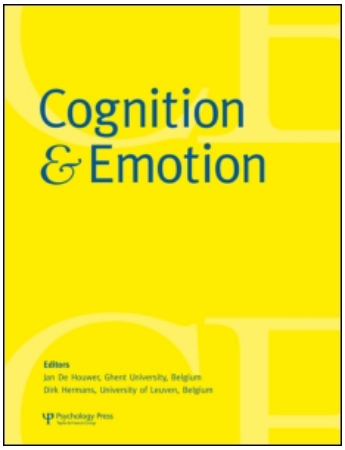

Cognition & Emotion
Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t713682755

Emotional dimensions as determinants of self-focused attention

Georgia Panayiotou [a]; Rashelle Brown [b]; Scott R. Vrana [b]
[a] University of Cyprus, Nicosia, Cyprus [b] Virginia Commonwealth University, Richmond, VA, USA

To cite this Article Panayiotou, Georgia, Brown, Rashelle and Vrana, Scott R.(2007) 'Emotional dimensions as determinants of self-focused attention', Cognition & Emotion, 21: 5, 982 — 998
To link to this Article: DOI: 10.1080/02699930701319170
URL: http://dx.doi.org/10.1080/02699930701319170

COGNITION AND EMOTION
2007, 21 (5), 982–998

Psychology Press
Taylor & Francis Group

Emotional dimensions as determinants of self-focused attention

Georgia Panayiotou
University of Cyprus, Nicosia, Cyprus

Rashelle Brown and Scott R. Vrana
Virginia Commonwealth University, Richmond, VA, USA

Negative emotions, and particularly sadness, have been found to induce self-focused attention among both depressed and normal individuals. However, positive emotion, such as happiness, is sometimes found to have a similar effect. The present study examines the effect of emotion on self-focus induction by looking separately at the emotional dimensions of valence and arousal. It postulates that arousal would be even more potent than valence in increasing self-focus, since it increases the salience of the self. Results of Experiment 1 showed that emotions that are both intense and negative, such as fear, induce the most self-focus, but pleasant relaxation also resulted in increased self-focusing. Experiment 2, using a similar design, replicated the arousal effect, and showed that fear and joy, the two most arousing emotions resulted in the most self-focus.

The idea that negative affect and self-focused attention are related has been in existence since the original theory of self-awareness by Duval and Wicklund (1972), who postulated that the comparison between self and social standards that is the outcome of self-focus, usually leads to negative emotion (see also Pyszczynski, Greenberg, Solomon, & Hamilton, 1990). Others (e.g., Carver, 1979) have modified this theory, proposing that self-focus can be associated with positive affect if one has the resources to meet the standard of comparison.

There is plenty of evidence to support the association between self-focus and negative emotions. Self-focus can intensify existing affect, such as anxiety (Gibbons et al., 1985; Scheier & Carver, 1977), and self-conscious

Correspondence should be addressed to: Georgia Panayiotou, Department of Psychology, University of Cyprus, PO Box 20537, Nicosia 1678, Cyprus. E-mail: georgiap@ucy.ac.cy

Preliminary results of Experiment 1 were presented at the annual meeting of the Society for Psychophysiological Research, 1998, Denver, CO, and the annual meeting of the Southeastern Psychological Association, 1998, Mobile, AL.

www.psypress.com/cogemotion DOI: 10.1080/02699930701319170

individuals report more negative affect in everyday life (Wood, Saltzberg, Neale, Stone & Rachmiel, 1990) and more depression when they receive failure feedback (Ingram, Johnson, Bernet, Dombeck & Rowe, 1992). Several studies have also lent support to the hypothesis that negative affect increases self-focused attention. Carr, Teasdale, and Broadbent (1991) found that a depression induction produced more negatively valent self-focused responses compared to an elation induction. Notably, elated participants produced more positive self-focused statements. Sedikides (1992) found that participants induced to feel sad reported more private self-consciousness than those induced to feel happy or neutral. Similarly, Wood, Saltzberg, and Goldsamt (1990) found that sad participants produced more self-focused responses than those placed in a neutral or happy mood. The picture becomes murkier when one considers findings by Salovey (1992) that both happy and sad mood result in increased self-focus compared to neutral.

One potential area of confusion in the literature examining the effects of emotions on self-focus is that only the valence (positive or negative) and not the intensity, or arousal level, of the emotion has so far been taken into consideration. Valence and arousal are the two dimensions of emotion that account for the majority of the variance in affective judgements (Russell & Mehrabian, 1977). Self-report, behavioural, and physiological indices of emotion can be substantially organised around these dimensions (Lang, 1984). It may be that these aspects of emotion need to be studied independently in order to find out what specifically is the cause of increased self-focus.

These two dimensions are believed to play a significant role in motivated action (Lang, 1995). Negatively valent emotions place one in a defensive state, where one is attentive and prepared for action in order to combat potential danger (Lang, 1995). This becomes evident in psychophysiological indices such as the potentiation of the startle reflex (Bradley & Lang, 2000; Witvliet & Vrana, 1995, 2000) and it is particularly true, of emotions such as fear that are also high in arousal and prepare one for an active response when danger becomes imminent (the fight/flight response). Startle potentiation is not found for negative emotions that do not prompt action, such as depression or "learned helplessness" (Lang, 1995). It can be postulated that action-oriented emotions may be associated with increased self-focus, in the same way that they are associated with sharpened attention to the outside world. That is, action-oriented (highly arousing emotions) whether positive or negative, may enhance attention to both external stimuli and internal sources of information that have to do with strategy, self-monitoring and action planning. Self-focus may be relatively low during emotional states that do not call for action and therefore require little attention, such as pleasant relaxation and sadness.

Some evidence exists that arousal may be a potent source of self-focus. Physiological symptoms of increased arousal have been found to increase self-focused attention (Wegner & Guiliano, 1983), especially when external causes for the arousal are absent or ambiguous (see Wood et al., 1990). Wegner and Guiliano (1980) argued that arousal induces an active search for its source, which may be equivalent to self-focus. Fenigstein and Carver (1978) found that giving participants false heart-rate feedback, whether this indicated constant or accelerated heart rate, increased self-focus relative to participants who were not given feedback. Apparently, even the perception that arousal is present (due to the external feedback) is enough to turn attention toward the self in an effort to search for its source. Thus, it may be that arousal instead of, or in addition to, valence mediates the tendency to focus on the self, since it increases the salience of the self (Wegner & Guiliano, 1980), and is associated with action preparation.

This hypothesis is consistent with the view of Duval, Silvia, and Lalwani (2001) who proposed a figure-ground account of the influence of affect on self-focus. They suggested that all emotions can potentially induce self-focus if they make the self distinctive in comparison to the background: Such a contrast would attract attention in order to examine a novel situation. Increased physiological or subjective arousal may be one way in which emotions can make the self distinctive and therefore self-focused.

The postulation that arousing emotions attract attention is in contrast to a recent theoretical formulation by Green and Sedikides (1999). They also proposed that a distinction can be drawn between emotions that entail specific actions (fear) and emotions that do not (relaxation). They termed this distinction "affect orientation". In direct contrast to the hypotheses proposed here, they suggest that emotions that are *not* active (e.g., sadness or relaxation) induce *more* self-focus as one searches actively for possible reactions and sources of the emotion, turning attention toward the self. Action-oriented emotions would not call for self-focus as the required action is already known and attention can be focused on executing it. We propose instead that active emotions are the ones that will lead to the most self-focus.

Unfortunately, all studies thus far have failed to make the distinction in their mood induction between valence and arousal (see Salovey, 1992), and to assess the mood manipulation for separate effects of the two dimensions. This is particularly an issue because the primary negative mood manipulation in self-focus studies has been sadness, which is negative in valence but can be operationalised as either low arousal hopelessness/helplessness or high arousal when mixed with grief or anxiety (Gotlib, 1984; Witvliet & Vrana, 1995). Thus there is currently no good data to support convincingly that self-focus is associated with negative valence, with high arousal, or with a specific emotion such as sadness.

The present study attempts to address some of these issues in two experiments by examining the dimensions of arousal and valence independently. Specifically, moods are induced within each quadrant of the Valence (positive, negative) × Arousal (high, low) affective space by using fear, joy, sadness, and pleasant relaxation imagery, with sadness operationalised as negative, low arousal. If salience of the self and need to prepare action is what is required for attention to be drawn toward the self, then arousing emotions (joy and fear) are predicted to increase self-focus. If, on the other hand, the negativity of the experience alone is what makes one want to examine the self for possible causes (e.g., discrepancies with standards) it is predicted that sadness and fear will be associated with increased self-focus. Physiological measures (heart rate and facial EMG) were collected as a check that the intended differences in valence and arousal between emotion inductions occurred. The Thought Listing Questionnaire (Ellis, Seibert, & Herbert, 1990; Sedikides, 1992) and Linguistic Implications Form (Wegner & Guiliano, 1983) were used to assess self-focused attention.

EXPERIMENT 1

Method

Participants. Participants were 48 college students (24 male, 24 female) who received credit for their introduction to psychology course in return for participation. They were 18–25 years old.

Apparatus. The timing of events and digital data collection were controlled by a personal computer and on-line physiological data collection software (Cook, Atkinson, & Lang, 1987). Auditory stimuli were presented binaurally through headphones. Lead I EKG was collected via two 12.55 mm Ag/AgCl electrodes filled with electrode gel and placed on each inner forearm. The signal was filtered by a Coulbourn S75–01 Hi Gain Bioamplifier and fed into a digital input on the computer, which recorded inter-beat intervals in milliseconds. Facial EMG was collected by monitoring electromyographic activity at the corrugator (“frown”) and zygomaticus (“smile”) muscles using 4 mm Ag/AgCl electrodes filled with electrode gel and placed on the left side of each participant’s face using skin preparation and placements recommended by Fridlund and Cacioppo (1986). Signals were amplified by a Hi Gain Bioamplifier using 90 Hz high-pass and 250 Hz low pass filters. The signals were then rectified and integrated using a Contour-Following Integrator set for a time constant of 500 ms and sampled at 10 Hz.

Emotion materials. Emotion was manipulated within-subjects. Emotion induction materials consisted of four sentences depicting different emotional situations for each of four different emotions: fear, joy, sadness and pleasant relaxation (see Appendix). The sentences had previously been rated by an independent sample on valence, arousal, and dominance (see Witvliet & Vrana, 1995, for more details). The sentences representing each emotion were matched on valence and arousal within condition based on the normative ratings. In addition, the four emotions were selected to fit into the four quadrants in the Valence × Arousal space, by ensuring that each pair of emotions was matched on one dimension while significantly different on the second: fear was high in arousal and negative in valence, joy was high in arousal and positive in valence, sadness was low in arousal and negative valence, and pleasant relaxation was low in arousal and positive in valence. After arriving in the lab, participants were asked to select the one situation among the four for each emotion that would best help them experience the intended state. The experimenter explained what the intended emotion was and what the typical expectations were regarding the valence and arousal of the particular emotion (e.g., that fear is a negative and highly arousing emotion and that they should try to experience this as intended).

Questionnaires. Two questionnaires were used to assess self-focused attention. The 20-item Linguistic Implications Form (LIF; Wegner & Guiliano, 1983) asks participants to select among first-, second- and third-person pronouns in order to complete ambiguous sentences such as: "Someone stopped (them, me, her) to get directions to the stadium". Self-focused individuals have been found to complete the sentences with more first-person pronouns (Davis & Brock, 1975). This measure was scored by obtaining a ratio of first-person pronouns to the total number of statements (20). The Thought Listing Questionnaire (TLQ; Ellis et al., 1990; Sedikides, 1992) asks participants to list any thoughts that came to mind at the time of the test. The thoughts reported on the TLQ were scored independently by two raters for self-focus or external focus. The following formula (from Carver & Scheier, 1978) was employed to calculate self-focus scores: [S + A]/[S + A + E + A], where S stands for self-focus statements, E stands for external focus statements, and A stands for ambivalent focus completions. Scores of the two raters were highly reliable ($r = .86$). The mean of the two ratings was used in analyses. The two questionnaires (LIF and TLQ) were given to participants in counterbalanced order (i.e., some received the LIF and some the TLQ first) across participants.

Procedure. Participants arrived at the lab and were seated in a padded reclining chair. The experiment consisted of four trials, one for each of the four emotional situations, presented in counterbalanced order across

participants. Before each trial the experimenter presented the participant with the sentence to be imagined during that trial, along with instructions to imagine actively participating in the event. Each trial began with a variable duration baseline (16–40 seconds) during which participants were cued by 500 deg;ms tones (800 Hz) to silently repeat the word "one" in order to clear their mind and relax (Vrana, Cuthbert, & Lang, 1989). A change in tone pitch (1000 Hz) cued participants to initiate imagery, which continued for 80 seconds. During this time tones at 8-second intervals cued the participant to continue with their imagery and add increasingly more detail to it. Following the 80-second emotion imagery period, participants completed the LIF and Thought Listing Questionnaire and gave ratings of their self-reported pleasantness, arousal, and dominance during imagery (Hodes, Cook, & Lang, 1985). Heart rate and facial EMG were collected during both imagery and baseline.

Data reduction and analysis. Cardiac inter-beat intervals were converted to beats per minute and facial EMG data converted to microvolts for the 80 seconds of imagery. For facial EMG the mean of the 80-second imagery period was used in analyses. For heart rate, the emotion effect was apparent through the first 24 seconds of imagery and then dissipated, hence only the first 24 seconds were analysed.

All dependent variables (LIF, TLQ, imagery ratings, heart rate, and facial EMG) were analysed in repeated measures analyses of variance (ANOVA) with gender as a between-subjects variable and arousal and valence of emotional imagery as within-subjects variables. Physiology during the last eight seconds of baseline prior to imagery was used as a covariate. The level of significance for post hoc comparisons was set at $p < .05$, corrected for multiple pair-wise comparisons using a modified Bonferroni correction procedure (Simes, 1986).

Results

Participant ratings of the valence, arousal, dominance and vividness of the imagery and physiological indices of the emotional response were used as manipulation checks for the success of the emotion induction. These results are reported first, followed by results regarding the measures of self-focus, which were the primary interest of this study.

Participant ratings. Participants reported more positive valence during positively valent emotions compared to negatively valent emotions, $F(1, 44) = 144.03$, $p < .0001$. They also reported more positive valence during high compared to low arousal emotions, $F(1, 44) = 11.38$, $p < .002$.

Participants reported more arousal after high compared to low arousal imagery, $F(1, 45) = 92.31$, $p < .0001$, and negative compared to positive valence imagery, $F(1, 45) = 16.78$, $p < .0001$. In addition, significantly greater arousal was reported during fear than sadness and relaxation, and significantly less arousal was reported during pleasant relaxation than the other three emotions, Arousal × Valence, $F(1, 45) = 28.98$, $p < .0001$. A Gender × Valence interaction showed that female participants indicated more arousal than male participants during the imagery of negatively valent emotions, $F(1, 45) = 3.74$, $p < .06$.

Participants reported feeling more dominant during positively valent emotions, $F(1, 45) = 54.66$, $p < .0001$. Ratings of vividness of imagery were high for all emotions but highest for positively valent imagery, $F(1, 45) = 144.03$, $p < .0001$. See Table 1 for mean ratings in all conditions.

Physiological responses. Heart rate was faster when participants imagined highly arousing emotions (i.e., fear and joy), compared to low arousal emotions (i.e., sadness and pleasant relaxation), $F(1, 40) = 8.71$, $p < .005$. Negatively valent emotions (i.e., fear and sadness) also resulted in higher heart rate than positive emotions, $F(1, 40) = 5.52$, $p < .02$.

Participants showed more zygomaticus activity during high arousal emotion, as indicated by a significant arousal effect, $F(1, 43) = 5.40$, $p < .03$, and a marginal Arousal × Valence interaction, $F(1, 43) = 2.68$, $p < .1$. Follow-up tests showed that the greatest zygomaticus activity occurred during joy imagery, which was significantly greater than sadness but with the correction for multiple comparisons was only marginally greater than relaxation ($p < .05$) and fear ($p < .14$). Participants showed more

TABLE 1
Means (and standard deviations) for all measures in the four emotional imagery conditions in Experiment 1

	Fear	*Joy*	*Sadness*	*Pleasant relaxation*
TLQ	0.60 (0.38)	0.50 (0.34)	0.45 (0.34)	0.61 (0.31)
LIF	0.51 (0.26)	0.43 (0.25)	0.35 (0.22)	0.39 (0.25)
Valence	6.61 (3.96)	17.21 (3.67)	5.89 (3.78)	15.77 (3.43)
Arousal	16.60 (5.27)	14.89 (5.75)	12.19 (6.05)	3.26 (2.99)
Dominance	5.68 (5.34)	14.00 (5.39)	6.02 (5.00)	13.75 (5.87)
Vividness	14.68 (4.70)	16.06 (5.00)	14.26 (4.06)	16.72 (3.89)
Heart rate	72.56 (11.73)	71.54 (11.51)	72.13 (10.80)	69.77 (10.78)
Zygomaticus	2.85 (6.52)	4.70 (14.70)	1.66 (1.30)	1.94 (5.65)
Corrugator	4.03 (7.96)	1.74 (1.44)	3.69 (4.87)	1.57 (1.13)

Note: TLQ = Thought Listing Questionnaire and LIF = Linguistic Implications Form. For the physiological measures the means reported are the covariate-adjusted means with the baseline recording corresponding to the particular emotion serving as the covariate.

corrugator activity during negative emotions, $F(1, 43) = 5.84$, $p < .02$. See Table 1 for covariance-adjusted means for each condition.

Based on the results for valence and arousal ratings and physiological responses it was deemed that emotions were successfully manipulated.

Self-focus. The ANOVA examining participant responses on the Thought Listing Questionnaire showed a significant Arousal × Valence interaction, $F(1, 33) = 11.09$, $p < .002$ (see Table 1). Comparisons between the means indicated that pleasant relaxation produced the highest ratio of self-focused to externally focused thoughts, which was significantly higher than joy and sadness. Fear produced the second-highest amount of self-focus but the means were not significantly different from any other emotion. A significant Arousal × Gender interaction indicated that women responded with more self-focused thoughts in the arousing conditions than did men, $F(1, 34) = 4.46$, $p < .04$, and a Gender × Arousal × Valence interaction showed that women responded with more self-focus than men in the fear condition, $F(1, 34) = 8.29$, $p < .007$.

On the Linguistic Implications Form, high arousal emotions resulted in higher self-focus ratings, $F(1, 41) = 17.73$, $p < .0001$ (see Table 1). A marginal Arousal × Valence interaction, $F(1, 43) = 3.04$, $p < .09$, indicated that participants were most self-focused in the fear condition, which resulted in significantly higher self-focus ratings than pleasant relaxation and sadness. Joy resulted in significantly higher self-focus scores than sadness but not pleasant relaxation. A marginally significant interaction between arousal and gender, $F(1, 43) = 3.46$, $p < .07$, showed that women responded with more self-focus to highly arousing emotions. Interestingly, in the case of both the TLQ and LIF, sadness resulted in the lowest self-focus scores.

To further test the hypothesis that arousal modulates self-focus, the analyses were repeated, but using the valence or the arousal ratings of participants as covariates in separate analyses. It was anticipated that if arousal carried the emotion effect on self-focus, when it was used as a covariate the effect of emotion on each of the two self-focus measures would dissipate to a greater degree than when valence ratings were used as covariates.

The ANCOVA examining participant responses on the Thought Listing Questionnaire, using arousal ratings as covariates continued to show a significant Arousal × Valence interaction, though the F value was reduced substantially, $F(1, 31) = 6.95$, $p < .01$. When valence was used as a covariate the Arousal × Valence interaction was not diminished, $F(1, 31) = 11.86$, $p < .002$. This time a significant effect of valence also emerged, $F(1, 31) = 4.40$, $p < .04$, with negatively valent emotions resulting in lower scores than positive emotions.

In the ANCOVA examining self-focus scores on the LIF, using arousal ratings as a covariate eliminated the significant main effect of arousal,

$F(1, 38) = 0.02$, $p = .90$, and the Arousal × Valence interaction was no longer marginal, $F(1, 38) = 1.52$, $p = .23$. When valence ratings were used as covariates, however, the arousal effect remained significant, $F(1, 38) = 6.99$, $p < .01$. Thus, covarying out self-reported arousal tends to reduce or eliminate statistical effects of arousal on self-focused attention, further suggesting that arousal is modulating self-focused attention.

Discussion

In this experiment, emotions were organised around the dimensions of valence and arousal to examine the effect of affect on inducing self-focused attention. Ratings and physiological measures showed that emotional dimensions were manipulated as intended, replicating previous imagery studies (Witvliet & Vrana, 1995).

Results from the two self-focus measures and from analyses of covariance provided strong evidence that arousal plays a significant role in the association between emotion and self-focus. On both questionnaires, low arousal sadness resulted in the least self-focus, whereas the emotion that was consistently associated with high levels of self-focus was fear. These results argue against the evidence in previous studies showing that sadness, that is negative mood alone, can induce self-focus.

For the most part, results also argue against the hypothesis of Green and Sedikides (1999) that emotions *not* oriented toward action promote self-focused attention. However, the latter hypothesis is consistent with the high levels of self-focus reported during pleasant relaxation, on the Thought Listing Questionnaire. It may be that at extremely low levels of arousal, and in the context of an emotion that prepares for no action at all, the only source of information that could occupy one's consciousness is related to the self—so that relaxation presents a special case of heightened self-focus in a non-arousing affective situation. Our results overall suggest that arousal is of paramount importance as a dimension of emotions that increase self-focus, and that sadness, when conceptualised as a low arousal emotion, is not associated with self-focus.

Unfortunately, another possible explanation of low self-focus during sadness is possible, and may limit the validity of the previous interpretation: The imagery situations used in this study clearly involved the self in the fear, joy and pleasant relaxation conditions but could be considered less self-relevant in the sadness condition (see Appendix). In defence of the present design, it is difficult in any media to create materials that are both strong in affective valence (positive or negative) and non-arousing (Lang, Greenwald, Bradley, & Hamm, 1993), and arousal is highly related to interest (Lang et al., 1993), which is by implication self-relevant. Indeed, it may be difficult not to become aroused when a sad situation (e.g., a loss) that pertains to

one's self is perceived, since the situation represents a problem that one must cope with actively. These difficulties aside, however, interpretation of the results could be more definitive if this shortcoming in the design was corrected. This was the purpose of the second experiment, which was designed to replicate the findings of Experiment 1 while including materials that would be equally self-relevant for all emotional conditions.

EXPERIMENT 2

Experiment 2 was conducted to control for the possible confound discussed above. This experiment followed the same methodology, but included a new set of emotion scripts that ensured that the target was indeed the self (see Appendix). Further, these materials correct for another possible limitation of Experiment 1: This time scripts were selected to be "gender neutral" in the sense that they would be equally likely to be selected by either men or women at the beginning of the experiment as the script that would best help them enter the specified emotional situation. Exploratory analyses of the scripts selected in Experiment 1 indicated that in the fear condition women tended to select those scripts dealing with assault more frequently than men. Lastly, Experiment 2 differed from Experiment 1 in that neutral (low arousal, and neither positive nor negative) scripts were included to examine the hypothesis that increased self-focus will occur under conditions of low levels of arousal with no preparation for action, when the only source of information that could occupy one's consciousness is related to the self.

Method

Participants. Participants were 49 college students (24 male, 25 female) who received credit for their introduction to psychology course in return for participation. They ranged in age from 18–23. Twenty-eight were Caucasian, nine were Black, eight were Asian, and three selected "other" as their racial group.

Apparatus. Apparatus was the same as that used in Experiment 1.

Emotion materials. Emotion-induction materials consisted of three sentences for each of five categories of fear, joy, sadness, pleasant relaxation, and neutral (see Appendix). The sentences were derived from the same normative set of scripts (Witvliet & Vrana, 1995). They were selected so that they were matched on valence and arousal within condition, and fit into the four quadrants in the Valence × Arousal space, plus neutral sentences, and it was ensured that they all included scenarios in which the protagonist was the self. Once more, participants selected the one situation among the three for

each category that best helped them experience the intended state (neutral was described to participants as "neither positive, negative, nor aroused").

Questionnaires. The same questionnaires as in Experiment 1 were used to measure self-focused attention. For the TLQ, the mean of the scores of two raters was once more used in data analyses. Interrater reliability was high ($r = .91$).

Procedure and data analysis. The procedure and data reduction were the same as in Experiment 1. Due to a computer error, image vividness ratings were not available for this experiment. Because of the addition of the neutral condition, data were analysed somewhat differently. A 5 Emotion (fear, joy, sadness, pleasant relaxation, neutral) × 2 Gender ANOVA was partitioned into four a priori contrasts: valence (fear and sadness versus joy and pleasant relaxation), arousal (fear and joy vs. sadness and pleasant relaxation), an Arousal × Valence interaction (fear and pleasant relaxation vs. joy and sadness), and neutral vs. low arousal emotion (neutral vs. sadness and pleasant relaxation).

Results

Participant ratings. See Table 2 for mean ratings in all conditions. Participants reported more positive valence during positively valent emotions compared to negatively valent ones, $F(1, 44) = 316.0$, $p < .0001$, and during high compared to low arousal conditions, $F(1, 44) = 27.96$, $p < .0001$.

Participants expressed significantly more arousal after high compared to low arousal imagery, $F(1, 45) = 92.31$, $p < .0001$, and to negative compared

TABLE 2
Means (and standard deviations) for all measures in the five emotional imagery conditions in Experiment 2

	Fear	*Joy*	*Sadness*	*Pleasant relaxation*	*Neutral*
TLQ	0.40 (0.25)	0.41 (0.27)	0.36 (0.24)	0.28 (0.25)	0.37 (0.28)
LIF	0.39 (0.22)	0.40 (0.21)	0.32 (0.20)	0.36 (0.23)	0.39 (0.23)
Valence	4.91 (3.50)	18.24 (2.86)	2.89 (3.72)	16.15 (3.54)	11.85 (3.37)
Arousal	17.87 (3.06)	16.72 (4.88)	12.62 (5.44)	7.23 (6.30)	6.96 (4.51)
Dominance	4.45 (4.38)	15.79 (4.58)	4.06 (4.27)	14.68 (4.61)	13.35 (5.07)
Heart rate	73.6 (12.35)	73.8 (11.65)	74.3 (11.68)	72.0 (12.06)	72.9 (11.65)
Zygomaticus	1.82 (0.81)	2.82 (2.10)	1.81 (0.59)	2.01 (1.52)	1.75 (0.76)
Corrugator	3.69 (2.30)	2.83 (1.81)	4.60 (2.57)	2.83 (1.66)	3.01 (1.69)

Note: TLQ = Thought Listing Questionnaire and LIF = Linguistic Implications Form. For the physiological measures the means reported are the covariance-adjusted means with the baseline recording corresponding to the particular emotion serving as the covariate.

to positive valence imagery, $F(1, 45) = 16.87$, $p < .0002$. In addition, significantly greater arousal was reported during sadness than pleasant relaxation, whereas fear and joy were not significantly different, Arousal × Valence, $F(1, 45) = 7.39$, $p < .01$. Further, neutral imagery was rated as significantly less arousing than the two low arousal affective conditions, $F(1, 45) = 22.68$, $p < .0001$.

Participants reported feeling more dominant during positively than negatively valent emotions, $F(1, 44) = 186.14$, $p < .0001$, and during neutral imagery than during the two low arousal affective conditions, $F(1, 44) = 37.93$, $p < .0001$.

Physiological responses. Table 2 displays mean physiological responses for all conditions. As in Experiment 1, heart rate was greater during negative than positive imagery, $F(1, 36) = 5.47$, $p < .05$, and during high arousal compared to low arousal imagery, $F(1, 36) = 4.07$, $p = .05$. In addition, the effect of valence was significant only for low arousal (e.g., sadness vs. pleasant relaxation) imagery, Arousal × Valence, $F(1, 36) = 6.35$, $p < .02$.

As in Experiment 1, zygomaticus EMG was greater during joy imagery than during fear, sad, or pleasant relaxation imagery, Valence × Arousal, $F(1, 43) = 9.38$, $p < .004$. There were also main effects for Valence, $F(1, 43) = 7.86$, $p < .01$, and Arousal, $F(1, 43) = 13.03$, $p < .001$. Corrugator EMG was greater during negative than positive valence imagery, $F(1, 41) = 38.59$, $p < .0001$. In addition, the corrugator response was greater during sad imagery than any other condition, with fear eliciting a greater response than joy and pleasant relaxation, Valence × Arousal, $F(1, 41) = 7.48$, $p < .01$. Finally, compared to neutral imagery, the two low-arousal affective conditions resulted in greater corrugator EMG, $F(1, 41) = 11.52$, $p < .002$.

Self-focus measures. High arousal emotions produced greater self-focus than low arousal emotions on the TLQ, $F(1, 43) = 10.85$, $p < .002$ (see Table 2). No other significant effects were found; unlike Experiment 1, there were no effects of gender (all main effects and interactions $F < 1.5$). High arousal emotions also produced greater self-focus than low arousal emotions on the LIF, $F(1, 47) = 7.16$, $p < .02$. Again no other significant effects were found, and there were no main effects or interactions with gender (all Fs < 1.0).

As in Experiment 1, the analyses of the self-focus measures were repeated with arousal and valence ratings used as covariates. When arousal ratings were used as covariates, the effect of arousal on LIF scores was eliminated, $F(1, 44) = 0.34$; however, the effect of arousal was maintained on the TLQ, $F(1, 47) = 12.79$, $p < .001$. A similar pattern was found when valence ratings were used as covariates: the arousal effect was reduced for the LIF, $F(1, 43) = 2.33$, $p < .15$, but not for the TLQ, $F(1, 43) = 11.17$, $p < .002$.

GENERAL DISCUSSION

Two experiments examined the role of affect on inducing self-focused attention when emotions were organised around the dimensions of valence and arousal. It was predicted that arousal, more than valence, would result in increased self-focused attention because it makes the self salient and is involved in preparing the organism for action, which may entail focused attention, planning and self-regulation.

Experiment 1 supported partially that highly arousing emotions (fear and joy) produced the most self-focus. Experiment 2 provided strong verification for the potency of emotional arousal in the induction of self-focused attention on both the TLQ and LIF. The only finding discrepant with our hypothesis was the increased self-focus associated with pleasant relaxation in Experiment 1 on the Thought Listing Questionnaire. A possible explanation for this is that in addition to arousal, self-focus increases in situations that involve very little demand for action or thought; when the self becomes the only salient content that could occupy one's thought. This would be in accord with the "affect orientation" hypothesis of Green and Sedikides (1999). It is supported by the fact that in Experiment 2, the neutral condition produced relatively high scores on the self-focus questionnaires, though the scores did not differ significantly from the two low arousal conditions. Alternatively, given that pleasant relaxation produced the lowest self-focus on the TLQ in Experiment 2, the effect in Experiment 1 may have been a chance finding.

In both experiments and on both questionnaires, sadness was associated with comparatively low levels of self-focus. Thus, the hypothesis that negative valence induces self-focus on its own, in the absence of high arousal, received no support at all. These results may at first glance appear at variance with the mood and self-focus literature, which has consistently found that sadness increases self-focus (Carr et al., 1991; Salovey, 1992; Sedikides, 1992; Wood et al., 1990). However, previous studies did not control for level of arousal, did not check their mood manipulation for induced arousal, and may have confounded the dimensions of valence and arousal so that the induced sadness was more arousing than in the present study. In the Carr et al. (1991) and Wood et al. (1990) studies, depressed participants reported more anxiety (typically a high arousal state) than elated and neutral mood participants, respectively, and in Sedikides (1992) sad mood was induced by imagery of a scene involving being burned in a fire, likely to have induced high arousal.

In both experiments, the emotion that was consistently associated with high levels of self-focus on both measures was fear. Fear is high in arousal and negative in valence, hence making the self salient and cueing the presence of a problem that needs to be actively addressed. If self-focus is indeed significant in self-regulation as proposed by Carver (1979), it is

expected that self-focus would be at its highest when one needs to plan one's actions to cope with a problem in a situation that is both intense (arousal) and negative (valence); that is, has the potential for harm to the self.

A possible limitation of the above interpretations has to do with the potential for demand effects in the emotion induction method: Since we specifically described to participants the valence and arousal of the emotional experience we expected, one may wonder whether their ratings reflected the demanded effect without participants actually undergoing the experience. Though demand effects always present a concern when it comes to psychological experiments, in the present study several assurances exist regarding the validity of the results: Physiological measures provide strong verification that emotions were induced as intended, rather than just reported by subjects. Further, it is unclear how demand effects would have led to the specific self-focus results observed unless participants were informed of our arousal hypothesis, which deviates from most other conceptualisations in the literature. It was on the basis of this logic, that we decided that the benefits of explaining clearly to participants the specific emotional experience they were supposed to have outweighed the risk of possible demand effects.

In sum, this study found no evidence that sad mood alone, in the absence of arousal, increases self-focused attention. The data suggest that breaking down emotions into their basic dimensions is an important tool for examining what exactly leads one to become self-focused in affective situations. The above results indicate that both arousal and negative valence are important determinants of self-focus, with arousal appearing more important since high arousal, *positive* joy is also associated with high levels of self-focus. Results support the notion that when the self is made salient by an emotional experience, attention is directed toward it, probably irrespective of the specific emotional content.

Manuscript received 9 August 2001
Revised manuscript received 17 October 2005
Manuscript accepted 22 February 2007

REFERENCES

Bradley, M. M., & Lang, P. J. (2000). Measuring emotion: Behavior, feeling and physiology. In R. Lane & L. Nadel (Eds.), *Cognitive neuroscience of emotion* (pp. 242–276). New York: Oxford University Press.

Carr, S. J., Teasdale, J. D., & Broadbent, D. (1991). Effects of induced elated and depressed mood on self-focused attention. *British Journal of Clinical Psychology*, *31*, 273–275.

Carver, C. S. (1979). A cybernetic model of self-attention processes. *Journal of Personality and Social Psychology*, *37*, 1251–1280.

Carver, C. S., & Scheier, M. F. (1978). Self-focusing effects of dispositional self-consciousness, mirror presence, and audience presence. *Journal of Personality and Social Psychology*, *36*, 324–332.

Cook, E. W., III, Atkinson, L., & Lang, K. G. (1987). Stimulus control and data acquisition for IBM PCs and compatibles. *Psychophysiology*, *24*, 726–727.

Davis, D., & Brock, T. C. (1975). Use of first person pronouns as a function of increased objective self-awareness and performance feedback. *Journal of Experimental Social Psychology*, *11*, 381–388.

Duval, S., & Wicklund, R. A. (1972). *A theory of objective self-awareness*. New York: Academic Press.

Duval, S. T., Silvia, P., & Lalwani, N. (2001). *Self-awareness and causal attribution: A dual systems theory*. Boston: Kluwer Academic Publishers.

Ellis, H. C., Seibert, P. S., & Herbert, B. J. (1990). Mood effects on thought listing. *Bulletin of the Psychonomic Society*, *28*, 147–150.

Fenigstein, A., & Carver, C. S. (1978). Self-focusing effects of heart rate feedback. *Journal of Personality and Social Psychology*, *36*, 1241–1250.

Fridlund, A. J., & Cacioppo, J. T. (1986). Guidelines for human electromyographic research. *Psychophysiology*, *23*, 567–589.

Gibbons, F. X., Smith, T. W., Ingram, R. E., Pearce, K., Brehm, S. S., & Schroeder, D. J. (1985). Self-awareness and self-confrontation: Effects of self-focused attention on members of a clinical population. *Journal of Personality and Social Psychology*, *48*, 662–675.

Gotlib, I. H. (1984). Depression and general psychopathology in university students. *Journal of Abnormal Psychology*, *93*, 19–30.

Green, J. D., & Sedikides, C. (1999). Affect and self-focus revisited: The role of affect orientation. *Personality and Social Psychology Bulletin*, *25*, 104–119.

Hodes, R. L., Cook, E. W., & Lang, P. J. (1985). Individual differences in autonomic response: Conditioned association or conditioned fear? *Psychophysiology*, *22*, 545–560.

Ingram, R. E., Johnson, B. R., Bernet, C. Z., Dombeck, M., & Rowe, M. K. (1992). Vulnerability to distress: Cognitive and emotional reactivity in chronically self-focused individuals. *Cognitive Therapy and Research*, *16*, 451–472.

Lang, P. J. (1984). Cognition in emotion: Concept and action. In C. Izard, J. K. Kagan, & R. Zajonc (Eds.), *Emotions, cognition, and behavior* (pp. 192–226). Cambridge, UK: Cambridge University Press.

Lang, P. J. (1995). The emotion probe: Studies of motivation and attention. *American Psychologist*, *50*, 372–385.

Lang, P. J., Greenwald, M. K., Bradley, M. M., & Hamm, A. O. (1993). Looking at pictures: Affective, facial, visceral, and behavioral reactions. *Psychophysiology*, *30*, 261–273.

Pyszczynski, T., Greenberg, J., Solomon, S., & Hamilton, J. (1990). A terror management analysis of self-awareness and anxiety: The hierarchy of terror. *Anxiety Research*, *2*, 177–195.

Russell, J. A., & Mehrabian, A. (1977). Evidence for a three-factor theory of emotions. *Journal of Research in Personality*, *11*, 273–294.

Salovey, P. (1992). Mood-induced self-focused attention. *Journal of Personality and Social Psychology*, *62*, 699–707.

Scheier, M. F., & Carver, C. S. (1977). Self-focused attention and the experience of emotion: Attraction, repulsion, elation, and depression. *Journal of Personality and Social Psychology*, *35*, 625–636.

Sedikides, C. (1992). Mood as a determinant of attentional focus. *Cognition and Emotion*, *6*, 129–148.

Simes, R. J. (1986). An improved Bonferroni procedure for multiple tests of significance. *Biometrika*, *73*, 751–754.

Vrana, S. R., Cuthbert, B. N., & Lang, P. J. (1989). Processing fearful and neutral sentences: Memory and heart rate change. *Cognition and Emotion*, *3*, 179–195.
Wegner, D. M., & Guiliano, T. (1980). Arousal-induced attention to self. *Journal of Personality and Social Psychology*, *38*, 719–726.
Wegner, D. M., & Guiliano, T. (1983). On sending artifact in research of artifact: Reply to McDonald, Harris, and Maher. *Journal of Personality and Social Psychology*, *44*, 290–293.
Witvliet, C. V., & Vrana, S. R. (1995). Psychophysiological responses as indices of affective dimensions. *Psychophysiology*, *32*, 436–443.
Witvliet, C. V., & Vrana, S. R. (2000). Emotional imagery, the visual startle, and covariation bias: An affective matching account. *Biological Psychology*, *52*, 187–204.
Wood, J. V., Saltzberg, J. A., & Goldsamt, L. A. (1990). Does affect induce self-focused attention? *Journal of Personality and Social Psychology*, *58*, 899–908.
Wood, J. V., Saltzberg, J. A., Neale, J. M., Stone, A. A., & Rachmiel, T. B. (1990). Self-focused attention, coping responses, and distressed mood in everyday life. *Journal of Personality and Social Psychology*, *58*, 1027–1036.

APPENDIX

Emotion sentences used in Experiment 1

Fear

1. I watch in horror as an oncoming car swerves into my lane and I realise I cannot avoid a head-on collision.
2. I'm play-wrestling with my date when I feel his/her grip tighten and a cold sharp blade against my neck.
3. A strange man is following me through a bad part of town; sweat pours down my face as I listen to his footsteps getting closer.
4. Alone in the alley my heart pounds in fear as, knives out, laughing with menace, the street gang surrounds me.

Joy

1. Muscles taut with excitement, I shout and slam home the winning shot.
2. I shout for joy as I read my grade report; all As for a semester of hard classes in my major.
3. My brand new husband (wife) and I stand closely together, and smile at one another as we cut into our beautiful wedding cake.
4. I jump up with excitement as my dad drives up the road with my Christmas present, a brand new car!

Sadness

1. I helplessly watch my best friend cry over his/her parent's divorce.
2. I watch the young girl struggle to walk as she copes with the crippling disease.
3. I sit listening to the stranger next to me tell me about losing her job and having to go on welfare to support her children.
4. I watch the television special on abandoned children who are left to grow up without the care of their parents.

Pleasant relaxation

1. I am lying in bed on a Sunday morning, half asleep and listening to the distant sound of bells, relaxing on my day off.
2. I am relaxing on my living room couch looking out the window on a sunny autumn day.

3. Soft music is playing on the stereo, as I snooze lazily on my favourite chair.
4. A wood fire dances in the hearth, I feel snug and warm in the cabin, reading the book on my lap, enjoying a well-deserved rest.

Emotion sentences used in Experiment 2

Fear

1. Alone in bed, I feel a scuttling along my bare leg; I switch on the light, and trembling, see a large, black spider crawling up my thigh.
2. Suddenly the oil in the pan bursts into flames; it catches fire to the curtain as I frantically search for a way to put it out.
3. The large, spade-headed snake darts forward, fangs protruding, striking my leg in a flash of pain.

Joy

1. As I walk across campus I catch the eye of a handsome/beautiful man/woman from one of my classes walking toward me; he/she smiles widely and winks as he/she passes.
2. I shout for joy as I read my grade report; all As for a semester of hard classes in my major.
3. I jump up with excitement as my dad drives up the road with my Christmas present, a brand new car!

Sadness

1. The relationship was finally ending; I watch sadly as she/he walks away for the last time.
2. I watch as my old, sick dog lies on the vet's surgical table; it wags its tail as if saying goodbye.
3. I sit beside my sister's hospital bed, barely able to look at her with the all the tubes connecting her to many machines.

Pleasant relaxation

1. I am sitting in a lawn chair on the front porch watching the soft summer breeze sway the leaves on the trees.
2. A soft smile creeps over my face as I begin to eat my favourite flavour of ice cream while listening to my favourite music on the stereo.
3. I dive into the cool pool waters, refreshing and enjoying my evening swim.

Neutral

1. I lean against the wall, watching people passing by as I wait for a friend before class.
2. I am reading an article in the school paper before class begins in the morning.
3. I walk through the supermarket aisles checking things off my list as I pick each item off the shelves.