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C'mon Get Happy: Reduced Magnitude and Duration of Response During a Positive Affect Induction in Depression

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Abstract

Background—Depression involves decreased positive affect. Whether this is due to a failure to achieve or maintain positive emotion in response to discrete stimuli is unclear. Understanding the nature of decreased positive affect could help to address how to intervene on the phenomenon, e.g., how to structure interventions using positive and rewarding stimuli in depression. Thus, we examined the time course of affect following exposure to positive stimuli in depressed and healthy individuals.

Methods—Seventy-one adults with major depressive disorder and 34 never-depressed controls read a self-generated highly positive script and continuously rated their affect for seven minutes.

Results—Both groups quickly achieved increased positive affect, however, compared to controls, depressed participants did not achieve the same level of positive affect, did not maintain their positive affect, spent less time rating their affect as happy, and demonstrated larger drops in mood.

Conclusions—These data indicate that depressed and non-depressed individuals can generate positive reactions to happy scripts, but depressed individuals cannot achieve or sustain equivalent levels of positive affect. Interventions for depression might fruitfully focus on increasing depressed individuals' ability to maintain initial engagement with positive stimuli over a sustained period of time.

Keywords

depression; dynamics; mood induction; positive psychology; affect processing

Like healthy individuals, depressed individuals experience increases in affect for at least a short time following positive stimuli. Yet, they often return to a diminished positive or

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negative affective state[e.g., 1,2-6]. Despite the wealth of theories regarding how otherwise positive moods could become negative in depression[e.g., 7,8], few studies have documented the process of decreasing positive affect in the minutes following exposure to positive stimuli, a process that is highly relevant to both real-world functioning and therapeutic approaches. Documenting the time-course of positive affect, particularly in response to highly self-relevant, personal information, could have strong implications for both the basic science of depression as well as provide better specification of targets for depression interventions, many of which primarily focus on negative thinking (e.g., Cognitive Therapy[9], a popular psychotherapy, addresses over-evaluation of negative information to the near exclusion of positive information processing). To address this issue, this study examined the temporal dynamics of affect in depressed and healthy individuals for several minutes after reading a self-generated script about an "extremely happy" personal experience. Our primary question was whether we could observe depressed individuals' affect naturalistically drop following induction into a positive affective state.

There are a number of reasons to expect that depressed individuals would display reduced and diminishing affective responses to positive stimuli. Inherent biases toward negative information and thoughts in individuals with depression[see 10 for reviews,11,12] result in decreased subjective positive affect[13-16], negative automatic thoughts[17,18], and negative dialogues[19], especially in those who ruminate[17]. Decreased positive affect in depression may also derive from altered responses specifically to positive information[20-24]. For example, depressed persons may perceive positive information as negative[25,26] or relatively less positive[27-30]. Tendencies to shift attention away from positive stimuli in depression have also been reported[6,31]. Consistent with this formulation, depressed individuals demonstrate decreased activity in a variety of regions associated with perception (lingual and fusiform gyri) as well as those associated with reward (ventral striatum) following presentation of happy faces[29,32]. Decreased activity in regions associated with reward such as the nucleus acumbens is also observed during upregulation of positive mood[33]. These findings are in contrast to increased activity in response to negative emotional stimuli in regions associated with emotion such as the amygdala in the same studies, arguing for a valence-specific phenomenon, rather than decreased arousal more generally. There are many possible explanations for decreased sustained processing of positive experiences (or savoring) given this formulation. For example, if neural activity above some threshold is required for the representation of positive emotional stimuli to be maintained[34], this threshold could be increased in depressed individuals, or associated activities or connectivities within a network necessary for a self-maintaining feedback loop could be decreased.

To capture the emergence of negative thinking from a nominally positive state we examined variations in affect, rated continuously([35]) for seven minutes. This approach is different from most research describing blunted responses to positive stimuli in depression which employs briefly presented normative stimuli[see 5 for summary] or retrospective questionnaire ratings following positive film clips[23,36]. We hypothesized that individuals with depression would initially engage positive affect (e.g., at early perceptual stages), yielding high ratings, but would not maintain positive affect after subsequent elaborative processing[34] yielding low ratings that might dip into the range of negative affect. Others have observed continuous

affect ratings to drop in individuals with dysphoria when negative stimuli follow positive stimuli [37]. Frontal striatal network function has also been observed to decrease over time in depressed individuals [33]. Here we uniquely examined naturalistic drops in subjective affect using exclusively positive idiosyncratic information.

For reference, we quantitatively compared observed ratings with the States of Mind model's[38] empirically-derived affective set points for healthy, and depressed individuals (see Supplement-S3).

Methods

Overview

Depressed and healthy participants viewed a self-generated positive script for seven minutes while listening to music they had judged to be happy, and used a mouse to continuously rate their affect.

Participants

Participants included unmedicated adults with major depressive disorder and healthy adult controls with no history of depression or other Axis I disorders, as diagnosed by the Structured Clinical Interview for DSM-IV Disorders, Patient edition (SCID[SCID; 39; Table 1]). The sample who consented to be scanned included 87 depressed and 34 healthy participants. Due to technical errors (e.g., the mouse did not work) and time constraints, or subjects who elected to end the experiment before this task, data from 23 depressed and 1 control was not useable from the scanner; 8 depressed and the control completed the task in a behavioral lab outside the scanner yielding a final sample of 71 depressed and 34 healthy participants (see Table 1 and Supplement-S1.1 for further information on included and non-included participants). The study was approved by the Internal Review Board of the University of Pittsburgh.

Positive affect induction

Preparation—Similar to previous affect induction studies, a combination of idiographic scripts and positive music was used to elicit positive affect[40-42]. Participants selected happy music from a list of non-linguistic pieces (e.g., Claude Bolling's Suite for Flute and Jazz Piano; full list available on request). To generate scripts, participants were asked to compose a short paragraph (i.e., which fit on about a quarter page of lines) about a vivid, extremely positive personal experience, one of the best times in their lives when they felt happy or exuberant and that they could re-experience during the task, and which they would rate at least a 7 on a scale of 1-9 (one being neutral, and 9 being the happiest they had ever been). To provide objective evaluation, independent raters blind to diagnoses also rated 18 consecutive controls' and 19 depressed participants' scripts on the same 1- 9 script rating scale used by participants yielding no remarkable differences between the groups on either mean ratings or their variance (rater 1: control M(SD)= 3.83(1.2), depressed: 4.32(1.49), Mean: $t(35)=-1.08$, $p=.29$, Levine's test of variances $F=2.73$, $p=.11$; rater 2: control M(SD)= 3.39(1.3), depressed: 3.89(1.70), Mean: $t(35)=-1.02$, $p=.31$, Levine's test of variances $F=.63$, $p=.43$).

Continuous affect rating task—The majority of participants completed the affect rating task in a Magnetic Resonance Imaging (MRI) scanner. Subjective affect data are reported here; neuroimaging data will be reported on separately. Just before task administration, participants were instructed as follows, modeled after [43]:

> "Now I would like you to get into a happy mood. You will listen to the music piece you selected, and think about the event you described. I would like you to read the event description and try to re-experience it. Once you have a clear image of the event, focus on the happiness of it and try to feel that happiness as strongly as you did when it occurred."

During the next seven minutes, participants listened, through earphones, to the happy music they had selected. They concurrently viewed their script and rated their affect by moving a mouse left for more negative and right for more positive. To anchor affect ratings, a visual scale with a green tracking ball in a fixed horizontal plane was located above the participant's typed script. Visual cues on the scale were indicated, from left to right in equidistant intervals: "very sad", "somewhat sad", "neutral", "somewhat happy", "very happy"..This type of *in the moment* measure continuously samples rapid changes in affect, minimizes response biases, is relatively simple to use and requires little training[35,44], and does not appear to decrease either self-reported affect or neural activity compared to passive viewing[45]. In similar studies, online ratings are correlated with post-viewing ratings (r=.5-.8 for ratings during an amusing film) and pertinent facial behavioral ratings (r=.73). Ratings during fMRI are highly correlated with ratings of the same film clips repeated outside the scanner [44] (r=.88-.98 for positive, negative and neutral clips). Software for the task was implemented in the E-prime presentation environment.[46]. Though the scripts varied in length, we did not control for length above and beyond giving participants a fixed space to write in. Participants' experience of the task could vary on both the intensity of positivity of the task as well as script length.

Procedure

Study details were fully provided to participants, after which written informed consent was obtained. Prior to the task, participants completed their scripts, made their musical selections and were trained on the affect ratings described previously (without a script).

On the day of testing, participants completed the BDI-II (see Supplement-S1.2) and a series of tasks (not germane to the present study; list available upon request from the authors) ending with the positive affect task described here, during concurrent neuroimaging. As noted previously, data from 8 depressed and 1 control participants were acquired in a behavioral lab outside the scanner. (see Supplement-S1.1 and S5). Additional self-report ratings for "sad" and "happy" affect (rated 1-5 using a 5-button response glove) were completed before and after the task.

Analysis Plan

Group differences in demographics were analyzed via t-tests subject to familywise error correction (Bonferroni).

Affect rating data gathered using the mouse were resampled to 20Hz (from a variable sampling rate across participants up to 166Hz) and the mouse position was scaled using a range of 0 to 1 corresponding to the visual analog scale rating cues as: Very Sad=0-0.125; Somewhat Sad=0.125-0.375; Neutral=0.375-0.625; Somewhat Happy=0.625-0.875; Very Happy=0.875-1.0.

To evaluate the time course of affect in depressed individuals compared to controls, we conducted planned contrasts as well as exploratory analyses. For planned contrasts type I error was controlled within families of tests using a Bonferroni correction. Specifically examined parameters included tests of group differences in *early* affective reactivity (average affect rating; velocity to peak affect within the first minute), *peak* affect (maximum rated affect throughout seven minutes), *sustained* affect (average affect after one minute, lowest affect rating after three minutes and change in affect rating from peak to subsequent lowest affect rating), *categorical differences in affective experience* (percentage of time rating within different affect label cues on the visual analog scale; number of ratings that dropped below the “somewhat happy” visual cue), along with overall *change in affect* and *variability*.

Exploratory analyses involved two sample t-tests examining group differences at each sample along affect-rating waveforms to identify time-regions over the seven minutes in which there were reliable differences between groups. As in previous reports, Type I error was controlled across these non-independent tests using Guthrie and Buchwald’s [47] technique (see Supplement-S1.3).

Results

The groups did not differ significantly on measured demographic variables including age, gender, and ethnicity (Table 1). Controls had one year more education than depressed participants (p=.03) which was not statistically significant when type I error was controlled for the family of demographic tests. Depressive severity was higher in depressed individuals than controls.

Planned Contrasts

Mean ratings—As shown in the first sections of Table 2, compared to healthy controls, depressed participants’ affect ratings were significantly lower on the majority of planned analyses. Their early reactivity was significantly decreased as measured in the first 1 or 3 minutes as was their peak affect ratings and ratings throughout the waveform in each *a priori* interval. Their minimum affect was lower than controls as well. Thus, regardless of how it was measured, depressed participants reported decreased positive affect on the task; this was particularly true for the majority of depressed participants, whose affect dropped below the “somewhat happy” rating (Supplement S2). Consistent with inability to maintain a happy mood, depressed participants showed a pronounced decrease in affect from their peak and a greater change from peak affect to their mean during the last minute. Group differences in variability were not uniform but the standard deviation of the affect ratings after three minutes was approximately twice as large for the depressed group as for the controls.

Time spent in rating categories—As shown in the "Affect Categories" section of Table 2 and Figure 1, healthy controls spent 97% of their time within the somewhat happy and very happy visual cues, compared to depressed participants who spent on average 66% of their time in these zones. Control participants spent more time in the very happy rating zone compared to depressed participants and depressed subjects spent more time in the neutral rating zone, with no significant differences between groups for time spent in the bands with few participants including Very Sad, Sad, and Somewhat Happy. Observed differences were not a result of just a few participants. Rather, 93% of depressed participants spent time below the "somewhat happy" mark compared to 59% of controls, and 48% spent time below the neutral mark compared to just 9% of controls. Figure 2 shows individual rating trajectories for each individual, with individuals whose ratings dropped below the neutral mark highlighted for illustration.

Contrasts across the Waveform

Figure 3 displays the mean rating trajectories for each group throughout the rating period. Regions of statistically significant differences across the waveforms are highlighted on the x-axis. Depressed participants displayed lower mean affect ratings compared to controls throughout nearly the entire time course with brief interruptions yielding nonsignificantly long windows from 1.8 to 14.4 seconds $t(103)=3.56$, $p<.005$, $D=0.05$, $d=0.74$, and 18.6 to 46.2s: $t(103)=2.68$, $p=0.01$, $D=0.07$, $d=0.56$, and a significant differences throughout the remainder of the waveform from 48.6 seconds to 7 minutes: $t(103)=6.42$, $p<.005$, $D=0.15$, $d=1.34$. Results were nearly identical with and without per-participant sample-wise outlier-rescaling. Observed differences remained when participants tested in the behavioral lab were removed from the sample (Supplement-S5).

Mood ratings before and after the task

Consistent with ratings during the task, as shown in Table 3, depressed participants rated their mood as more sad and less happy than controls before the task and after the task. Depressed participants did not become less sad (change in sadness was slightly negative) whereas controls did become less sad following the task. The groups did not differ significantly on their change in happiness.

Individual Differences

Supplement-S4 describes associations of multiple self-report measures with affect ratings. Among depressed participants, low affect ratings were associated with self-reported suicidality, state anxiety, rumination, loss of interest, and state negative affect. Higher positive affect was associated with self-reported reflection, sociability, positive automatic thoughts, reappraisal of negative thoughts, and emotion- and self-focus in response to positive information.

Discussion

This study examined differences in continuous affect ratings for depressed and never-depressed participants while viewing a highly positive, personally relevant script of an extremely happy experience over seven minutes. Depressed individuals neither achieved nor

maintained the same level of positive affect ratings as controls. Depressed subjects had less positive initial reactions, more extreme drops from their peak affect rating and greater variability compared to healthy subjects. Despite being asked to relive one of the happiest moments of their life, depressed participants' maximum ratings fell short of the "very happy" cue and they spent only 66% of their time within the somewhat happy or very happy zone compared to 97% for healthy controls. Decreased mood was associated with a variety of self-reported indicators of ruminative coping and inversely with indicators of more positive emotion-focused thinking.

Implications for the Basic Science of Depression

These data support the idea, described by cognitive theorists, that depression involves a spiral of negative thinking in which spontaneously emerging negative thoughts dampen positive affect recollections and states [e.g., 7,8]. They are consistent with studies reporting less intense responses to positive stimuli in depressed individuals [see 5 for review]. According to empirically derived "set-points" [38], depressed individuals' positive affect began in the *normal* range and dropped to the *subnormal* range, in contrast to controls' levels which remained in the *optimal* or *superoptimal* range throughout the mood induction (see Supplement-S3).

This study extends the literature by indicating that despite similar initial reactions to a positive personal memory (i.e., rising affect), the temporal pattern of affect over *minutes* distinguished depressed from healthy adults. For example, despite initially engaging in positive affect for the first minute with similar speed to peak rating, maximum happiness ratings were lower for depressed individuals, suggesting reduced capacity for, or estimates of, engaging the extremes of positive affect in depression. This result is consistent with literature indicating depressed and dysphoric individuals are capable of initially engaging in an increased, yet sub-normal, level of positive affect[28,48,49] but may demonstrate decreased sustained positive affect[33,37].

Drops in positive affect in depressed participants may have occurred for a variety of reasons including concurrent and competing increases in negative affect, an inability to fully engage or sustain positive emotions[34], comparison with unrealistic standards for judging high levels of positive affect. Associations of negative affect with self-reported rumination could also suggest that positive information can be "spun negative" in the context of increased rumination or intrusion of negative thoughts in depressed individuals [see 50 for review]. On discussion, many patients reported that indeed, their mood had fallen following negative thoughts, with stories such as "My script was about when I was happily in love. But then she left me. And I thought about how I will never have that again." Mood congruent memory biases[13,51] could have shifted attention away from the positive script due to intrusive recall of negative memories. Additional potential explanations include not engaging brain mechanisms associated with increasing or maintaining affect[e.g., 33,52], not savoring positive affect[34], or conversely, engaging cognitive or brain mechanisms that regulate or dampen positive affect[53]. For instance, if positive experiences engender a sense of discomfort or guilt in individuals with depression, participants may have down-regulated their positive affect.

Clinical Implications

These data suggest a disruption in sustained processing of personally relevant positive information in depression. Coping styles such as rumination were associated with decreases in subjective affect. Thus, it may be helpful to expose depressed individuals to thinking styles geared towards maintaining affect towards positive information. These could be added to interventions such as Cognitive Therapy that traditionally emphasize negative cognitions or could be used alone based on patient needs. Emerging interventions that focus on savoring[54] may be particularly appropriate in this regard. This focus may be a relatively unexamined key to the success of time-tested protocols that explicitly help individuals to balance positive with negative thinking in response to positive events such as the efficacious Coping With Depression course[55]. Allowing patients to dynamically measure their affect, as in this protocol, may give them insight into the time course of their affective information processing, and thus into aspects of affect and regulation useful to focus on in treatment.

Limitations

The study has several limitations. Affect was assessed using a bipolar scale (happy or sad) that did not allow assessment of simultaneously occurring negative and positive affect[35]. Self-reported state sadness and anxiety on questionnaires measures was associated with ratings, which could mean that results were a function of state, rather than trait features. As with any experiment involving mood induction, either group may have exaggerated or limited their reported affect due to factors such as demand characteristics, e.g., depressed participants may have reported sad mood to “live up to” their depression diagnosis [56,57]. Task demands, involving attending to affect, could have altered ratings for depressed individuals, though they likely did not affect controls.[45] Other important unmeasured causes could be reduced emotional intensity, reduced task engagement, distraction by ambient noise in the scanner, differential time spent re-reading and associated habituation to the personally relevant script, overall personal relevance for depressed subjects, and/or diminished recall for autobiographical memories [e.g., 58,59,60].

Summary

In summary, data suggest that although individuals with depression could, with prompting, achieve positive affect consistent with euthymic individuals’ everyday experience, they did not rise to the same level of positive affect as healthy controls. Depressed participants then experienced larger decreases in affect from their peak and showed more variability in affect over time suggesting difficulty maintaining positive affect. These findings have potential importance in the clinical setting, particularly in supporting the utility of interventions geared towards enhancing positive affect [e.g., 34,61,62,63]. The employed paradigm may specifically be useful in future examinations of blunted positive affect in depression, particularly, for capturing and monitoring the spiraling negative affect and “emotional roller-coaster” that characterizes the lives of many depressed individuals, even in the context of nominally positive events.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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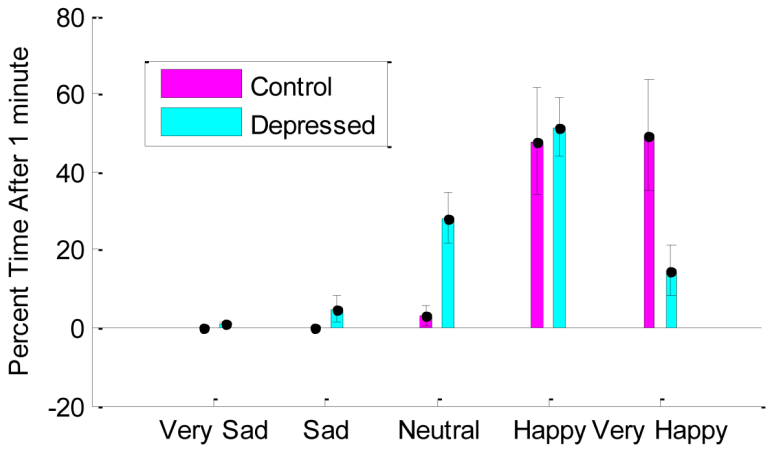

Figure 1.

Mean percentage of time spent within each emotion rating cue for healthy and depressed participants. Statistically significant differences between groups $p < 0.01$ are marked with asterisks. Error bars represent 95% confidence intervals around the mean for each bar, computed separately within each affect label within each group.

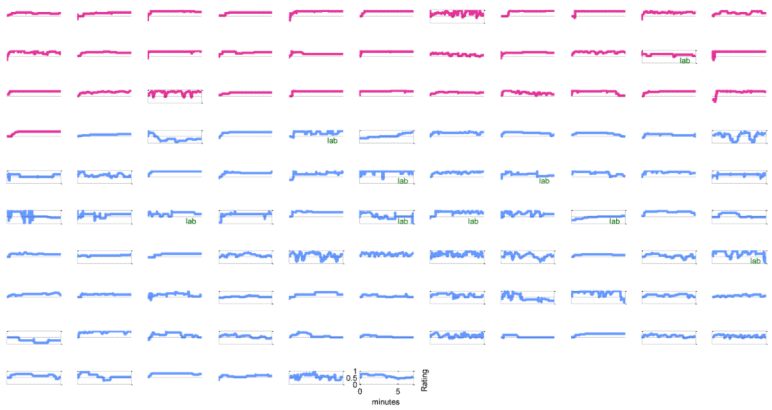

Figure 2.

Continuous affect ratings, over seven minutes, for each participant. Control participants are shown in pink. Depressed participants are shown in blue. Dotted lines represent the "Neutral affect" anchor at the 0.5 rating. Participants whose affect after one minute feel below this anchor are highlighted. Participants assessed in the behavioral lab rather than the scanner are marked with the word "lab".

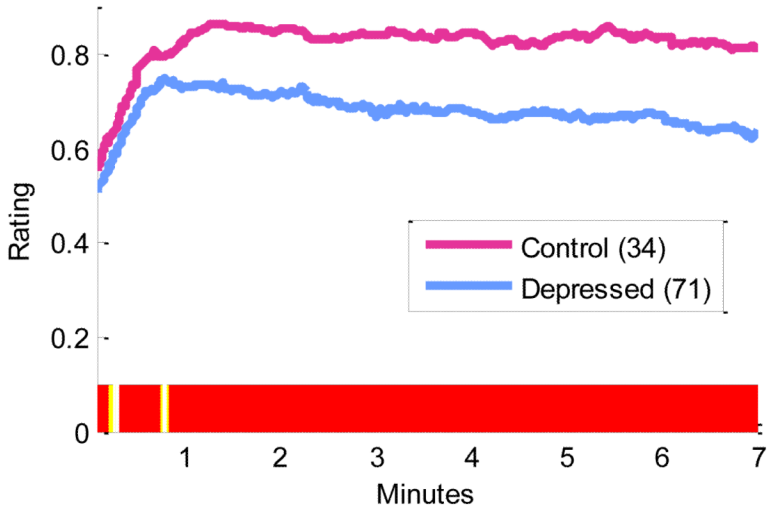

Figure 3.

Mean continuous affect ratings for control participants (pink) and depressed participants (blue). Regions of statistically significant differences between the waveforms are highlighted below the x-axis. Yellow indicates differences significant at $p < 0.1$. Red indicates differences significant at $p < 0.05$.

Table 1

Demographics and Measures

	Controls (n=34)	**Depressed (n=71)**	**Statistic testing group differences**	**Statistical significance (P)**
Mean Age (SD)	35.32 (9.94)	34.56(10.99)	t(104)=.35	.73
Sex (% Female)	67.6% (n=23)	70.8.1% (n=51)	Fisher's exact	.82
Ethnicity (% Caucasian)	82.4% (n=28)	76.3% (n=55)	Fisher's exact	.62
Mean Education (SD)	16.03 (2.20)[c]	14.93 (2,48)	t(103)=−2.20	.03
BDI (SD)[a]	2.33 (4.44)	30.54(9.31)	t(99.99)=−20.70[b]	<.0001
HAM-D (SD)[c]	---	19.79 (5.61)	---	---
Median # depressive episodes	0	3		

[a] day of testing, N=33 Controls, N=69 patients (1 BDI from a week prior to testing)

[b] equal variances not assumed

[c] 5 participants' data was taken from a rating done in the weeks after, rather than before testing.

Table 2

Affect rating parameters x1000 (i.e., whereas ratings are reported as 0-1 throughout the manuscript, here they are reported as 0-1000 to allow examination of integer measures of change). =Significant within family using Bonferroni correction.

Family of tests	Measure	Statistic	Control Mean(Std)	Depressed Mean(Std)
Early reactivity	Mean Before 1 Minute	t(103)=−2.64, p=0.01*, D(s)=−60.56(110.05), d=−0.55	715.439(100.700)	654.881(114.186)
	Max in First 3 Minutes	t(103)=−2.90, p<.005*, D(s)=−69.78(115.38), d=−0.60	914.882(64.427)	845.099(132.778)
Peak and sustained affect	Max	t(103)=−2.61, p=0.01*, D(s)=−55.79(102.40), d=−0.54	923.706(63.565)	867.915(116.299)
	Mean After 1 Minutes	t(103)=−6.13, p<.005*, D(s)=−156.32(122.23), d=−1.28	839.790(72.396)	683.465(139.690)
	Mean Last Minute	t(103)=−6.17, p<.005*, D(s)=−177.28(137.75), d=−1.29	823.378(101.183)	646.096(151.964)
	Min After 3 Min	t(103)=−6.17, p<.005*, D(s)=−260.88(202.58), d=−1.29	747.206(149.751)	486.324(223.185)
Variability	Velocity to Peak in First Minute	t(103)=−1.36, p=0.18, D(s)=−0.06(0.22), d=−0.28	0.375(0.246)	0.312(0.211)
	Std Dev After 3 Minutes	t(103)=3.86,p<.005*, D(s)=41.95(52.05), d=0.81	35.662(43.713)	77.608(55.550)
	Change From Peak to Last Minute	t(103)=3.33, p<.005*, D(s)=107.50(154.83), d=0.69	91.504(104.853)	199.002(173.471)
	Change After Max	t(103)=3.84,p<.005*, D(s)=191.15(238.89), d=0.80	178.206(158.387)	369.352(268.597)
	Slope After 3 Minutes	t(103)=−0.83, p=0.41, D(s)=−0.00(0.03), d=−0.17	−0.004(0.019)	−0.009(0.032)
Sadness	Percent Lower than Happy after 1Minute	t(103)=6.69, p<.005*, D(s)=47.31(33.90), d=1.40	16.356(28.124)	63.661(36.309)
	Percent Lower than Happy after 3Minutes	t(103)=6.31,p<.005*, D(s)=48.23(36.65), d=1.32	17.872(31.683)	66.101(38.776)
Affect categories	Very Sad	t(103)=1.24, p=0.22, D(s)=0.84(3.25), d=0.26	0.000(0.000)	0.839(3.948)
	Somewhat Sad	t(103)=1.86, p=0.07, D(s)=4.86(12.57), d=0.39	0.000(0.000)	4.861(15.242)
	Neutral	t(103)=5.13,p<.005*, D(s)=25.18(23.53), d=1.07	2.875(7.892)	28.059(28.029)
	Somewhat Happy	t(103)=0.50, p=0.62, D(s)=3.64(35.06), d=0.10	47.793(41.231)	51.430(31.733)
	Very Happy	t(103)=−5.03, p<.005*, D(s)=−34.61(32.97), d=−1.05	49.268(42.493)	14.660(27.349)
	Somewhat or Very Sad	t(103)=1.87, p=0.06, D(s)=5.70(14.64), d=0.39	0.000(0.000)	5.703(17.757)

Family of tests	Measure	Statistic	Control Mean(Std)	Depressed Mean(Std)
	Somewhat or Very Happy	t(103)=−5.57, p<.005*, D(s)=−30.96(26.64), d=−1.16	97.123(7.898)	66.160(31.860)
Proportions of participants	#Went Below Somewhat Happy	ChiSq=18.07, p<0.005*	20 (59%)	66 (93%)
	#Went Below Neutral	ChiSq=14.16,p<0.005*	3 (9%)	34 (48%)

Table 3

Peri-task mood ratings for “sad” and “happy” for control and depressed participants who rated their mood before and after the task. Ratings were on a scale of 1 (low) to 5 (high).*=Significant within family using Bonferroni correction.

Family of tests	Measure	Statistic	Control (N=24) Mean(Std)	Depressed (N=65) Mean(Std)
Pre-task affect ratings	Sad	t(87)=5.02, p<.005* D(s)=1.10(0.91), d=1.20	1.042(0.204)	2.138(1.059)
	Happy	t(87)=−3.69, p<.005* D(s)=−0.99(1.13), d=−0.88	2.792(1.503)	1.800(0.955)
Post-task affect ratings	Sad	t(87)=1.50, p=0.14, D(s)=0.39(1.09), d=0.36	1.500(1.251)	1.892(1.033)
	Happy	t(87)=−5.13, p<.005*, D(s)=−1.39(1.13), d=−1.23	3.833(1.129)	2.446(1.132)
Pre- to post-task changes in affect ratings	Sad	t(87)=−2.84, p=0.01*, D(s)=−0.70(1.04), d=−0.68	0.458(1.285)	−0.246(0.936)
	Happy	t(87)=−1.29, p=0.20, D(s)=−0.40(1.29), d=−0.31	1.042(1.488)	0.646(1.205)