Supporting Information

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SI Methods

Cognitive Regulation Training Session. The experimenter presented two simple cartoons: the first (Fig. S6) illustrated that adopting a different interpretation of a stimulus can lead to a different emotional response; the second (Fig. S7) introduced how prior experience in a situation can reduce uncertainty and alter the way in which a situation is interpreted. Participants were then presented with two abstract images (Fig. S8) and were asked to describe their thoughts and emotions regarding these images. It was then revealed that the two images depicted the HIV virus and penicillin, respectively, to demonstrate how learning new information about a stimulus alters the subsequent emotional response.

Next, the experimenter reviewed some cognitive errors that individuals often commit when assessing emotional events. The experimenter explained how people have a tendency to "catastrophize" fearful situations by focusing on only one negative aspect of a larger situation. Participants estimated how frequently they received a shock during controlled stimulus with aversive action (CS+) trials. Participants were then reminded that there were only a small percentage of CS+ trials that were paired with an electric shock; this information often contradicted participants' initial beliefs and exemplified their propensity to catastrophize. The reappraisal and restructuring portion of the cognitive regulation training (CRT) session then followed.

SI Results

Baseline Analyses (Skin Conductance Response). To assess how mean skin conductance response (SCR) for the baseline stimulus (conditioned stimulus neutral, CS−) changed across sessions a repeated-measures ANOVA was conducted using a between-subject factor of group and a within-subject factor of session. This process revealed a main effect of session [$F_{(1,\ 78)} = 60.91$, $P < 0.0001$] but no main effect of group or interaction [$F_{(1,\ 78)} = 0.00$, $P = 0.99$; $F_{(1,\ 78)} = 2.43$, $P = 0.12$, respectively]. Planned comparisons confirmed that SCR for the CS− did not differ between groups on day 1 [$t_{(78)} = 0.62$, $P = 0.54$], nor day 2 [$t_{(78)} = -0.97$, $P = 0.33$] and that both groups showed significant reductions in SCR for the CS− across sessions [control: $t_{(43)} = 7.17$, $P < 0.0001$; stress: $t_{(35)} = 4.07$, $P < 0.001$].

Neuroendocrine Analyses. To assess whether mean α-amylase and cortisol concentrations differed between groups across the day 1 learning session, salivary samples were collected at three timepoints. A baseline sample was collected 10 min after participants' arrival to the laboratory, directly before fear-conditioning; another was collected after fear-conditioning, directly before CRT; and a final sample was collected directly after CRT at the end of the day 1 session (see Fig. 1 for a schematic of day 1). A time X condition repeated measures ANOVA using mean α-amylase levels revealed a main effect of time [$F_{(2,\ 140)} = 11.51$, $P < 0.001$], and no main effect of condition or interaction. A time X condition ANOVA using mean cortisol levels yielded similar results: a main effect of time [$F_{(2,\ 142)} = 7.79$, $P = 0.001$], no effect of condition, and no interaction. Planned comparisons confirmed that mean α-amylase did not differ between groups at baseline [$t_{(73)} = 0.16$, $P = 0.87$], after fear-conditioning [$t_{(73)} = 0.26$, $P = 0.79$], or after the CRT session [$t_{(73)} = -0.18$, $P = 0.86$]; nor did mean cortisol concentrations differ between groups at any of these three points [$t_{(73)} = 0.18$, $P = 0.85$; $t_{(74)} = -0.85$, $P = 0.40$; $t_{(73)} = -1.40$, $P = 0.16$, respectively].

On day 2, a time X condition repeated-measures ANOVA assessing mean α-amylase levels yielded a main effect of time [$F_{(2,\ 130)} = 7.99$, $P = 0.001$], but no main effect of condition [$F_{(2,\ 134)} = 0.92$, $P = 0.34$] and no interaction [$F_{(2,\ 130)} = 0.11$, $P = 0.88$]. Because α-amylase is secreted rapidly after a stressor and reflects sympathetic nervous system arousal, its salivary concentration is more transient than cortisol (1–3), thus this result is likely because of the 10 min participants waited before providing poststress salivary samples. Because of the transient nature of α-amylase, we hypothesized that samples taken 10 min after the CP/control task (but not samples taken 20 min after) might yield group differences. Planned comparisons confirmed that groups did not differ in α-amylase levels at baseline [$t_{(68)} = 0.82$, $P = 0.42$] nor 20 min after the CP/control task; however, the stress group showed slightly elevated α-amylase relative to controls 10 min after the CP/control manipulation [$t_{(70)} = 1.39$, $P = 0.08$, one tailed t test].

Self-Report Fear Intensity Ratings. In addition to the number of fear words generated, we also examined how intensity ratings for these words changed before and after CRT on day 1 and again on day 2. [Ten participants (control: $n = 4$; stress: $n = 6$) failed to report initial intensity ratings on day 1, thus these data points could not be included in this analysis.] A repeated-measures ANOVA with a between-subject factor of group (stress, control) and a within-subject factor of rating (day 1 pre-CRT, day 1 post-CRT, day 2) revealed a main effect of rating [$F_{(2,\ 136)} = 79.75$, $P < 0.0001$], no main effect of group [$F_{(1,\ 68)} = 0.43$, $P = 0.51$] and no interaction [$F_{(2,\ 136)} = 0.96$, $P = 0.37$]. Planned comparisons confirmed that both groups diminished fear intensity ratings for the CS+ on day 1 after regulation training [stress: $t_{(29)} = 7.73$, $P < 0.00001$; control: $t_{(39)} = 6.61$, $P = 0.00000007$], and these ratings were reduced further on day 2 [stress: $t_{(35)} = 2.47$, $P = 0.018$; control: $t_{(43)} = 4.67$, $P = 0.00003$], indicating that subjective fear intensity was reduced after CRT for both groups. Although these fear intensity ratings did not differ between groups before [$t_{(68)} = -0.136$, $P = 0.89$] nor after [$t_{(78)} = 0.295$, $P = 0.77$] regulation training on day 1, stressed participants demonstrated a trend toward higher fear intensity ratings for the fear words reported on day 2 [$t_{(78)} = -1.46$, $P = 0.07$, one-tailed t test] (Fig. S1). That is, the stress group not only assigned significantly more fear-related emotions to the CS+ on day 2, but the average intensity rating for those self-reported fear emotions was also marginally higher.

Self-Report Questionnaires. Independent samples t tests confirmed that mean scores on all self-report questionnaires did not differ between groups on day 1 [State and Trait Anxiety Inventory (STAI-S): $t_{(67)} = 0.273$, $P = 0.78$; STAI-T: $t_{(67)} = -0.042$, $P = 0.96$; Need for Closure Scale (NFCS): $t_{(70)} = -0.925$, $P = 0.36$; Intolerance of Uncertainty Scale (IUS): $t_{(70)} = -0.277$, $P = 0.78$; Emotional Regulation Questionnaire (ERQ): $t_{(72)} = 0.408$, $P = 0.68$; Pain Catastrophizing Scale (PCS): $t_{(71)} = -0.107$, $P = 0.91$]; nor day 2 [STAT-S: $t_{(71)} = 0.707$, $P = 0.482$; IUS: $t_{(73)} = -1.475$, $P = 0.14$; and PCS: $t_{(72)} = -1.44$, $P = 0.15$].

1. Lupien SJ, Maheu F, Tu M, Fiocco A, Schramek TE (2007) The effects of stress and stress hormones on human cognition: Implications for the field of brain and cognition. *Brain Cogn* 65(3):209–237.
2. Velasco M, Gómez J, Blanco M, Rodriguez I (1997) The cold pressor test: Pharmacological and therapeutic aspects. *Am J Ther* 4(1):34–38.
3. McRae AL, et al. (2006) Stress reactivity: Biological and subjective responses to the cold pressor and trier social stressors. *Hum Psychopharmacol* 21(6):377–385.

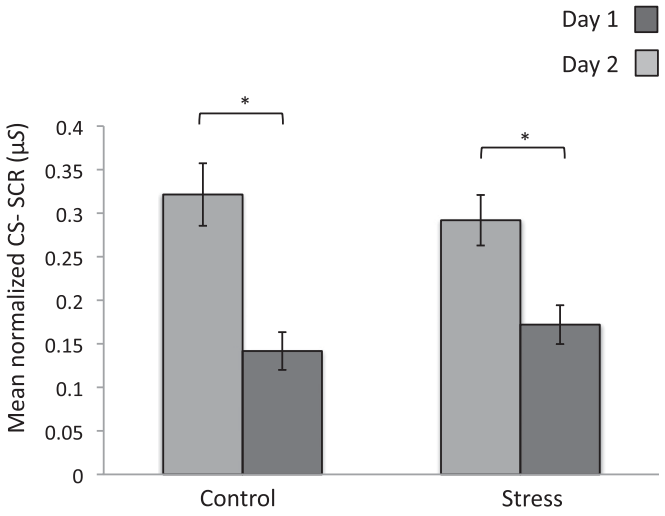

Fig. S1. Mean SCR for the CS− for each group across sessions. Fear responses toward the baseline stimulus did not differ between groups during either session. On day 2, fear arousal to the CS− was markedly diminished relative to day 1 for both groups. *$P < 0.001$; error bars denote SEM.

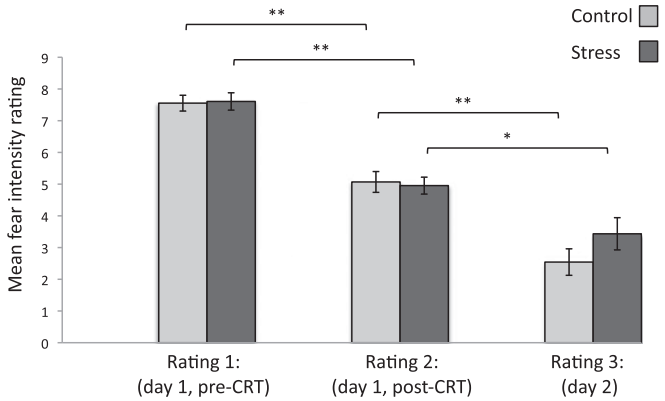

Fig. S2. Mean intensity ratings for all fear-related emotions assigned to the CS+. Both groups markedly reduced their fear intensity ratings after cognitive regulation training on day 1 (Rating 1 taken after fear-conditioning but before CRT; Rating 2 taken after CRT) and demonstrated further reductions on Day 2 (Rating 3 taken after the CP/control manipulation but before the fear regulation task). *$P < .05$, **$P < .0001$; error bars denote standard error of the mean.

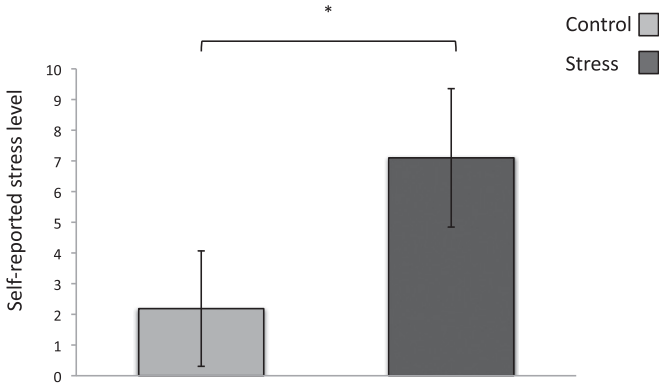

Fig. S3. Self-reported stress levels rated on a scale from 1 (least stressful) to 10 (most stressful) directly after the cold-pressor task (stress) or control task. Subjective ratings of stress were significantly higher in the stress group relative to the control group (*$P < 0.0001$, two-tailed).

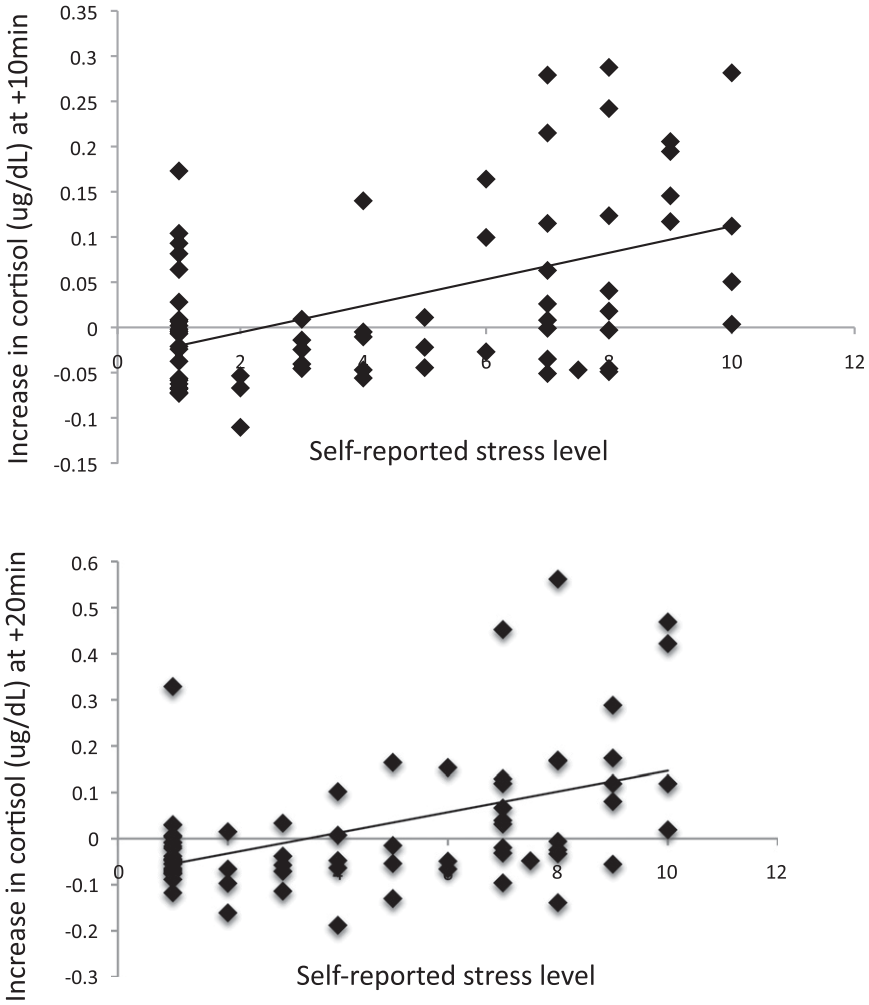

Fig. S4. Self-reported stress levels from the CP/control task correlated positively with subsequent cortisol increases both 10 min (r = .43, *P* = .0002) and 20 min (r = .48, *P* = .00001) after the manipulation.

Fig. S5. Conditioned stimuli: photographs of spiders and snakes. Participants were either assigned two images of spiders or two images of snakes to serve as CSs.

Fig. S6. Cartoon presented to participants during the cognitive restructuring training session demonstrating how thoughts influence emotion. Although the two cats are in the same exact situation, their thoughts differ regarding the dog thus their emotional responses also differ (adapted with permission from ref. 1).

1. Kendall PC, Hedtke K (2006) *The Coping Cat Workbook* (Workbook Publishing, Ardmore, PA).

Fig. S7. Cartoon used in the CRT session demonstrating the relationship between thoughts and emotions and the effect of experience. The man on the left is afraid to be on the plane, a fear likely induced by catastrophizing about the small chance of negative outcomes (e.g., a plane crash). In contrast, the two individuals on the right frequently experience flying, thus they are not focusing on these negative thoughts and appear calm.

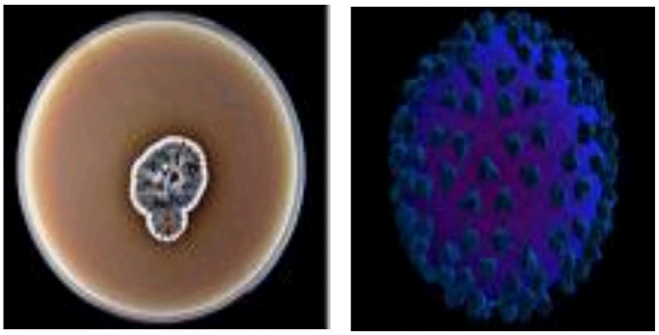

Fig. S8. Abstract images used in CRT session. The image on the right may be viewed positively until given the additional information that it depicts HIV. Conversely, the image on the left may seem negative until it is revealed that it depicts penicillin.