher reinterpretations is not statistically different from zero, and the equivalence test was marginally significant, $t(39) = 1.55$, $p = .06$, indicating that the observed difference between participant reinterpretations and researcher reinterpretations is marginally equivalent to zero.

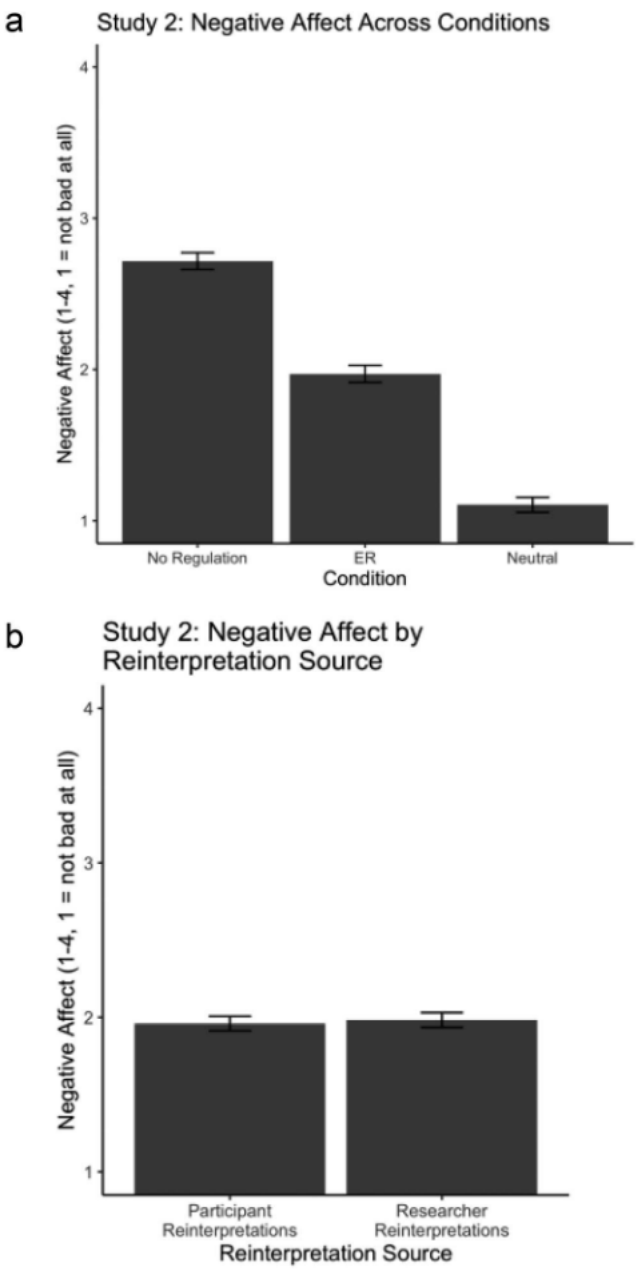

Figure 3. In Study 2, (a) social emotion regulation (ER) was more effective than no regulation, $p < .0001$; and (b) there was no significant difference in negative affect for social ER trials that used reinterpretations generated by participants, and for those that used reinterpretations generated by the research team, $p = .75$.

Study 3

A second question that arose following Study 1 was whether social ER was more effective than solo ER due to the comforting or distracting nature of the social ER condition as compared to the solo ER condition. In other words, was a "mere presence" effect triggered by hearing the friend's voice enhancing the efficacy of social ER, irrespective of the ER strategy being implemented? If so, then hearing a friend's voice should reduce negative affect even when the friend is not using reappraisal. To test this question, in Study 3 ($N = 40$ dyads) we replicated Study 1 with an additional baseline condition as part of the social and solo tasks: a counting condition. This condition allowed us to examine whether social interaction (i.e., hearing a friend count calmly) reduced negative affect as compared to a matched solo condition (i.e., counting calmly alone).

Method

Participants. We recruited pairs of female friends ($N = 41$ dyads, $N = 82$ participants) that reported having a close relationship from the UCLA campus through flyers and e-mails. One dyad was excluded during data collection due to technical difficulties during the session, leaving a final sample of 40 dyads ($N = 80$ participants). The mean age of this sample was 21 years, and the sample was approximately 50% Asian, 29% White/Caucasian, 30% Latino/Hispanic, and 10% Black/African American. The remaining participants identified as multiracial or another identity.

Task development. Study 3 modified the two computerized tasks from Study 1 to include a counting condition. This counting condition was included as a baseline condition in both the social and solo tasks, and involved counting up or down from a specific number (e.g., "count up from 15" or "count down from 25"). The instruction to count up or down and the number to begin counting from (i.e., 15, 25, etc.) varied for each trial in order to keep the different trials from being redundant. The number of trials for each

condition in the social and solo tasks were modified to maintain the same number of total trials as in Study 1 (54 trials): 18 neutral trials, 12 look trials, 12 count trials, and 12 reinterpret trials. We chose to include this counting condition as our baseline condition because we could control the content of the condition across social and solo tasks and across participants, and because it was a task that could be presented to participants as being a potentially helpful meditative activity during negative affective situations (Goldin & Gross, 2010; Rasmussen et al., 2019).

Procedure. Study 3 followed a similar procedure as Study 1, except that participants were additionally trained to respond to a "count" instruction. Upon arriving, one participant from each dyad was randomly assigned to be the experiencer in the study and the other participant was assigned to be the helper. After assignment and consenting, the friend pairs were separated for the remainder of the study. As each participant completed their tasks, they were reminded of each other's role in the study. Experiencers were reminded that the helpers were trying to help them decrease their negative response to some of the images using different strategies, and helpers were reminded that their job was to help their friend feel less negatively about some of the images they would see using different strategies. Both participants completed the same set of questionnaires.

Experiencer. The experiencer began by completing questionnaires. Next, they completed a brief Powerpoint training that prepared them for the social and solo ER tasks. As part of this training, experiencers saw sample images (which were not used in the experimental task) and were instructed on how to respond to different cues, including look, reinterpret, and count for the solo ER task, and look or listen for the social ER task. The instructions for the look and reinterpret cues were exactly the same as Study 1. When they saw the cue to count, participants were instructed to count, calmly and slowly, up or down from a specific number presented on the screen. When they saw the cue to listen, participants were instructed to listen to their friend either reinterpreting the negative stimuli, or counting, calmly and slowly, up or down from a specific number presented on the screen. Thus, the cue to listen could signify that they were about to hear either a reinterpretation or counting from their friend. After training, the experiencers completed the two tasks using E-Prime in counterbalanced order. In between the two tasks, experiencers took a 5-min break to watch a brief neutral video. At the end of both tasks, experiencers were asked about their perceptions of the study and debriefed on the details of the study.

Helper. The helpers began by completing a relationship salience task (same as Study 1). After the salience task, the helper recorded 14 reinterpretations from the script generated by the research team. Next, they recorded 14 audio clips counting up or down from specific numbers. For both sets of recordings, helpers were instructed to speak in a way that would make the audio clips feel helpful to their friend as they viewed negative images. After completing the recordings, helpers completed questionnaires. At the end of the study, helpers were asked about their perceptions of the study.

Analyses. Like Studies 1 and 2, Study 3 utilized an incomplete design. Thus, we analyzed the data in two stages. First, we filtered the data for look trials only and ran an LMM (i.e., a multilevel regression model) with valence of the images (negative vs. neutral) as the predictor variable, self-rated negative affect (trial level) as the outcome variable, and participant ID as the group-level random variable. Next, we filtered the data for negative image trials only, and ran an LMM with instruction type (reinterpret vs. look vs. count) and task (solo vs. social) as the predictor variables, self-rated negative affect as the outcome variable, and participant ID as the group-level random variable. Given that we had three instruction types in this model, we set the reference group as look such that our model would produce an estimate for look versus reinterpret and look versus count. As in Study 1, we included an interaction term between instruction and task (resulting in estimates for look vs. reinterpret by task and look vs. count by task), and followed up with Tukey-adjusted pairwise comparisons to specifically compare social ER versus solo ER, and social counting versus solo counting. For both of these models, we initially included version of the task (1–4) and which task they completed first (solo vs. social) as predictors of no interest in the model, but since they did not significantly predict the outcome variable ($ps > .05$), they were removed. To examine the relationship between the efficacy of social ER and solo ER, we first calculated difference scores between look-negative and reinterpret-negative for the social task (i.e., social ER efficacy) and solo task (i.e., solo ER efficacy) for each participant. Then, we calculated the Pearson correlation coefficient between social ER efficacy and solo ER efficacy.

Results

Our analysis of look trials suggested that there was a significant effect of valence, $b = -1.21$, $t(2321.11) = -43.63$, $p < .0001$, 95% CI [−1.27, −1.16], on participants' negative affect, such that participants reported higher negative affect on the negative-look trials ($M = 2.37$, $SD = 1.00$) than the neutral-look trials ($M = 1.15$, $SD = 0.44$). Our analysis of negative trials revealed that there was no main effect of task (solo vs. social), $b = -0.07$, $t(2762.13) = -1.34$, $p = .18$, 95% CI [−0.18, 0.03], on participants' negative affect. However, with look as the reference group, there were significant main effects of counting, $b = -0.25$, $t(2762.14) = -4.60$, $p < .0001$, 95% CI [−0.35, −0.14], and reinterpreting, $b = -0.83$, $t(2762.21) = -15.30$, $p < .0001$, 95% CI [−0.93, −0.72], such that negative affect was lower on the count trials ($M = 2.17$, $SD = 0.91$) and reinterpret trials ($M = 1.64$, $SD = 0.75$) as compared to the look trials ($M = 2.37$, $SD = 1.00$). While there was no interaction between count (vs. look) and task, $b = 0.10$, $t(2762.13) = 1.23$, $p = .21$, 95% CI [−0.05, 0.25], there was a significant interaction between reinterpret (vs. look) and task, $b = 0.20$, $t(2762.21) = 2.59$, $p < .005$, 95% CI [0.05, 0.35]. Pairwise comparisons indicated that there was a significant difference between the solo-reinterpret and social-reinterpret conditions, $t(2762) = -2.32$, $p = .02$, such that participants reported greater negative affect during solo-reinterpret ($M = 1.71$, $SD = 0.80$), than social-reinterpret ($M = 1.58$, $SD = 0.70$; Figure 4a). There was no difference between the solo-look and social-look conditions, $t(2762) = 1.34$, $p = .18$. Additionally, as in Study 1, there was a correlation between social ER efficacy and solo ER efficacy, $r = .35$, $t(38) = 2.33$, $p = .02$, 95% CI [0.05, 0.60] as depicted in Figure 4b.

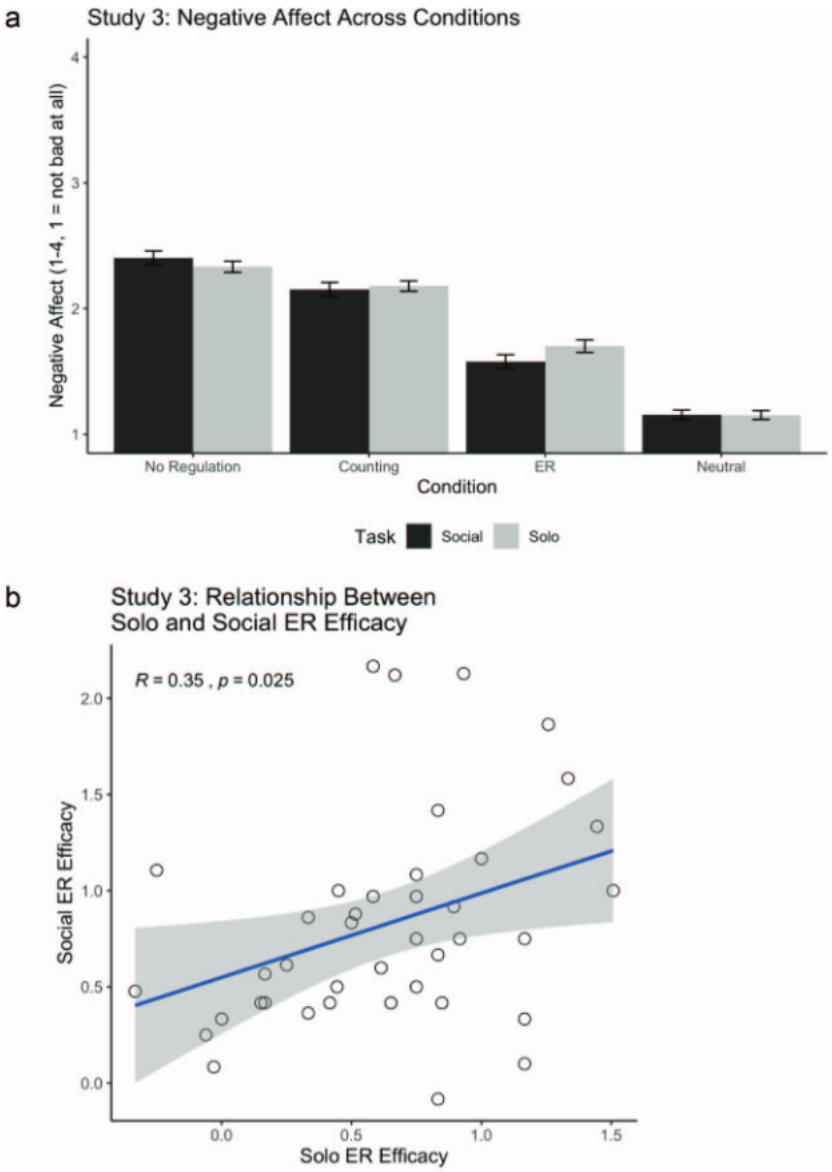

Figure 4. In Study 3, (a) there were no significant differences between the solo and social tasks for the no regulation, counting, and neutral conditions, but social emotion regulation (ER) was associated with lower negative affect than solo ER, $p < .0001$; and (b) social ER efficacy was correlated with solo ER efficacy, $p < .05$. See the online article for the color version of this figure.

Discussion

The present collection of studies examined whether social help selectively increased the efficacy of reappraisal, a widely studied and utilized ER strategy that involves changing how one thinks about negative stimuli in order to change how they feel about it (Gross, 1998a). Across two studies, we found that social help boosted the efficacy of ER: when individuals heard their friend reappraising negative stimuli, it was more effective in reducing negative affect than reappraising stimuli alone. Importantly, Study 2 suggested that while reinterpretations generated by participants and researchers were not statistically equivalent, it is unlikely that there is a difference in the quality of reinterpretations between the social ER and solo ER tasks since the participant-generated reappraisal condition and researcher-generated reappraisal condition were not statistically different, and were marginally statistically equivalent. Meanwhile Study 3 suggested that the effect of social reappraisal was not due to a social buffering or mere presence effect triggered by hearing the friend's voice irrespective of the ER strategy. Rather, social support seemed to selectively enhance the efficacy of reappraisal, suggesting that social help may be particularly instrumental in facilitating the implementation of ER strategies. We additionally found that the efficacy of solo ER and social ER was correlated within individuals across two studies. This finding suggests that ER strategies like reappraisal potentially

share a common mechanism across intrapersonal and interpersonal contexts, though further research is necessary to explicitly examine the mechanisms underlying reappraisal in social contexts.

While several theoretical frameworks posit that ER strategies like reappraisal are implemented and effective in social contexts (Niven, 2017; Reeck et al., 2016; Zaki & Williams, 2013), the present research is one of the first to directly compare the efficacy of an ER strategy across interpersonal and intrapersonal contexts. Given that this form of social ER (i.e., providing reinterpretations of negative events for someone else) is common in everyday life (Niven et al., 2015), it is important to examine its efficacy relative to regulating alone. By demonstrating the value of social help in implementing ER, the present work provides novel insight into why social relationships may be so important to individuals' long-term wellbeing and health (Kawachi & Berkman, 2001). Indeed, socially supported ER may be an understudied but critical path through which individuals navigate hardship and cultivate resilience in the face of adversity.

While the present research ruled out social buffering as a possible mechanism underlying the efficacy of social ER, we did not test additional possible mechanisms that could help explain why social ER was more effective than solo ER. This will be a critical next step for this line of work and thus we describe here several potential mechanisms that could explain the observed results. One possible explanation for why social ER is more effective than solo ER is because it offers a short-cut to ER by outsourcing some of the cognitive effort required to self-regulate (Beckes & Coan, 2011). It can be emotionally and cognitively taxing to generate reappraisals since this strategy requires people to engage with the negative stimuli (Sheppes, 2014). In other words, we cannot rethink the meaning of a negative event (e.g., there will be other great job opportunities) without engaging with our feelings about the event (e.g., I did not get the desired job). Thus, receiving a reappraisal from an outside source, particularly a trusted source like a close friend, may make it easier to change the perception of the stimuli by reducing the experiencer's vulnerability and mental load. This mechanism could be tested by examining whether competing cognitive demands disrupt solo ER to a greater extent than social ER.

Relatedly, reappraisals generated by others may feel more plausible than those we generate ourselves, particularly when the stimuli are personally relevant, since they provide us with some insight into how a more objective outsider might perceive things. Research suggests that people tend to focus on concrete details of their negative experiences (Ayduk & Kross, 2010; Grossmann & Kross, 2010), and that transcending one's own egocentric viewpoint (i.e., adopting a psychologically distanced perspective) can facilitate wise reasoning about emotional events (Kross & Grossmann, 2012). Thus, social ER may facilitate a more distanced perspective of the stimuli, resulting in more effective downregulation of negative affect related to that stimuli (Kross, Ayduk, & Mischel, 2005). This question of how social ER changes one's perspective of an emotional event could potentially be evaluated through post hoc interviewing of participants.

Furthermore, it is possible that social ER counters negative emotional experiences with positive feelings of social connection and understanding (Eisenberg et al., 2014). While our findings suggest that social ER is not more effective than solo ER because of a mere presence effect triggered by hearing the friend's voice, it is possible that receiving reappraisals from a close other is more rewarding or comforting than hearing them count because it more clearly demonstrates that they are engaging with the stimuli. In other words, hearing someone else's perspective of what we're experiencing may facilitate a sense of shared experience, which allows individuals to obtain a more reliable worldview and helps them maintain a sense of connectedness to those around them (Echterhoff, Higgins, & Levine, 2009). This mechanism could be tested by assessing how connected participants feel to their friends before and after engaging in social ER, as compared to when they regulate alone. Future work can explicitly examine these proposed mechanisms, and whether they operate independently or in parallel during social ER.

The present research builds on prior work demonstrating the role of social scaffolding on ER processes. In contrast to scaffolding techniques which support someone else's regulatory efforts by, for example, modeling ER or providing instructions to regulate (A. S. Morris, Silk, Steinberg, Myers, & Robinson, 2007), the present studies examined whether one person can directly provide ER strategies to regulate someone else's emotions (Niven et al., 2009; Rimé, 2009; Zaki & Williams, 2013). Given the widespread use of scaffolding techniques in clinical and educational programs aimed at boosting ER efficacy (Domitrovich, Cortes, & Greenberg, 2007; Kovacs & Lopez-Duran, 2012; Rasmussen et al., 2019), our work has the potential to contribute to the development of novel interventions that leverage social relationships in more active roles during ER. Indeed, some prior work has demonstrated how social interactions can be leveraged toward enhancing engagement with online CBT-based clinical treatment programs. Specifically, Morris and colleagues developed a platform that crowd-sourced supportive reappraisals, and found that participants who used this platform demonstrated increased engagement and greater clinical benefits relative to those assigned to an expressive writing task (R. R. Morris, Schueller, & Picard, 2015). While this work does not compare the efficacy of the social CBT program to more traditional CBT programs where participants self-regulate, it does suggest that social support can be leveraged in clinical treatment to increase engagement and adherence. It is possible that social interventions that entail such explicit regulation of others' emotions are particularly useful in boosting ER efficacy when individuals are having difficulty regulating on their own, though further research is required to examine this proposition. Future interventions may target individuals' ability to regulate others' emotions, as opposed to their own emotions, particularly in group settings where such social ER may increase group cohesion and decrease the potential consequences of heightened individual or collective negative emotional experiences (Friesen et al., 2013; Niven, Holman, & Totterdell, 2012). Such interventions are especially worth exploring in light of accumulating research suggesting that regulating others' emotions can improve one's own emotions (Doré, Morris, Burr, Picard, & Ochsner, 2017; Inagaki & Eisenberger, 2012).

Since this research is among the first to specifically examine the efficacy of social ER relative to solo ER, there are several limitations that can be explored in future work. For example, our work specifically examined social ER in the context of a close female friendship (in a predominantly undergraduate sample). Thus, it is unclear the extent to which social help boosts the efficacy of ER in

other relationships. It is possible that social help boosts the efficacy of ER when the person providing the reinterpretations is a close other, but not when they are a distant other. While we found that social ER was still effective in reducing negative affect as compared to no regulation (i.e., passively viewing negative images) when the reinterpretations were provided by a stranger, future work can explicitly compare social ER across different types of relationships, such as friendships, parent–child relationships, or work relationships. It is possible that some social support figures are more effective in facilitating this type of social ER than others, particularly at different developmental time points (Rimé, 2009), providing some insight into the mechanisms underlying this form of ER. Relatedly, there may be specific factors about a relationship, such as degree of trust or similarity between individuals' viewpoints, that shape ER outcomes that would be informative to study in the future. Additionally, future work can sample from a more diverse population including both genders, and extend beyond an undergraduate sample.

Our study utilized a classic reappraisal paradigm, allowing it to directly build on prior ER work with insights about how this ER strategy comparatively unfolds in a social context. However, this lab-based paradigm comes with the limitation of presenting participants with impersonal stimuli. Reappraisal is known to be a helpful ER strategy in reducing negative affect, but in everyday life this strategy sometimes backfires, such as when negative events allow few opportunities for reinterpretation, or when the event is highly intense/challenging (Somerville, 2013). Relatedly, while our study design provided reinterpretations that were intended to be useful during social ER, in real life there is no such guarantee. Thus, future work should investigate the everyday contexts in which social ER is helpful, the degree to which friends spontaneously offer helpful reinterpretations in real life, and how social help shapes the outcome of ER processes across situational contexts. It is possible that social help could be ineffective in certain contexts, or that it would be helpful in contexts where solo ER is particularly difficult. In order to further enhance the ecological validity of such research, future work could utilize daily diary or ecological momentary assessment studies to examine how such social regulatory processes unfold outside of the lab.

Finally, this research is limited to examining a single ER strategy. Future work can investigate how other ER strategies, like putting feelings into words (Torre & Lieberman, 2018), differ across intrapersonal and interpersonal contexts, and can compare this ER strategy to other forms of social support, such as social scaffolding (A. S. Morris, Criss, Silk, & Houltberg, 2017). While additional work would be informative with regard to painting a broader picture of social ER and its mechanisms, the present work meaningfully sets the stage for such research, and provides important preliminary insights into how individuals directly regulate each other's emotions using paradigmatic ER strategies that have been predominantly studied in a social vacuum.

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