Emotion
2011, Vol. 11, No. 3, 468–480

1528-3542/11/$12.00 DOI: 10.1037/a0023503

Subjective Responses to Emotional Stimuli During Labeling, Reappraisal, and Distraction

Matthew D. Lieberman and Tristen K. Inagaki
University of California, Los Angeles

Golnaz Tabibnia
Carnegie Mellon University

Molly J. Crockett
University of Cambridge

Although multiple neuroimaging studies suggest that affect labeling (i.e., putting feelings into words) can dampen affect-related responses in the amygdala, the consequences of affect labeling have not been examined in other channels of emotional responding. We conducted four studies examining the effect of affect labeling on self-reported emotional experience. In study one, self-reported distress was lower during affect labeling, compared to passive watching, of negative emotional pictures. Studies two and three added reappraisal and distraction conditions, respectively. Affect labeling showed similar effects on self-reported distress as both of these intentional emotion regulation strategies. In each of the first three studies, however, participant predictions about the effects of affect labeling suggest that unlike reappraisal and distraction, people do not believe affect labeling to be an effective emotion regulation strategy. Even after having the experience of affect labels leading to lower distress, participants still predicted that affect labeling would increase distress in the future. Thus, affect labeling is best described as an *incidental emotion regulation* process. Finally, study four employed positive emotional pictures and here, affect labeling was associated with diminished self-reported pleasure, relative to passive watching. This suggests that affect labeling tends to dampen affective responses in general, rather than specifically alleviating negative affect.

Keywords: emotion, emotion regulation, emotional experience

Putting feelings into words can be an effective way to manage unwanted emotions and the distress associated with aversive events. A century of different forms of talk therapy and countless bedside diaries attest to this notion. In the past two decades, there has been a great deal of research demonstrating that putting feelings into words leads to long term improvements in mental and physical health (Frattaroli, 2006; Pennebaker & Beall, 1986). Most recently, it was demonstrated that writing down one's worries regarding an impending exam significantly improved performance on that exam just moments later (Ramirez & Beilock, 2011). Nevertheless, broad consensus is still lacking regarding the mechanisms that allow putting feelings into words to be beneficial. In the current research, we suggest that part of the benefit results from the fact that putting feelings into words involves 'affect labeling.' Whereas putting feelings into words can involve a lengthy characterization of one's feelings along with attempts to find new insights and understandings, affect labeling refers to the simple act of using words to characterize feelings or the emotional aspects of stimuli and events. A number of fMRI studies have examined the neural correlates of affect labeling (Berkman & Lieberman, 2009) and the results are consistent with an emotion regulation account of the benefits of putting feelings into words. However, neural responses are just one measure of emotional responses and no study to date has examined the subjective emotional consequences of affect labeling.

Affect Labeling

Most of what is currently known about the effects of affect labeling comes from fMRI studies. These studies have shown that processing the affective aspects of stimuli with words recruits different brain regions than processing the affective aspects of stimuli in more perceptual or experiential ways (Hariri, Bookheimer, & Mazziotta, 2000; Lieberman et al., 2007). In these studies, participants are typically asked to either choose from a pair of words or from a pair of pictures, the word or picture that is relevant to the emotional content of a target picture. For instance, the target picture might be an angry face and participants would choose the word "angry" on a labeling trial or choose the picture of another angry face on a perceptual matching trial. Affect labeling consistently recruits right ventrolateral prefrontal cortex (VLPFC), a region involved in effortful processing (Duncan & Owen, 2000), across a number of affect labeling studies (Lieberman, in press). In contrast, perceptual processing of affective stimuli typically activates the amygdala, a region associated with

This article was published Online First May 2, 2011.

Matthew D. Lieberman and Tristen K. Inagaki, Department of Psychology, University of California, Los Angeles; Golnaz Tabibnia, Department of Social and Decision Sciences, Carnegie Mellon, University; Molly J. Crockett, Department of Experimental Psychology, University of Cambridge, Cambridge, United Kingdom.

Correspondence concerning this article should be addressed to Matthew D. Lieberman, Department of Psychology, 1285 Franz Hall, UCLA, Los Angeles, CA 90095-1563. E-mail: lieber@ucla.edu

automatic affective processes (Morris, Ohman, & Dolan, 1999; Whalen et al., 1998). Despite the potentially automatic nature of amygdala responses, affect labeling of affective stimuli is commonly associated with a dampened amygdala response (Foland et al., 2008; Hariri et al., 2000; Lieberman et al., 2007). Additionally, the magnitude of right VLPFC responses during affect labeling is typically inversely associated with the magnitude of amygdala responses, consistent with the idea that affect labeling serves to regulate amygdala responses by way of right VLPFC.

One potential implication of these findings is that affect labeling may serve to regulate emotional responses more generally, across multiple channels of emotion processing, and thus provide at least a partial account of the benefits of putting feelings into words. However, to date, affect labeling paradigms have almost exclusively examined the effects of affect labeling on neural responses (cf. Tabibnia, Lieberman, & Craske, 2008).

The other main line of investigation has focused on the relationship of affect labeling to emotion regulation in preschool aged children. Language impairments in young children are associated with poorer emotion regulation (Fujiki, Brinton, & Clarke, 2002) and affect labeling ability is associated with greater self-control (Izard et al., 2001) and less time appearing angry or hurt (Denham, 1986). The common refrain of "use your words" partially captures this notion that early affect labeling is an important contributor to emotion regulation. Denham writes, "Without the label, no distancing occurs between feeling and action" (p. 230, 1996). Although important and interesting, these studies are limited by the use of observation and are correlational in nature. Experimental examination of how other channels of emotion experience are influenced by affect labeling is critical to determining whether affect labeling constitutes a form of emotion regulation.

The Current Research

The current research had a number of goals. First and foremost, we wanted to examine whether the effects of affect labeling on amygdala activity generalized to another channel of emotional responding: self-reported emotional experience. In each study, we examined self-reported emotional responses to emotionally evocative images from the International Affective Picture Set (IAPS; Lang, Bradley, & Cuthbert, 1999).

A second goal of the current investigation was to examine the relation of affect labeling to other emotion regulation techniques. It is unclear whether affect labeling relies on similar mechanisms as established emotion regulation strategies such as reappraisal or distraction. Thus, in studies 2 and 4, we compared the effects of affect labeling and reappraisal and, in Study 3, we compared the effects of affect labeling and distraction.

A third goal was to examine people's theories or expectations about the effectiveness of different emotion regulation strategies. Thus, in each study, some participants were asked to predict their emotional experiences (Gilbert et al., 1998) under different potential conditions (e.g., watching, labeling, reappraising). In studies 1 and 2, groups of participants who had not experienced the task previously made predictions, whereas in studies 2–4, participants made predictions after going through the experience of the basic task. Our basic hypothesis was that people would be less aware of the benefits of affect labeling than they are of other emotion regulation strategies. More specifically, we predicted that affect labeling would reduce distress, but that predictors would instead predict that affect labeling increases distress. If this is the case, then affect labeling could be characterized as a form of *incidental emotion regulation*, which would indicate that people are unaware of its benefits. If predictors who have just gone through the experience of labeling aversive images also make this misprediction, it would suggest existing lay theories about affect labeling may be resistant, even in the face of recent contrary evidence.

A fourth and final goal was to determine whether affect labeling is only effective when labeling negative emotional stimuli or if the effects extend to dampening positive emotional responses to positive stimuli as well. Prior neuroimaging studies of affect labeling have exclusively focused on negative emotional stimuli, so it is unclear what to expect.

Study 1: Affect Labeling and Self-Reported Distress

Method

Overview. In Study 1, we examined the effects of affect labeling on self-reported distress. Although prior affect labeling studies have used emotionally expressive faces as target images, these are unlikely to produce meaningful levels of subjective distress in observers. Thus, pictures from the International Affective Picture System (IAPS, Lang et al., 1999) were used to induce stronger emotional responses. The images rated most emotionally arousing and negative were used, as they are quite aversive for many people to look at. In Study 1, one group of participants ("experiencers") labeled or attended to extremely negative, moderately negative, and neutral images. After each image, these participants were asked how distressing it had been to look at the image. A second group of participants ("predictors") read descriptions of trials similar to those in the experiencer protocol and predicted how distressing it would be to look at those pictures while either labeling or attending. These predictions allow us to assess participants' theories or expectations about the effect of affect labeling on one's emotional state.

Participants. Participants were 44 right-handed undergraduates (17 males, mean age = 24.1, SD = 1.9) at the University of California, Los Angeles who participated for class credit. Participants were screened for phobia to the sight of blood. Any individuals reporting this phobia were excused from participation in the rest of the study. Informed consent was obtained per the guidelines of the Human Subjects Protection Committee.

Stimuli. Images were selected and categorized based on average arousal and valence ratings from the original IAPS database (Lang et al., 1999). Valence ratings were based on a 9-point likert scale, with 1 indicating negative valence and 9 indicating positive valence. Arousal ratings were also based on a 9-point likert scale with 1 indicating low arousal and 9 indicating high arousal. Negative images were broken down into two categories. Extremely negative stimuli included pictures of mutilation and other severe injuries (mean arousal = 7.21, mean valence = 1.41), whereas moderately negative pictures were typically of unpleasant events or emotions such as a woman crying or a robbery (mean arousal = 5.5, mean valence = 2.48). Neutrally valenced images were of people with neutral expressions or people in everyday settings (mean arousal = 2.98, mean valence = 5.62). Four neg-

ative and one neutral image appeared in each block with no pictures repeating over the course of the experiment.

Procedure. Participants in the "experiencer" condition (N = 28) performed a computer task that involved affect labeling and watching emotionally evocative pictures. Participants first viewed neutral and unpleasant pictures from the IAPS (Lang et al., 1999) one at a time presented in blocks of five trials. The order of the blocks was counterbalanced across two versions such that half of the participants saw one order and the other half saw a different order. Each block contained one neutral, two moderately negative, and two extremely negative picture trials based on arousal and valence ratings of the original IAPS. Prior to each block, a three second instruction indicated whether the participant should label or watch the pictures in that block. The instruction cues "scene description" or "look and let yourself respond naturally" indicated labeling and watching blocks, respectively. Pictures that appeared in the labeling block in one run order appeared in the watch block in the second run order and vice versa. Pictures with similar content (e.g., people grieving) were shown in each condition.

During the watch trials, a picture was presented for 5 s and the participant was asked to attend to the picture without making an overt response. During the label trials, participants were asked to choose from a pair of words that appeared below the IAPS picture, the word that was semantically relevant to the picture. Both of the words were negatively valenced if the picture was negatively valenced or neutrally valenced if the picture was neutrally valenced. Thus, for instance, a picture of a person crying could have appeared with the words "crying" and "bomb" below the picture. Participants chose a word by pressing a key corresponding to the word's position on the screen during the 5 s that the picture and words were on the screen (see Figure 1).

After each picture presentation, regardless of condition, participants indicated the affective experience they had had during the presentation of the picture. Participants saw the question "How distressed did you feel while looking at the picture?" and then answered on a 9-point likert scale with "not distressed" and "very distressed" as anchors. This question appeared for 4.5 s, during which the participant answered. The experimenter stressed that there was no right or wrong answer and that it was best to go with the first, intuitive response. A three second rest occurred between the distress question and the beginning of the next trial.

Participants in the "predictor" condition (N = 16) were not presented with IAPS images, but instead were asked to imagine they were going through trials like those in the procedure described above. Each participant read a description of two trials from each of the six trial types (labeling or watching each of the neutral, moderately negative, and extremely negative picture types) and was asked how distressing they thought it would be to look at this stimulus for 5 s. For instance, participants were asked to imagine observing "a picture of a mutilated face", which would constitute imagining what an extremely aversive trial in the watch condition would be like. Similarly, participants were asked to imagine selecting a label for "a picture of women grieving, with the words pollute and sorrow", which would constitute imagining what a moderately aversive trial from the label condition would be like. After each description, participants indicated how they thought they would have felt, on a 9-point likert scale anchored by "not distressed" and "very distressed" and like the experiencers had 4.5 s to answer.

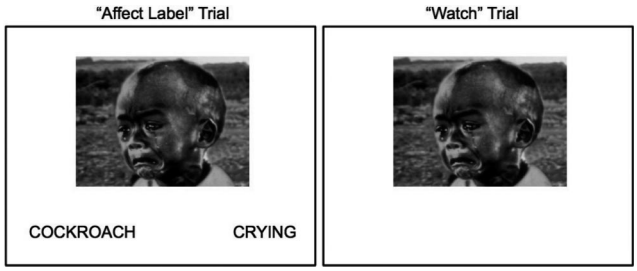

Figure 1. Sample trials from Affect Label and Watch conditions.

Participants were randomized to either the experiencer or prediction conditions. However, we oversampled in the experiencer, relative to the predictor, condition approximately two to one. Our expectation was that actual affect labeling effects would tend to be relatively small in comparison to the prediction of affect labeling effects and thus we wanted to increase our statistical power to detect effects in the experiencer condition.

Results and Discussion

As predicted, experiencers reported that negatively valenced images (collapsed across moderately and extremely negative images) were more distressing to look at in the watch (6.64) relative to the label (6.25) conditions, $t(27) = 2.96$, $p < .01$ (see Figure 2). This effect was present for moderately negative images that were watched (5.40) or labeled (4.97), $t(27) = 3.48$, $p < .01$, but showed only a trend toward significance for extremely negative images that were watched (7.60) or labeled (7.52), $t(27) = 1.63$, $p < .15$.

In contrast to the experiencers, predictors expected labeling to lead to greater distress (6.94) than watching (5.72) negative images, $t(16) = 4.10$, $p < .001$ (see Figure 2). This effect was present for moderately negative images that would be watched (3.75) or labeled (6.10), $t(16) = 4.51$, $p < .001$, but not for extremely negative images that would be watched (7.68) and labeled (7.78), $t(16) = 0.75$, $p > .20$.

Overall, there was a significant group by condition interaction (see Figure 2), $F(1, 43) = 29.38$, $p < .001$, such that predictors underpredicted the distress of watching negative images, $t(44) = 2.64$, $p < .05$, but overpredicted the distress that would occur while labeling, $t(44) = 2.05$, $p < .05$. Put another way, participants underpredicted the benefits of labeling relative to watching (predicted benefit: -1.22; actual benefit: .39). This interaction was still significant when limited to moderately negative images, $F(1, 43) = 39.69$, $p < .001$, but not when limited to extremely negative images, $F(1, 43) = 0.81$, $p > .20$.

It should be noted that the comparisons across predictors and experiencers are limited by the fact that experiencers saw many more images for each condition than predictors imagined seeing. Nevertheless, the overall pattern depends only on the within group comparisons demonstrating that experiencers and predictors believed that affect labeling related to watching in qualitatively different ways.

In summary, three main findings emerged from this study. First, choosing a label that describes a negative aspect of an aversive image diminishes the self-reported distress associated with looking

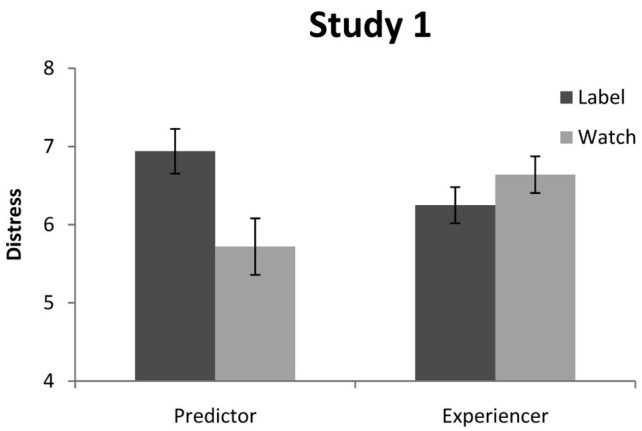

Figure 2. Level of predicted and experienced distress while viewing negative emotional pictures under Affect Label and Watch conditions. *Note:* Although generally assumed that overlapping error bars indicate nonsignificant differences, this is only true for between subject analyses. For within subject analyses, the 'error-bar' heuristic would only apply if the standard error of the difference scores were used in the bar graphs. Given that our bar graphs include both between and within subject comparisons, it is important to distinguish to which comparisons the error-bar heuristic applies.

at the image. This is consistent with the previous neuroimaging work in which labeling was associated with diminished amygdala activity (Foland et al., 2008; Hariri et al., 2000; Lieberman et al., 2007). Second, in this study, labeling may be primarily beneficial in diminishing distress for moderately aversive stimuli. Third, participants' predictions of the distress of watching and labeling aversive images was the reverse of the actual experience. Participants expected that selecting a label that could highlight the aversive aspect of the image would be more distressing than merely watching the image; however, for experiencers the opposite was true. This suggests that the self-reported distress of the experiencers is unlikely to be due to any demand characteristics as they would drive self-reported responses in the opposite direction.

Study 2: Affect Labeling and Reappraisal

Method

Overview. Study 2 was similar to Study 1 except for two additions. First, there was an added reappraisal condition in which participants actively tried to diminish their emotional responses to the target images by generating new, less distressing ways of thinking about the content of the images. Adding this condition allows for a comparison of affect labeling and reappraisal in three ways: (a) what are the relative magnitudes of their effects? (b) are the effects of each, relative to attending to the images, correlated with one another? and (c) are individuals able to predict the effects of affect labeling and reappraisal with similar success?

The second change to this design involved adding another group of predictors. These predictors (predictors$_2$) were experiencers first and then made predictions after finishing the experiencer protocol. We were interested in predictors$_2$ because their responses represent a test of how ingrained people's theories of affect labeling are. One might expect that after just having reported, trial by trial, that affect labeling reduces distress, these participants might be much more accurate than predictors$_1$ who never had the experience. Yet if the prior experience does not improve the predictions, this would suggest that people's theories about affect labeling might be relatively immune to contradictory experience.

Participants. Forty-six right-handed undergraduates (20 males, mean age = 20.3, *SD* = 1.69) at the University of California, Los Angeles participated for class credit. Participants were screened for phobia to the sight of blood. Any individuals reporting this phobia were excused from participation in the rest of the study. Informed consent was obtained per the guidelines of the Human Subjects Protection Committee.

Procedure. "Experiencers" in Study 2 (N = 31) viewed neutral and unpleasant pictures in blocks of five trials as described in Study 1. Prior to each block, a three second instruction indicated whether the participant should label, watch, or reappraise. The instruction cues "scene description," "look and let yourself respond naturally," or "decrease emotion" indicated labeling, watching, and reappraisal blocks, respectively.

Label and watch trials were identical to those in Study 1. For the reappraisal trials, a picture was presented for 5 s during which time the participant was asked to actively think about the image in a way that made their emotional response decrease (Ochsner & Gross, 2005). If the image of a man lying in a hospital bed was presented, participants may have reappraised the picture in a more positive light by imagining that the person was possessed of a strong constitution and would likely recover quickly. Possible ways of reappraising were discussed with each participant. Participants practiced reappraising and were given feedback about their reappraisal strategies prior to the actual task.

After each picture presentation participants indicated their affective experience by answering the question "How distressed did you feel while looking at the picture?" on a 9-point likert scale with "not distressed" and "very distressed" as anchors. A 3 s rest occurred between the distress question and the beginning of the next trial.

The second set of participants (predictors$_1$) (N = 15), was asked to imagine they were going through trials from the computer task described above. Participants read a description of two trials from each of the nine conditions and were asked how distressing they thought it would be to look at this stimulus for 5 s. Participants were asked to imagine observing, labeling, and decreasing their emotional response to different pictures. After each description, participants indicated how they think they would have felt, on a 9-point likert scale anchored by *not distressed* and *very distressed*, if they had actually seen each picture.

Finally, a third set of participants (predictors$_2$) (N = 23) were a subset of the experiencers who completed the prediction task after completing the experiencer protocol. These postexperience predictors went through the exact protocol as the predictors$_1$, but did so only after completing the experiencer protocol. It is important to note that the experiencer protocol was never referred to once these participants were going through the predictor protocol; experimenters treated them as fully independent procedures. In addition, although the descriptions of pictures given in the predictor protocol generically described the kind of images in the experiencer protocol, no particular images from the experiencer protocol were referenced, nor were participants advised to reflect back on their experiences with the images seen the prior protocol. Finally, the

cognitive instructions given during the prediction protocol for a given image description (reappraise/label/watch) were not matched to the cognitive instructions associated with the same image during the experiencer protocol. Thus, if asked to imagine reappraising a picture of a grieving woman, participants would not be able to think back to having reappraised a picture of a grieving woman during the experiencer protocol. Participants may have been able to draw on their recent experience with reappraising, labeling, and watching in general to imagine how they might be affected by doing so in an imagined future context, but they could not simply retrieve an instance of, for example, reappraising a specific image to answer how that same image would be reappraised in the future.

Results and Discussion

Among the experiencers, the results for labeling and watching largely replicated Study 1. Once again, experiencers reported that negatively valenced images (collapsed across moderately and extremely negative images) were more distressing to look at in the watch (6.03) relative to the label (5.81) conditions, $t(28) = 2.12$, $p < .05$ (see Figure 3). This effect was present for extremely negative images that were watched (7.37) or labeled (7.08), $t(28) = 3.48$, $p < .01$, but not for moderately negative images that were watched (4.70) or labeled (4.54), $t(28) = 1.44$, $p = .16$.

The reappraisal condition led to less self-reported distress (5.24) than watching, $t(28) = 4.45$, $p < .001$, and than labeling, $t(28) = 3.51$, $p < .01$. Reappraisal led to less self-reported distress than watching in both the moderately negative image trials (3.95), $t(28) = 4.33$, $p < .001$, and in the extremely negative image trials (6.54), $t(28) = 3.51$, $p < .01$. Similarly, reappraisal led to less self-reported distress than labeling in both the moderately negative image trials, $t(28) = 3.34$, $p < .01$, and in the extremely negative image trials, $t(28) = 2.88$, $p < .01$.

Interestingly, the benefit participants received from labeling, relative to watching, was significantly correlated with the benefit they received with reappraising, relative to labeling, $r = .43$, $p < .05$ (see Figure 4). This correlation was strong for the extremely negative image trials, $r = .58$, $p < .01$, and also significant in the moderately negative image trials, $r = .34$, $p = .05$. This result suggests that the same people who benefit the most from reappraising also tend to benefit the most from labeling and is consistent with the notion that reappraisal and affect labeling share some common underlying mechanisms for emotion regulation. This is consistent with other work demonstrating correlated levels of amygdala reductions in reappraisal and affect labeling, as well as similar functional connectivity observed across the two tasks (Payer, Baicy, Lieberman, & London, under review).

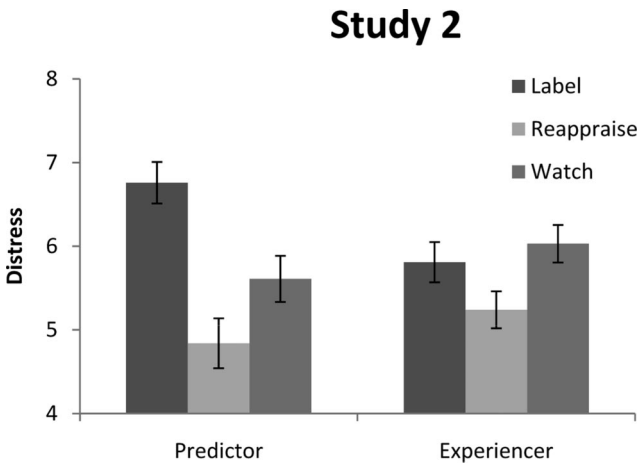

Figure 3. Level of predicted and experienced distress while viewing negative emotional pictures under Affect Label, Reappraisal, and Watch conditions.

Among all of the predictors, collapsing across those who only made predictions ($predictors_1$) and those who were experiencers first and then made predictions ($predictors_2$), the results for the watch and label conditions largely replicated Study 1. Once again, predictors expected labeling to lead to greater distress (6.76) than watching (5.61) negative images, $t(37) = 5.76$, $p < .001$ (see Figure 3). This effect was present for moderately negative images that would be watched (4.22) or labeled (6.24), $t(37) = 7.22$, $p < .001$, but not for extremely negative images that would be watched (7.12) and labeled (7.28), $t(37) = 1.35$, $p = .18$. Critically, the $predictors_2$ group showed the same pattern of results for watched (5.64) and labeled (6.36) negative images, $t(22) = 2.57$, $p < .05$, as the $predictors_1$ group did for watched (5.55) and labeled (7.37) negative images, $t(14) = 8.24$, $p < .05$, suggesting that recent relevant experience to the contrary does not mitigate this misprediction.

In contrast to labeling effects, reappraisal (4.84) was predicted to produce significantly less distress than watching, $t(37) = 3.90$, $p < .001$. This was the case for both reappraisal of moderately negative images (3.79), $t(37) = 2.24$, $p < .05$, and for reappraisal of extremely negative images (5.88), $t(37) = 4.65$, $p < .001$. The reappraisal predictions of their response to aversive images were nearly identical for the two groups of predictors ($predictors_1 = 4.82$; $predictors_2 = 4.85$) with no significant differences for reappraisal in general or broken down by image intensity (p's $> .40$).

As in Study 1, there was a significant group by condition interaction, $F(2, 64) = 14.39$, $p < .001$. Here, participants overpredicted the distress during labeling, but underpredicted the distress of watching and reappraising. Put another way, participants underpredicted the benefits of labeling relative to watching (predicted benefit: -1.15; actual benefit: .22; $t(65) = 5.24$, $p < .001$) and accurately predicted the benefits of reappraisal relative to watching (predicted benefit: .77; actual benefit: .79; $t(65) = .06$, $p > .20$).

Thus, the results of Study 2 largely replicated Study 1, such that affect labeling led to less distress than attending to negatively valenced pictures; however, predictors predicted the opposite pattern suggesting that affect labeling produces emotion regulatory effects incidentally (i.e., without subjective awareness). This misprediction was present regardless of whether the predictors had been experiencers first or not. This is somewhat remarkable. These $predictors_2$ had just finished indicating, as experiencers, that they were less distressed while labeling than while attending. Nevertheless, $predictors_2$ still predicted that going forward, labeling would be more distressing. This suggests a strongly held expectation about the effects of labeling as enhancing the aversiveness of an experience, rather than reducing it, as it did in reality.

In addition, we observed that reappraisal produced a greater reduction in distress than affect labeling. However, this should be understood in context. Given that the instructions to reappraise represent a demand characteristic to report diminished distress, reappraisal effects

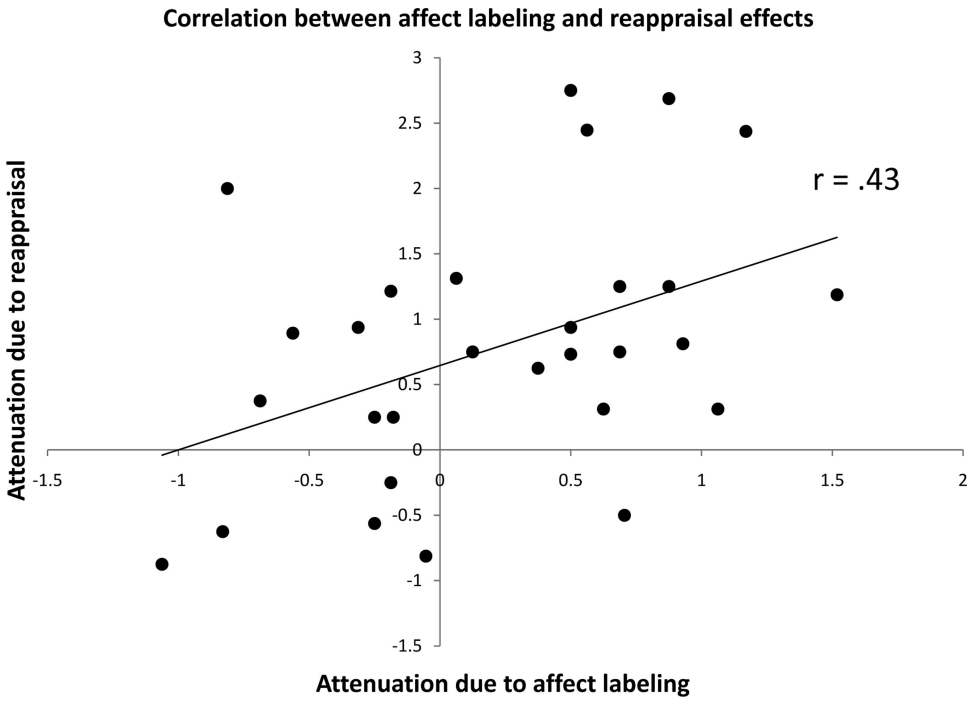

Figure 4. Correlation between effects during Affect Label and Reappraisal conditions.

presumably represent a combination of true effects and demand. Neuroimaging studies (Ochsner & Gross, 2005) have clearly demonstrated that limbic responses are diminished during reappraisal and thus reappraisal effects cannot be reduced to demand, but it is still likely that some component of the self-reports during reappraisal reflect demand. It is plausible that participants' predictions about the magnitude of reappraisal effects are some indication of their theories and expectations about what reappraisal *should* do and thus may index the strength of the demand characteristics to some degree. In other words, someone who predicts that reappraisal will not affect their emotional state is less likely to respond on the basis of demand characteristics than someone who predicts that reappraisal will dramatically affect their emotional state. Taking this into account, it appears that reappraisal may induce greater demand effects than labeling and thus it is unclear how much greater the true effect of reappraisal on emotional state is, compared to labeling. In the future, it would be of interest to collect forecasts prior to fMRI scans of reappraisal to determine whether those who forecast the largest benefits of reappraisal are presenting an accurate assessment of their own ability to diminish limbic responses or simply show the greatest effects of demand characteristics.

Study 3: Affect Labeling and Distraction

Method

Overview. Study 3 was identical to Study 2 with one exception. Here, a distraction condition was included instead of a reappraisal condition.

Participants. Twenty-five right-handed undergraduates (11 males, mean age = 19.4, *SD* = 1.47) at the University of California, Los Angeles participated for class credit. Participants reporting a phobia to the sight of blood were screened out. The Human Subjects Protection Committee approved all procedures.

Procedure. As in the previous studies there were both experiencers ($N = 25$) and predictors ($N = 21$). All of the predictors in this study went through the experiencer protocol first and thus the predictors were a subset of the experiencers. As in Study 2, no mention of the prior experiencer protocol was made during the prediction protocol.

Study 3 followed the design of Study 2 with a distraction condition added in place of the reappraisal condition. The instruction cues "scene description," "look and let yourself respond naturally," or "distraction" indicated labeling, watching, or distraction blocks, respectively.

Instructions for watch and label trials were the same as in studies 1 and 2. During distraction trials, participants continued to visually attend to the images for 5 s each, but were instructed to think about something other than the picture. Any topic unrelated to the picture was acceptable. For instance, participants could distract themselves from a picture of a corpse by thinking about laundry or their next social outing. All other aspects of the procedure were the same as those described in studies 2 and 3.

Results and Discussion

As in studies 1 and 2, experiencers reported that negatively valenced images (collapsed across moderately and extremely negative images) were more distressing to look at in the watch (5.73) relative to the label (5.49) conditions, $t(24) = 2.44$, $p < .05$ (see Figure 5). This effect was present for extremely negative images that were watched (7.26) or labeled (6.93), $t(24) = 2.75$, $p < .01$,

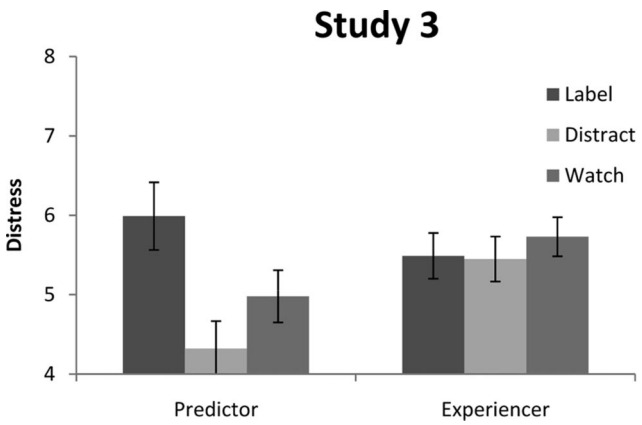

Figure 5. Level of predicted and experienced distress while viewing negative emotional pictures under Affect Label, Distraction, and Watch conditions.

but not for moderately negative images that were watched (4.21) or labeled (4.06), $t(24) = 1.25$, $p > .20$.

The distraction condition also led to less self-reported distress (5.45) than watching, $t(24) = 2.50$, $p < .05$, but produced nearly identical levels as labeling (5.45 vs. 5.49), $t(24) = 0.90$, $p > .20$. Distraction produced marginally lower levels of distress than watching for both moderately negative images (3.92), $t(24) = 1.72$, $p < .10$, and for extremely negative images (6.98), $t(24) = 1.96$, $p < .10$. Distraction did not produce different distress levels than labeling for either moderately or extremely negative images.

Unlike in Study 2, where labeling and reappraisal effects were significantly correlated with one another, only a trend toward significance emerged in the correlation of labeling and distraction effects, $r = .32$, $p < .15$ (collapsed across moderate and extreme images). There was also a trend for extremely negative images, $r = .32$, $p < .15$; however, there was a robust relationship between labeling and distraction effects for the moderately negative images, $r = .62$, $p < .01$.

As in studies 1 and 2, predictors expected that negatively valenced images would be more distressing to look at in the label (5.99) than watch (4.98) conditions, $t(20) = 3.86$, $p < .001$ (see Figure 5). This effect was present for moderately negative images that were watched (3.48) or labeled (5.29), $t(20) = 4.53$, $p < .001$, but not for extremely negative images that were watched (6.48) or labeled (6.68) where the effect was numerically reversed, $t(37) = -1.22$, $p < .20$.

In contrast to labeling, distraction (4.32) was predicted to produce significantly less distress than watching, $t(20) = 3.21$, $p < .01$. This effect was significant for extremely negative images (5.62), $t(20) = 2.88$, $p < .01$, and marginally significant for moderately negative images (3.02), $t(20) = 1.75$, $p < .10$.

Similar to Study 2, there was a significant group by condition interaction, $F(2, 43) = 17.39$, $p < .001$, such that participants overpredicted the distress of labeling, but underpredicted the distress of watching and distraction. Participants underpredicted the benefits of labeling relative to watching (predicted benefit: -1.01; actual benefit: .24; $t(43) = 4.57$, $p < .001$) and marginally overpredicted the benefits of distraction relative to watching (predicted benefit: .65; actual benefit: .28; $t(43) = 1.83$, $p < .10$).

Once again, Study 3 replicated the basic pattern of label/watch effects seen in studies 1 and 2 such that watching negative images was more distressing than labeling them, whereas participants predicted that labeling would be more distressing than watching. In addition, we observed that distraction produced a benefit of similar magnitude as affect labeling and that the benefits of these two manipulations may be correlated, particularly for moderately aversive images. In contrast to affect labeling which was associated with less distress than predicted, distraction, like reappraisal, was associated with more distress than predicted. Finally, predictors in Study 3 had all already gone through the experiencer protocol before making their predictions. Thus, even though these predictors actually felt less distress when labeling than watching in the first part of the study, when later asked what it would be like to go through the same task again, they indicated that labeling would be more distressing than watching. This again suggests that the benefits of labeling may be outside of awareness and resistant to relevant contrary experiences.

Study 4: Labeling and Reappraising Positive Images

Method

Overview. Study 4 is quite similar to Study 2 except for a focus on positive rather than negative images. All previous affect labeling studies have focused on the effects of affect labeling on distressing stimuli. Here, we examined the effects of affect labeling on stimuli that typically induce positive affect. Because different classes of IAPS images are known to produce positive affect in men and women, we collected a female-only sample, with images selected based on female IAPS ratings. More specifically, we wanted to include images rated high in positive valence and in arousal, to parallel the extremely aversive negative images used in studies 1–3. Among the images that meet both criteria for valence and arousal, there is almost no overlap in pictures rated by men and women. This is largely due to the fact that for men, virtually all images meeting critieria were erotic images of women or couples.

Participants. Twenty-two right-handed female undergraduates (mean age = 20, $SD = 1.69$) at the University of California, Los Angeles participated for class credit. Only females were run to control for gender effects. Informed consent was obtained per the guidelines of the Human Subjects Protection Committee.

Stimuli. Images were selected and categorized based on average female ratings of arousal and valence from the original IAPS database (Lang et al., 1999). Valence ratings were based on a 9-point likert scale, with 1 indicating negative valence and 9 indicating positive valence. Arousal ratings were also based on a 9-point likert scale with 1 indicating low arousal and 9 indicating high arousal. Positive images were broken down into two categories. Extremely positive stimuli included pictures of attractive men, brides, desserts, and adventurous activities such as sky diving (mean arousal = 6.05, mean valence = 7.58). Moderately positive pictures were typically of babies or friends having a good time (mean arousal = 4.63, mean valence = 7.68). Neutrally valenced images were of people with neutral expressions or neutral objects such as a basket or lamp (mean arousal = 2.37, mean valence = 4.76).

Procedure. The research team followed the same procedure as outlined in Study 2, but with positively valenced pictures.

Participants first viewed neutral and pleasant IAPS pictures one at a time presented in blocks of five trials. Each block contained one neutral, two moderately positive, and two extremely positive picture trials based on the average female arousal and valence ratings of the original IAPS. Prior to each block, a three second instruction indicated whether the participant should label, observe, or reappraise their emotions to the pictures. The instruction cues "scene description," "look and let yourself respond naturally," or "decrease emotion" appeared before each block as in Study 2. For instance, if the image of a puppy was presented, participants may have reappraised the picture in a more negative light by imagining that the dog was bred to do hard labor or fight other dogs. Like in Study 2, participants practiced reappraising prior to beginning the experiment.

Participants saw the question "How pleasurable was it to view this picture?" and then answered on a 9-point likert scale with *not pleasurable* and *very pleasurable* as anchors, paralleling the distress question asked in studies 1–3. This question appeared for 4.5 s during which the participant answered. The experimenter stressed that there was no right or wrong answer and that it was best to go with the first, intuitive response. A three second rest occurred between the affective question and the beginning of the next trial. After going through the experiencer part of the protocol, all participants also went through a predictor protocol identical to those in previous studies except that the imagined trials were from this protocol with positive images and participants were asked how they thought they would feel using the question "How pleasurable was it to view this picture?". Note that participants were predicting how they would answer this question based on imagining a future trial, rather than retrieving a response to a particular trial during the experiencer protocol.

Results and Discussion

Experiencers reported that positively valenced images (collapsed across moderately and extremely positive images) were more pleasurable to look at in the watch (6.34) relative to the label (6.02) conditions, $t(21) = 2.21$, $p < .05$, consistent with the hypothesis that labeling diminishes affective intensity (see Figure 6). This effect was present for extremely positive images that were watched (6.35) or labeled (5.96), $t(21) = 2.38$, $p < .01$ but only at the trend level for moderately positive images that were watched (6.34) or labeled (6.08), $t(21) = 1.56$, $p < .15$.

The reappraisal condition also led to less self-reported pleasure (3.50) than watching, $t(21) = 11.55$, $p < .001$. Reappraisal led to less self-reported pleasure than watching in both the moderately positive image trials (3.56), $t(21) = 10.70$, $p < .001$, and in the extremely positive image trials (3.44), $t(21) = 10.91$, $p < .001$. Similarly, reappraisal led to less self-reported pleasure than labeling in both the moderately positive image trials, $t(21) = 8.79$, $p < .001$, and in the extremely positive image trials, $t(21) = 9.40$, $p < .001$.

As in Study 2, which also included a reappraisal condition, the effect for participants associated with labeling, relative to watching, was positively correlated with the effect associated with reappraising, relative to labeling. However, the correlation in the current study was not significant $r = .24$, $p > .20$. This correlation was also not significant for the moderately positive image trials, $r = .27$, $p = .20$, and marginally significant in the extremely positive image trials, $r = .34$, $p = .10$.

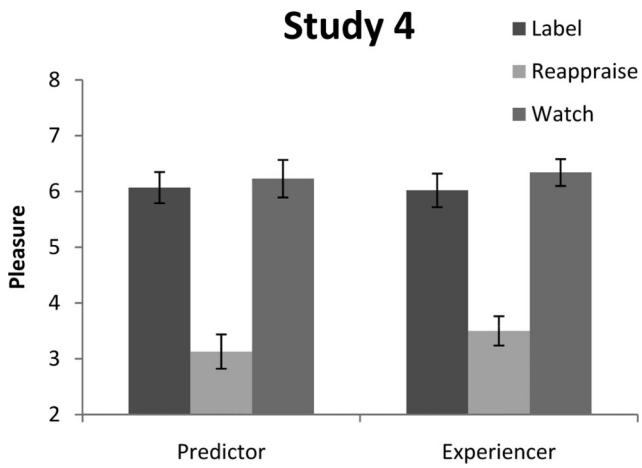

Figure 6. Level of predicted and experienced pleasure while viewing positive emotional pictures under Affect Label, Reappraisal, and Watch conditions.

Unlike studies 1–3 in which negative images were presented, in the current study with positive images, predictors were remarkably accurate in their predictions (see Figure 6). Here, predictors accurately predicted that it would be more pleasurable to look at the positive images in the watch (6.23) than the label (6.07) conditions, albeit not significantly, $t(21) = 1.09$, $p > .2$. The accuracy of these predictions is reflected in the lack of interaction between group and the watch/label conditions, $F(1, 20) = 1.00$, $p > .20$. Predictors also predicted that it would be more pleasurable to look at the positive images in the watch than reappraise (3.13) conditions, $t(21) = 8.98$, $p < .001$. Again, the accuracy of these predictions is reflected in the lack of interaction between group and watch/reappraise conditions, $F(1, 20) = 1.32$, $p > .20$.

Thus, as in previous studies with negative affective images, affect labeling and reappraisal of positive images led to attenuated affective responses relative to watching the images. This suggests that affect labeling may function to diminish affective responses in general, rather than simply alleviating distress as earlier studies might have suggested. The primary difference between affect labeling of positive and negative images appears to be the accuracy of their predictions of the consequences of each. Although participants underpredicted the benefits of labeling negative images in studies 1–3, they were quite accurate in predicting the attenuated positive affect in Study 4. It should be noted that the effects of Study 4 generalize only to female samples as we did not include a male sample in this particular study.

General Discussion

In four studies, we examined the effects of affect labeling on the subjective emotional response to negative (Studies 1–3) and positive (Study 4) images and compared these effects to those that result from reappraisal (Studies 2 & 4) and distraction (Study 3). In addition, some subjects made predictions of how it would feel to go through the task either without having seen the task (Study

1 & 2) or after having gone through the task themselves (Studies 2–4).

Several general findings emerged. First, in each study, affect labeling produced an attenuation of the subjective emotional response to the images relative to merely watching them. For negative images (Studies 1–3), affect labeling led to significantly less distress, whereas for positive images (Study 4), affect labeling led to less pleasure. This represents the first demonstration that affect labeling modulates self-reported affective experience in ways consistent with the limbic attenuation observed in fMRI studies. In three of the four studies, the effects were larger for the extreme valenced images suggesting that affect labeling may have greater impact during stronger emotional responses.

Second, as would be expected from previous research, reappraisal and distraction also both reliably attenuated affective responses. Reappraisal (Study 2) and distraction (Study 3) during the presentation of negative images led to less self-reported distress. Similarly, reappraisal (Study 4) during the presentation of positive images led to less self-reported pleasure.

Third, participants tended to mispredict the effects of affect labeling on self-reported emotional experience. In studies 1–3, participants predicted that affect labeling would lead to greater distress than merely attending to a negative image; however, in each study, affect labeling led to less distress than merely attending. Perhaps most striking is that in two of these studies (2 & 3), the participants made their predictions *after* being experiencers. In these cases, the same participants reported feeling less distress during affect labeling during the first part of the study and then went on to predict that if they had to go through similar trials in the future, affect labeling would increase their distress. The fact that participants predicted affect labeling would increase distress, but during the actual trials reported decreased distress is strong evidence against the possibility that affect labeling effects are due to demand characteristics. In Study 4, participants were able to accurately assess the effect of affect labeling of positive images. In contrast to affect labeling, participants were able to reliably predict the direction of effects that reappraisal and distraction had relative to merely attending to images. When significant differences emerged between prediction and experience, it was because subjects believed that reappraisal (Study 2) and distraction (Study 3) would alleviate distress more than they actually did.

Affect Labeling as Incidental Emotion Regulation

Reappraisal and distraction are well-established techniques for emotion regulation, both in terms of self-reported experience and their consequences for neural changes in the prefrontal cortex and limbic system (Gross, 2008; Ochsner & Gross, 2005). Although past fMRI research suggests that affect labeling may produce a pattern of neural responses similar to those seen during intentional emotion regulation (Berkman & Lieberman, 2009; Burklund, Creswell, Irwin, & Lieberman, under review), it is still unclear whether affect labeling should really be considered a form of emotion regulation. Individuals do put feelings into words, during therapy, for instance, as a means to achieve insights that will help regulate their emotions, yet it is not obvious that people believe that the mere act of putting feelings into words has emotion regulatory outcomes.

Consistent with this, participants in studies 1–3 reliably indicated that affect labeling would make their distress worse, not better. Yet in each study, the subjective effects of affect labeling paralleled the previous fMRI literature: affect labeling reliably diminished affective responses.

If we grant that affect labeling is a form of emotion regulation, how does it compare with the other kinds examined here? Let's begin with the similarities. In the current studies, affect labeling, reappraisal, and distraction all led to diminished distress in response to negative images and affect labeling and reappraisal also led to diminished pleasure in response to positive images (distraction was not tested in this context). Additionally, the magnitude of the effects of affect labeling and reappraisal, relative to watching, were significantly correlated and the effect of affect labeling and distraction displayed a trend toward a significant correlation. In other words, to the extent that individuals benefited from a traditional form of emotion regulation, they also tended to benefit from affect labeling—an effect that suggests shared mechanisms across affect labeling and established forms of emotion regulation.

There were also important differences between the three forms of emotion regulation as well. Whereas affect labeling and distraction produced similar reductions in affective responses, relative to watching, reappraisal produced much greater reductions. Additionally, participants' theories of the three forms of emotion regulation, in terms of predictions made about the efficacy of each, were substantially different from one another with respect to their efficacy in alleviating distress. Participants predicted that reappraisal would have quite substantial benefits, that distraction would have smaller but still substantial benefits, and that affect labeling would instead increase distress levels, relative to merely watching. Put in the context of the actual effects, participants substantially overestimated the affect attenuation due to reappraisal, modestly overestimated the affect attenuation due to distraction, and substantially underestimated affect attenuation due to affect labeling, relative to merely watching. The comparisons across prediction and experience are limited by the fact predictors were run through fewer trials than experiencers. However, the qualitative patterns are still meaningful; reappraisal and distraction were predicted to alleviate distress and did, whereas labeling was predicted to increase distress, but did not.

Together, these differences suggest that unlike reappraisal and distraction, which are intentionally and explicitly invoked forms of emotion regulation, affect labeling may more properly be described as *incidental emotion regulation* (Berkman & Lieberman, 2009). We use the term "incidental" rather than automatic or implicit because affect labeling is not effort free (i.e., capacity to label would likely be impaired by concurrent cognitive load) or outside of awareness (i.e., people know that they are labeling), but the prediction data strongly suggest that affect labeling is not intentionally initiated for the purpose of emotion regulation because people do not believe that labeling is an effective emotion regulation strategy. If one happens to be putting feelings into words, there are emotion regulatory consequences that are incidental to the intentional goal (e.g., updating a friend on what one has been up to recently).

The similarities and differences between affect labeling and intentional emotion regulation strategies are recapitulated in the neural correlates associated with each. A recent review of neuroimaging studies of emotion regulation (Berkman & Lieberman,

2009) reported that right VLPFC was present in 70% of intentional emotion regulation studies and was the most commonly observed region. Similarly, virtually every study of affect labeling has also reported activity in right VLPFC (Berkman & Lieberman, 2009). The difference, however, is that most intentional emotion regulation studies (65%) also report left VLPFC and many also report presupplementary motor area (pre-SMA) or posterior dorsomedial PFC, whereas affect labeling only rarely produces activity in these regions. In the context of the behavioral findings, this suggests that right VLPFC may serve as a core region producing emotion regulatory outcomes, with other regions like left VLPFC and pre-SMA involved in initiating and maintaining an explicit emotion regulation goal.

Alleviating Distress or Affect Attenuation?

Because prior work on affect labeling and expressive writing, more generally, has almost exclusively focused on negative experiences, events, and stimuli, there have been two equally plausible accounts of what affect labeling does. On the one hand, affect labeling might diminish the negative aspects of experience, moving one's affect on a continuum from more negative states to more positive states. On the other hand, affect labeling may attenuate affect regardless of its valence such that it moves people from either negative or positive states to more neutral states. In order to distinguish between these accounts, it was critical to examine the effects of affect labeling on positive affective responses as we did in Study 4.

The results of Study 4 suggest that affect labeling serves as an affect attenuator regardless of the initial valence of one's affective state, rather than an alleviator of negative affect. In Study 4, we observed that labeling positive affective stimuli attenuated self-reported pleasure just as in studies 1–3, labeling negative affective stimuli attenuated self-reported distress. This is consistent with the notion that affect labeling taps into a coarse "braking" system in right VLPFC that is capable of inhibiting various kinds of responses (Berkman, Burklund, & Lieberman, 2009; Cohen & Lieberman, 2010).

These results are also consistent with a growing literature demonstrating that systematic analysis of the causes of one's emotional states tends to diminish those states. For instance, Wilson, Centerbar, Kermer, and Gilbert (2005) found that people took less pleasure in receiving a small gift from a stranger when it was easy to analyze why the gift had been given. Wilson et al. suggest that certainty is driving these effects with subsequent work showing that having a sense of certainty diminishes both positive and negative affective states (Bar-Anan, Wilson, & Gilbert, 2009; Wilson & Gilbert, 2008; see also Davis, Nolen-Hoeksema, & Larson, 1998). Similarly, Lyubormirsky, Sousa, and Dickerhoof (2006) observed that writing or talking about positive events in their lives diminished life satisfaction and writing or talking about negative events in their lives increased life satisfaction, each relative to merely thinking about the events. They argued that writing and talking tends to be more analytic and coherent than thinking and that it's the analytic style of processing that produces these effects. They tested this by inducing participants to write or think about positive events using either an analytical or reexperiencing style. They found that either writing or thinking could diminish life satisfaction if an analytical style was induced.

It should be acknowledged that whereas certainty and analytical processing of emotional events are descriptions of the conditions under which affect is attenuated, it is not obvious why either should have a causal role in this attenuation. A psychological account can be given, but an account could be generated for the opposite findings as well. One key to these findings may be that both analytical processing of and certainty generation for emotional events invariably involves something like affect labeling. A clear neurocognitive account can explain why psychological processes that invoke affect labeling will lead to attenuated affect. Specifically, affect labeling reliably activates right VLPFC and this region in turn tends to inhibit prepotent and prereflective responses across multiple domains including motor (Aron et al., 2003), cognition (Depue, Curran, & Banich, 2007; Goel & Dolan, 2003; Mitchell et al., 2007), emotion (Berkman & Lieberman, 2009), pain (Lieberman et al., 2004; Wager et al., 2004), and social cognition (Samson, Apperly, Kathirgamanathan, & Humphreys, 2005). Additionally, it has been demonstrated that activating right VLPFC, even in the absence of emotion regulatory goals, can still attenuate responses in the limbic system (Berkman, Burklund, & Lieberman, 2009). Thus, analytical and certainty-inducing processes that involve affect labeling should recruit right VLFPC activity and dampen limbic responses thought to generate affective experience.

Applications of Affect Labeling

Numerous developmental studies have demonstrated links between affect labeling and observable indices of emotion regulation (Denham,1986; Fujiki et al., 2002; Izard et al., 2001). It has also been established that affect labeling ability is associated with academic competence (Izard et al., 2001) social competence (Mostow, Izard, Fine, & Trentacosta, 2002), being more liked by peers (Fabes, Eisenberg, Hanish, & Spinrad, 2001), and engaging in more prosocial behavior (Denham, 1986; Izard et al., 2001). One of these studies demonstrated that several of these effects remain significant after controlling for general verbal ability suggesting there is something specific about affect labeling ability that contributes to other socioemotional outcomes. Mostow et al. (2002) observed in a longitudinal study of first graders that affect labeling ability measured in the fall predicted social skills measured in the spring, after controlling for social skills measured in the fall. All of these studies suggest that affect labeling, perhaps by way of better emotion regulation, promotes better social and academic behavior.

However, even by age four there are systematic differences in affect labeling ability as a function one's social environment. Children high in socioeconomic status perform better at affect labeling tasks than children low in socioeconomic status (Edwards, Manstead, & Macdonald, 1984). Similarly, abused and maltreated children perform worse on affect labeling tasks (Camras, Grow, & Ribordy, 1983; for related adult fMRI findings, see Taylor, Eisenberger, Saxbe, Lehman, & Lieberman, 2006). Finally, one intervention study that included training of affect labeling as one of its major components, demonstrated increased social competence in four year olds who received the training (Denham & Burton, 1996). As affect labeling was only one of the components of the intervention and this is only a single study, more research is needed to determine whether the training of affect labeling may

yield a variety of salutary effects in children. Additionally, it is important to consider the training and testing of both affect labeling capacity and tendency (Berkman & Lieberman, 2009). Testing whether someone can accurately label their own emotion is quite different from assessing whether that individual tends to spontaneously label the emotion when it occurs. Interventions that increase this tendency may make an important contribution to childhood outcomes.

Issue and Limitations

Before concluding there are some remaining issues about the experimental control, generalizability and boundary conditions of the studies presented here. Although the studies used reappraisal and affect labeling tasks that have been used in many prior studies, most of the analyses involved a comparison to the typical, but imperfect control condition that involved merely watching an image. Reappraisal presumably involves a number of processes including goal maintenance, working memory, language generation, and perceptual imagery generation in addition to more direct inhibitory or regulatory processes. Affect labeling involves affective processing, linguistic processing, and categorization processes. In both cases, the watch condition differs from the regulation condition in many ways.

Although other studies have demonstrated that affect labeling effects cannot be reduced to labeling per se in terms of the neural responses (Lieberman et al., 2007), this has not yet been demonstrated in the domain of self-report effects. Thus it is plausible that the effects of affect labeling observed in this investigation might be part of a broader set of labeling processes that would produce similar effects. It is possible that other kinds of labeling that do not focus on affect would also diminish affective responses. Whether this is the case or not awaits further research. It should be noted that if labeling in general produced incidental emotion regulation effects, this would not imply that affect labeling does not produce incidental emotion regulation effects, but would rather dilute the specificity of this claim. It would still be the case that affect labeling diminishes affective responses and that people's predictions about the effects of affect labeling are incorrect.

We are unaware of any research demonstrating that reappraisal effects on self-report are specific to reappraising rather than a broader class of psychological processes of which reappraisal is one instance. Thus our understanding of reappraisal effects on self-reported affect is subject to the same limitation as for affect labeling. For instance, it is unknown whether inventing reappraisals for events other than the one depicted in a presented image, and unrelated to it, would produce the same effect or not. When presented with an image of a man sick in a hospital bed, what is the effect of thinking about why a woman's unrelated romantic breakup will not be a terrible thing in the long run? Perhaps there is some generalized effect of thinking on the bright side that is not specific to the affect-inducing content. Given that processing an imaginary trauma that never occurred can produced the same health benefits that processing a real trauma can (Greenberg, Wortman, & Stone, 1996) it is not obvious what aspect of the reappraisal process is producing the observed effects. Thus for both reappraisal and affect labeling further study is needed to determine the mechanisms driving the self-reported reductions in affective experience.

Additionally, affect labeling is meant to be a small scale analogue of putting feelings into words in real world contexts that matter (e.g., to deal with real life distress, possibly in the context of therapy). It is an open question whether our operationalization of affect labeling really relates to those contexts and the way affect labeling is deployed in real life. In our study, we operationalized affect labeling in terms of labeling the emotional content of an image depicting an emotional scene. In daily life, the benefits of putting feelings into words usually accrue from discussing one's own feelings, not just describing the emotions of others. Using our procedure provides good experimental control because there is a correct answer and we know we have placed it on the screen as an option. When labeling our own feelings, the answer is likely to vary from person to person and if we are providing written options to participants, the person's actual emotional state may not be one of them. Nevertheless, there are some studies beginning to address the issue. One recent fMRI study (Herwig, Kaffenberger, Jancke, & Bruhl, 2010) asked people to spend time thinking about their own emotional state and, compared to other ways of thinking about themselves, this produced a pattern very similar to what has been seen in past affect labeling studies (increased right VLPFC and decreased amygdala activity). A second study (Burklund et al., under review) asked people to label their own feelings in response to IAPS images (not distressed, somewhat distressed, very distressed) and found this same pattern of activity as well. Thus there is at least some evidence that labeling emotional content and labeling one's own feelings produce similar responses, at least at the level of neural responses.

The other issue here is whether the effects of labeling responses to images that are not self-relevant provide a meaningful analogue to the kinds of deeply personally distressing events that might lead a person to therapy. This is a genuine limitation of this line of work; however, there are multiple investigations with more clinically relevant outcomes currently ongoing that should address this in the near future. In one, treatment of spider phobics that incorporated of affect labeling (patients generating sentences of the form "the _____ spider makes me feel _____") resulted in the phobics standing closer to an actual spider in a later test than a treatment that did not involve affect labeling (Kircanski, Craske, & Lieberman, unpublished data).

Finally, it should be noted that affect labeling should not be thought of as always downregulating affective processes. Rumination, the process of repeatedly reviewing issues or events that are personally distressing is known to amplify rather than diminish distress. Although it is not yet established under what conditions putting feelings into words dampens rather than increasing distress, the most promising reconciliation is that the level of abstraction and self-distancing in the language used is important (Kross, Ayduk, & Mischel, 2005; Lyubormirsky et al., 2006). Labeling can either categorize feelings and separate the feelings from oneself or they can immerse us back into the original experience. Rumination typically involves a great deal of imagistic language that creates a reproduction or replaying of past events in one's head (Lyubormirsky et al., 2006). Using language to create imagery is likely to activate perceptual pathways involved in the original perception (Kosslyn et al., 1993) and such pathways may well reactivate limbic responses. In contrast, more abstract and detached labeling processes may avoid perceptual reactivation and promote dampening through VLPFC responses.

Conclusions

Across four studies, we have demonstrated that labeling affective aspects of an emotionally evocative image attenuates affective responses relative to merely attending to the same images. This was true whether the images were positively or negatively valenced. Affect labeling produced qualitatively similar effects to reappraisal and distraction, suggesting that affect labeling has emotion regulatory consequences. However, participants were aware of the benefits of reappraisal and distraction, but were unaware of the benefits of affect labeling. Thus affect labeling is best thought of as a form of incidental emotion regulation.

References

Aron, A. R., Fletcher, P. C., Bullmore, E. T., Sahakian, B. J., & Robbins, T. W. (2003). Stop-signal inhibition disrupted by damage to right inferior frontal gyrus in humans. *Nature Neuroscience, 6,* 115–116.

Bar-Anan, Y., Wilson, T. D., & Gilbert, D. T. (2009). The feeling of uncertainty intensifies affective reactions. *Emotion, 9,* 123–127.

Berkman, E., & Lieberman, M. D. (2009). Using neuroscience to broaden emotion regulation: Theoretical and methodological considerations. *Social and Personality Psychology Compass, 3,* 475–493.

Berkman, E. T., Burklund, L., & Lieberman, M. D. (2009). Inhibitory spillover: Intentional motor inhibition produces incidental limbic inhibition via right inferior frontal cortex. *Neuroimage, 47,* 705–712.

Burklund, L. J., Creswell, J. D., Irwin, M. R., & Lieberman, M. D. (under review). Labeling your own emotions and reappraisal produce overlapping neural activity.

Camras, L. A., Grow, J. G., & Ribordy, S. C. (1983). Recognition of emotional expression by abused children. *Journal of Clinical Child Psychology, 12,* 325–328.

Cohen, J. R. & Lieberman, M. D. (2010). The common neural basis of exerting self-control in multiple domains. In Y. Trope, R. Hassin, & K. N. Ochsner (eds.) *Self-control* (pp. 141–160). Oxford University Press.

Davis, C. G., Nolen-Hoeksema, S., & Larson, J. (1998). Making sense of loss and benefiting from experience: Two construals of meaning. *Journal of Personality and Social Psychology, 75,* 561–574.

Denham, S. A. (1986). Social cognition, prosocial behavior, and emotion in preschoolers: Contextual validation. *Child Development, 57,* 194–201.

Denham, S. A., & Burton, R. (1996). A social-emotional intervention for at-risk 4-year-olds. *Journal of School Psychology, 34,* 225–245.

Depue, B. E., Curran, T., & Banich, M. T. (2007). Prefrontal regions orchestrate suppression of emotional memories via a two-phase process. *Science, 317,* 215–219.

Duncan, J., & Owen, A. M. (2000). Common regions of the human frontal lobe recruited by diverse cognitive demands. *Trends in Neurosciences, 23,* 473–483.

Edwards, R., Manstead, A. S. R., & Macdonald, C. J. (1984). The relationship between children's sociometric status and ability to recognize facial expressions of emotion. *European Journal of Social Psychology, 14,* 235–238.

Fabes, R. A., Eisenberg, N., Hanish, L. D., & Spinrad, T. L. (2001). Preschoolers' spontaneous emotion vocabulary: Relations to likability. *Early Education & Development, 12,* 11–27.

Foland, L. C., Altshuler, L. L., Bookheimer, S. Y., Eisenberger, N., Townsend, J., & Thompson, P. M. (2008). Evidence for deficient modulation of amygdala response by prefrontal cortex in bipolar mania. *Psychiatry Research, 162,* 27–37.

Frattaroli, J. (2006). Experimental disclosure and its moderators: A meta-analysis. *Psychological Bulletin, 132,* 823–865.

Fujiki, M., Brinton, B., & Clarke, D. (2002). Emotion regulation in children with specific language impairment. *Language, Speech, and Hearing Services in Schools, 33,* 102–111.

Gilbert, D. T., Pinel, E. C., Wilson, T. D., Blumberg, S. J., & Wheatley, T. P. (1998). Immune neglect: A source of durability bias in affective forecasting. *Journal of Personality and Social Psychology, 75,* 617–638.

Goel, V., & Dolan, R. J. (2003). Reciprocal neural response within lateral and ventral medial prefrontal cortex during hot and cold reasoning. *Neuroimage, 20,* 4314–4321.

Greenberg, M. A., Wortman, C. B., & Stone, A. A. (1996). Emotional expression and physical health: Revising traumatic memories or fostering self-regulation? *Journal of Personality and Social Psychology, 71,* 588–602.

Gross, J. J. (2008). Emotion regulation. In M. Lewis, J. M. Haviland-Jones, and L. F. Barrett (Eds.), Handbook of emotions (3rd ed., pp. 497–512). New York: Guilford Press.

Hariri, A. R., Bookheimer, S. Y., & Mazziotta, J. C. (2000). Modulating emotional response: Effects of a neocortical network on the limbic system. *Neuro Report, 11,* 43–48.

Herwig, U., Kaffenberger, T., Jancke, L., & Bruhl, A. B. (2010). Self-related awareness and emotion regulation. *Neuroimage, 50,* 734–741.

Izard, C., Fine, S., Schultz, D., Mostow, A., Ackerman, B., & Youngstrom, E. (2001). Emotion knowledge as a predictor of social behavior and academic competence in children at risk. *Psychological Science, 12,* 18–23.

Kircanski, K., Lieberman, M. D., & Craske, M. G. Impact of affect labeling and reappraisal on phobia-specific behavior. Manuscript in preparation.

Kosslyn, S. M., Alpert, N. M., Thompson, W. L., Maljkovic, V., Weise, S. B., Chabris, C. F., . . . Buonnano, F. S. (1993). Visual mental imagery activates topographically organized visual cortex: PET investigations. *Journal of Cognitive Neuroscience, 5,* 263–287.

Kross, E., Ayduk, O., & Mischel, W. (2005). When asking "why" does not hurt: Distinguishing rumination from reflective processing of negative emotions. *Psychological Science, 16,* 709–715.

Lang, P. J., Bradley, M. M., & Cuthbert, B. N. (1999). *International affective picture system (IAPS): Instruction manual and affective ratings.* Gainesville: University of Florida, The Center for Research in Psychophysiology.

Lieberman, M. D. (2011). Why symbolic processing of affect can disrupt negative affect: Social cognitive and affective neuroscience investigations. In A. Todorov, S. T. Fiske, & D. Prentice (Eds.) *Social Neuroscience: Toward understanding the underpinnings of the social mind.* (pp. 188–209). New York: Oxford University Press.

Lieberman, M. D., Eisenberger, N. I., Crockett, M. J., Tom, S., Pfeifer, J. H., Way, B. M., (2007). Putting feelings into words: Affect labeling disrupts amygdala activity to affective stimuli. *Psychological Science, 18,* 421–428.

Lieberman, M. D., Jarcho, J. M., Berman, S., Naliboff, B., Suyenobu, B. Y., Mandelkern, M., & Mayer, E. (2004). The neural correlates of placebo effects: A disruption account. *NeuroImage, 22,* 447–455.

Lyubormirsky, S., Sousa, L., & Dickerhoof, R. (2006). The costs and benefits of writing, talking, and thinking about life's triumphs and defeats. *Journal of Personality and Social Psychology, 90,* 692–708.

Mitchell, J. P., Heatherton, T. F., Kelley, W. M., Wyland, C. L., Wegner, D. M., & Neil Macrae, C. (2007). Separating sustained from transient aspects of cognitive control during thought suppression. *Psychological Science, 18,* 292–297.

Morris, J. S., Ohman, A., & Dolan, R. J. (1999). A subcortical pathway to the right amygdala mediating "unseen" fear. *Proceedings of National Academy of Science, USA, 96,* 1680–1685.

Mostow, A. J., Izard, C. E., Fine, S., & Trentacosta, C. J. (2002). Modeling emotional, cognitive, and behavioral predictors of peer acceptance. *Child Development, 73,* 1775–1787.

Ochsner, K. N., & Gross, J. J. (2005). The cognitive control of emotion. *Trends in Cognitive Sciences, 9,* 242–249.

Payer, D. E., Baicy, K., Lieberman, M. D., & London, E. D. (under review). Overlapping neural substrates between intentional and incidental down-regulation of negative emotions. *Emotion*.

Pennebaker, J. W., & Beall, S. K. (1986). Confronting a traumatic event: Toward an understanding of inhibition and disease. *Journal of Abnormal Psychology, 95,* 274–281.

Ramirez, G., & Beilock, S. L. (2011). Writing about testing worries boosts exam performance in the classroom. *Science, 331,* 211–213.

Samson, D., Apperly, I. A., Kathirgamanathan, U., & Humphreys, G. W. (2005). Seeing it my way: A case of selective deficit in inhibiting self-perspective. *Brain, 128,* 1102–1111.

Tabibnia, G., Lieberman, M. D., & Craske, M. G. (2008). The lasting effect of words on feelings: Words may facilitate exposure effects to threatening images. *Emotion, 8,* 307–317.

Taylor, S. E., Eisenberger, N. I., Saxbe, D., Lehman, B. J., & Lieberman, M. D. (2006). Neural bases of regulatory deficits associated with childhood family stress. *Biological Psychiatry, 60,* 296–301.

Wager, T. D., Rilling, J. K., Smith, E. E., Sokolik, A., Casey, K. L., Davidson, R. J., . . . Cohen, J. D. (2004). Placebo-induced changes in FMRI in the anticipation and experience of pain. *Science, 303,* 1162–1167.

Whalen, P. J., Rauch, S. L., Etcoff, N. L., McInerney, S. C., Lee, M. B., & Jenike, M. A. (1998). Masked presentations of emotional facial expressions modulate amygdala activity without explicit knowledge. *Journal of Neuroscience, 18,* 411–418.

Wilson, T. D., Centerbar, D. B., Kermer, D. A., & Gilbert, D. T. (2005). The pleasures of uncertainty: Prolonging positive moods in ways people do not anticipate. *Journal of Personality and Social Psychology, 88,* 5–21.

Wilson, T. D., & Gilbert, D. T. (2008). Explaining away: A model of affective adaptation. *Perspectives on Psychological Science, 5,* 370–386.

Received September 14, 2009
Revision received January 18, 2011
Accepted January 18, 2011 ■