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Abstract

Research indicates that an affective state's valence (positive/negative), orientation (approach/avoidance), and activation level (activated/deactivated) can influence people's ability to make creative associations. Unfortunately, how these features influence associative thought has not been fully tested because researchers typically do not examine deactivated states. In three studies, respondents in either elated (positive, approach, activated), relaxed (positive, avoidance, deactivated), bored (negative, approach, deactivated), or distressed (negative, avoidance, activated) states completed measures of associative thought. Consistent with the orientation hypothesis, respondents in approach-oriented states (elated/bored) performed better on two measures of associative thought than those in avoidance-oriented states (distressed/relaxed). These effects stemmed from the approach states promoting a desire for new experiences, as sensation seeking mediated these results (Study 3). The data indicate that not only can deactivated states alter thought, but their effect depends on whether they are associated with approaching or avoiding new experiences.

Key words: Deactivated affective states, boredom, relaxation, creativity, associative thought, approach and avoidance

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People's feelings influence their ability to make creative associations (Ashby, Isen, & Turken, 1999; Baas, De Dreu, & Nijstad, 2008). A recent meta-analysis on affect and creativity, for instance, identified 102 different effect sizes that examined this issue (Baas et al., 2008). However, very few of these effect sizes focused on how deactivated (low arousal) states, like feeling relaxed or bored, altered the creative process. This oversight is surprising given that relaxation and boredom are key achievement-related emotions (Pekrun, 2006). Additionally, these deactivated affective states play a critical role in testing extant theories for why and how affect influences creative thought. The purpose of this paper is to examine how states that vary in valence, activation, and orientation (specifically, elation, distress, boredom, and relaxation) shape the way that affect alters the process of making novel, broad, unusual, and useful associations between concepts – a key component of creativity (Mednick, Mednick, & Mednick, 1964) – which we refer to as associative thought.

Theories on how affect alters creativity differ in terms of whether they argue that an affective state's valence, activation, or orientation are important. Valence refers to whether the affective state is positive (e.g., elation, happiness, or relaxation) or negative (e.g., distress, sadness, boredom). Activation refers to the degree to which the states produce attention, alertness, and arousal (Baas, De Dreu, & Nijstad, 2011). These two dimensions can be combined to form a circumplex model of affective experience (Russell, 2003), depicted in Figure 1. The diagonal lines in the circle depict the valence (top left to bottom right) and activation (top right to bottom left) dimensions. Orientation is reflected in the vertical and horizontal dimensions, and it indicates whether the state focuses on approaching rewards or avoiding threats. The placement of

the orientation dimension stems from Watson, Wiese, Vaidya, and Tellegen's (1999; see also Remington, Fabrigar, & Visser, 2000) research. They argue that instead of focusing on valence and activation, the circumplex should be turned 45 degrees and focus on positive activation (PA): a state both positive and activated, which indicates an approach orientation; and negative activation (NA): a state both negative and activated, which indicates an avoidance orientation, depicted as the horizontal and vertical axes in Figure 1 (Watson, et al., 1999). PA or approach-oriented states arise when people are focused on whether obtainable rewards are present, which can produce elation (a high PA state), or absent, which can produce boredom (a low PA state).[1] NA or avoidance-oriented states arise when people focus on whether threats that should be avoided are present, which can produce distress (a high NA state), or absent, which can produce relaxation (a low NA state). With these definitions in mind, we now discuss how these dimensions may explain the role that affective states play in associative thought.

Valence Hypothesis

Research indicates that positively-valenced affective states – like happiness, elation, and enthusiasm – spark associative thought (Ashby et al., 1999; Baas et al., 2008; Clore, Gasper, & Garvin, 2001; Isen & Daubman, 1984; Isen, Johnson, Mertz, & Robinson, 1985; Wyer, Clore, & Isbell, 1999). These effects may arise because positive affective states indicate that all is well within the environment (Carver, 2003; Clore et al., 2001; Schwarz & Clore, 2003), signaling that

[1] The control value theory of achievement emotions discusses boredom as an avoidance emotion (Pekrun et al., 2010; Pekrun & Stephens, 2010). It makes sense that if one is bored by a specific task, then one may want to avoid that task. We are examining boredom as a general affective state, rather than as a specific emotion, in that it lacks a clear referent. We view this general state of boredom as activating approach, in that it sparks seeking out rewarding activities. Pekrun et al., (2010) acknowledge that boredom can have this effect, writing; "Boredom functions to withdraw attention from activities lacking in value and to redirect attention toward more rewarding stimuli and activities." Pg. 535. In addition, Pekrun and colleagues (2010) also discuss what they call a "lack of interest," which taps into the approach dimension, writing: "Lack of interest and enjoyment entail a lack of approach motivation; whereas boredom promotes avoidance motivation." Pg.533. It may be that what we are assessing is akin to a lack of interest. We use the term boredom, however, rather than a lack of interest, due to the fact that boredom lies at the low end of the PA dimension (Remington, et al. 2000), others (Rule, 1998, Schubert, 1978; Vodanovich, 2003) argue that it may spark approaching rewards, and our data indicate the our manipulations and measures concern feelings of boredom.

one can engage in pursuits that promote growth and exploration (Fredrickson & Branigan, 2005; Fredrickson, 1998). Consistent with this view, Wyer et al., (1999) argue that positive affective experiences may operate like a "go signal," for they indicate that one should rely on whatever comes to mind. This reliance on what pops into one's head can promote finding and using unusual associations. In contrast, negative affective states may signal that there is a problem with the environment (Clore et al., 2001; Schwarz & Clore, 2003; Wyer et al., 1999). They may operate like a "stop signal," indicating that one should be wary and systematic to handle the issue (Wyer et al., 1999). This wariness may decrease associative thinking by encouraging people to be cautious about making new connections (Gasper, 2003, 2004). Thus, the *valence hypothesis* is that positive affect facilitates associative thinking more than negative affect.

Other research, however, suggests that a valence hypothesis may be incorrect, for the effects of negative affective states on creativity are mixed (Ashby et al,. 1999). A recent meta-analysis found no differences between negative and neutral states, and negative and positive states on flexible thought (Baas et al., 2008). One reason for the null result could be due to the practice of examining a wider variety of negative than positive affective states. Research on negative affect has included such states as sadness, fear, distress, and anger. Making conclusions across this particular set of affects is problematic because these states differ in terms of orientation and activation, both of which could differentially alter associative thought. In contrast, research on positive affect typically only examines happiness making it unclear to what extent the valence hypothesis generalizes to other positively valenced states, especially those that involve different orientation and activation levels than happiness.

Orientation Hypothesis

Indeed, research indicates that approach orientations promote more flexible and associative thought processes than do avoidance orientations (Friedman & Förster, 2000, 2002, 2008). An approach orientation activates a broad, global style of thought, which facilitates being open to new experiences and encourages finding novel associations (Baas et al., 2011; De Dreu, Nijstad, & Baas, 2010; Friedman & Förster, 2002, 2008). An avoidance orientation activates a more narrow style of thought, which facilitates focusing on threats, but limits finding novel associations (Friedman & Förster, 2008). Approach and avoidance orientations can stem from either positive or negative states (Carver, 2004). For example, approach can be sparked by negative, deactivated states like boredom, whereas avoidance can be sparked by positive, deactivated states like relaxation.[2]

The role that deactivated states play in associative thought has not been extensively examined; yet, some research supports the idea that the orientation of these states, rather than the valence, may play a key role in associative thought. For instance, bored individuals want, but are unable, to engage in satisfying activities (Eastwood, Frischen, Fenske, & Smilek, 2012). Also, boredom is thought to spark a search for meaning (Eastwood, et al. 2012; Van Tilburg & Igou, 2012). This desire to seek out and engage in satisfying, meaningful activities supports the classification of boredom as an approach state. It also suggests that boredom might motivate associative thought. Indeed, other researchers (Carroll, Parker, & Inkson, 2010; Rule, 1998, Schubert, 1978; Vodanovich, 2003) have hypothesized, but not tested, the idea that boredom encourages people to approach and perform creative endeavors. There is correlational data, for instance, indicating that people high in boredom proneness are more likely to engage in sensation

[2] Some theorists argue that sadness is a negative, deactivated, approach state (see Carver, 2006; Higgins, 1999). Sadness, however, may not be an ideal affective state to test this line of inquiry, for according to Watson et al.'s (1999) model of affect, boredom, not sadness, reflects a purer marker of a negative, deactivated, approach state. Thus, we decided to focus on the low PA dimension of the circumplex.

seeking, which involves approaching rewarding stimuli, and more likely to exhibit divergent thinking styles (McCrae, 1987). Thus, boredom may encourage people to approach rewards and spark associative thought. Conversely, positive avoidance states, like feeling relaxed, signal that threats are absent for now, but not that one should seek new experiences. Thus, relaxation may have negative motivational effects and fail to facilitate the use of flexible cognitive strategies (as suggested by Pekrun & Stephens, 2010). Based on this work, the *orientation hypothesis* is that approach-oriented affective states (like elation and boredom) should promote more associative thought than avoidance-oriented affective states (like distress and relaxation).

Activated-Orientation Hypothesis

One problem with the valence and orientation hypotheses is that deactivated states, like boredom and relaxation, may not influence associative thought because they signal that there is little motivational imperative to act (Baas et al., 2008, 2011; De Dreu, Baas, & Nijstad, 2008). Deactivated states fail to signal urgency, which is needed to encourage action. Consistent with this view, in their meta-analysis, Baas et al., (2008) argue that approach/activated states should promote flexible thought, while avoidance/activated states should hinder it, but deactivated states, regardless of their orientation, should not alter behavior. Supporting this assumption, Baas et al., (2008) found that positive activated states promoted flexible thought relative to neutral controls, negative activated states hindered flexible thought relative to neutral controls, and negative and positive deactivated states had no effect relative to neutral controls. Thus, the *activated-orientation hypothesis* predicts a main effect of both valence (positive more associative thought than negative) and orientation (approach more associative thought than avoidance). Specifically, positive-approach states (elation) should foster associative thought more than positive-avoidance states (relaxation), and negative-approach states (boredom) should promote

more associative thought than negative-avoidance states (distress), and relaxation and boredom should produce similar amounts of associative thought given that neither sparks action.

Even though the activated-orientation hypothesis argues that deactivated states exert little influence on thought, very few studies have tested it. For instance, in Baas et al.'s (2008) meta-analysis, relaxation appeared in only three samples and boredom never appeared. The results revealed that relaxation did not alter creativity relative to a neutral state; however, this comparison may not be very informative given that many neutral states are also deactivated/relaxed states, thus confounding the two. Moreover, relaxation also can lessen associative thought relative to more activated states (De Dreu et al., 2008). Thus, the relaxation data are consistent with both the orientation and activated-orientation hypothesis, in that poorer performance could stem from relaxation either promoting an avoidance orientation or reducing activation, indicating that there is no need to act.

Thus, the valence, orientation, and activated-orientation hypotheses differ with regards to whether valence, orientation, or both matter. These hypotheses have not been adequately tested because researchers often do not examine whether these ideas extend to deactivated affective states. We conducted three studies to examine how four affective states – positive-approach (elation), positive-avoidance (relaxation), negative-approach (boredom), and negative-avoidance (distress) – alter associative thought. We analyzed the data using a Valence x Orientation design. This design allows us to examine wither valence, orientation, or both matter. In addition, even though we have no predictions concerning a main effect of the activation dimension, the design allows to us to examine whether activation matters. For, an activation effect would appear as a Valence x Orientation interaction.

Study 1

Method

Participants. Respondents (51 women and 55 men) attending a university in the United States completed the study in exchange for course credit in their introduction to psychology class. Analyses revealed that one student was an outlier, with a standardized residual of 2.98 on the associative thought measure; all other residuals were between -2.04 and 1.86. This woman was dropped leaving 105 participants.

Materials and Procedure. Participants arrived in the lab to complete a study on associations between words. After answering demographic questions, they were randomly assigned to watch one of four clips designed to produce elation, distress, relaxation, or boredom. Even though these clips were used by Gross and Levenson (1995) to produce amusement, sadness, and pleasant-neutral affect or neutral affect, our pilot testing revealed that they altered PA and NA as measured by the Positive and Negative Affective Schedule (PANAS, Watson, Clark, & Tellegen, 1988).[3] The elation clip (the orgasm scene from When Harry Met Sally) and the bored clip (a silent, screen-saver clip in which colored sticks appear, see Gross & Levenson, 1995) produced high and low PA, respectively. The distress clip (a scene from The Champ, in which a boy is in distress, which Storbeck [2012] used to induce a withdrawal-oriented, negative state) and relaxed clip (a nature clip with narration and quiet music) produced high and low NA, respectively.

After watching the clip, respondents indicated whether they had seen the clip before and rated how pleasant/unpleasant and calm/aroused the clip made them feel on a scale from 0 (not at all*)* to 10 (extremely). They then worked on the Remote Associates Test (RAT; Mednick et al.,

[3] A full summary of this pilot is available as a supplemental analysis: see http://www.personal.psu.edu/kxg20/Supplemental_Data_AAA.docx

1964), which was designed to assess creative, associative thought. For this task, participants saw a screen with 16 boxes, each with a word inside of it. This word served as a brief reminder of the content of the problem (e.g. sore). Respondents could click on any of these boxes to reveal a RAT trial. Each RAT trial consisted of three words (e.g. "sore," "shoulder," and "sweat"), with which participants had to find a fourth, related word (e.g. "cold," as in "cold sore," "cold shoulder," and "cold sweat"). For five minutes, participants could view any of the 16 problems in any order they wished, any number of times, and were instructed to skip a viewed problem if they could not immediately think of a solution, and that they could come back to it later. Once participants provided an answer for the problem, the problem was no longer viewable. Respondents who engage in associative thought should have the solutions readily come to mind.

To ensure that task interest, difficulty, and concern could not account for the data, participants then rated task interest (5 items, $\alpha = .86$, "I thought that word association task was…" "interesting," "fun," "dull" [R], "okay to do," and " I was bored by it" [R]), difficulty (3 items, $\alpha = .80$, "The word association task was…" "challenging," "easy" [R], "difficult"), and concern (4 items, $\alpha = .77$, "I was concerned about my performance on the word-association task," "Working on the word-association task made me feel anxious" [R], "I doubted my performance on the work association task" [R], and "Overall, I don't mind working on the word association task") using a scale that ranged from 1 (strongly disagree) to 7 (strongly agree). [4]

Results

Affect Manipulation Check. A 2(Orientation: Approach, Avoidance) x 2 (Valence: Positive, Negative) ANOVA was conducted on self-reports of valence and arousal, with having seen the clip before as a covariate. We included having seen the clip as a covariate because prior

[4] Participants then completed another affect manipulation-check. Analyses confirmed the previous manipulation check, indicating that the differences in affect remained even after completing the RAT. Details of these supplemental analyses are at: http://www.personal.psu.edu/kxg20/Supplemental_Data_AAA.docx.

viewing of the clip may indicate that participants had already completed a similar study and/or may lessen the effectiveness of the clip due to people being aware of the source of their mood (Schwarz & Clore, 2003). [5] The analyses revealed that the affect manipulations were effective. Respondents in the positive (elation and relaxation) conditions were more positive than those in the negative (distress and boredom) conditions, M = 6.79 vs. 3.73, SE = .32, .31, valence main effect: $F(1, 100) = 45.57$, $p < .001$, $\eta^2_{partial} = .31$. In terms of the arousal measure, orientation and valence interacted, $F(1, 100) = 8.11$, $p = .005$, $\eta^2_{partial} = .08$, to indicate that people in an activated affect condition were more aroused ($M_{elation} = 4.83$, $SE = .50$; $M_{distress} = 4.80$, $SE = .47$) than those in a deactivated affect condition ($M_{relaxation} = 2.68$, $SE = .48$; $M_{boredom} = 4.25$, $SE = .47$). There were no other significant effects. Thus, the affective manipulations successfully altered valence and activation.

Associative Thought. A 2 (Orientation: Approach, Avoidance) x 2 (Valence: Positive, Negative) ANOVA was conducted on total number of RAT problems correct. This version of the RAT had a unique feature in that respondents could attempt the problem any number of times. Respondents viewed an average of 18.84 problems (SD = 4.67). Because people differed in their number of attempts, we controlled for total number of attempts taken (sum of total correct, total viewed but not answered, and total incorrect) as well as whether they had seen the clip. Consistent with the orientation hypothesis, respondents in the approach conditions were more likely to write down a correct answer, M = 5.69, SE = .30, than those in the avoidance conditions, M = 4.81, SE = .30, Cohen's d = .40, $F(1, 99) = 4.17$, $p = .04$, $\eta^2_{partial} = .04$.[6] Valence produced no main effect, $p > .51$, nor interaction, p's > .55, see Table 1. Both having

[5] The results replicated when the analyses were re-run using only people who had not seen the clips. Rather than drop the 9 participants who had seen the clips, we decided to treat having seen the clip as a covariate.

[6] When total number of attempts at the problem was not included as a covariate, the effect of orientation was not significant, $F(1,100) = 2.42$, $p = .12$, indicating that attempting a lot of problems masks the effect of mood on RAT performance.

seen the clip, $F(1, 99) = 5.22$, $p = .02$, $\eta^2_{partial} = .05$, and number of attempts, $F(1, 99) = 34.71$, $p < .001$, $\eta^2_{partial} = .26$, were associated with better performance on the RAT. Thus, the data indicate that orientation influenced peoples' ability to obtain the correct responses on the RAT.

Moreover, orientation did not affect ratings of RAT interest, difficulty, or concern. The only effect on these measures was that people were more concerned about their performance in the positive than negative affect conditions, valence main effect: *M's* = 4.21, 3.70, *SE*s = .19, .18, $F(1, 99) = 3.79$, $p = .05$, $\eta^2_{partial} = .04$.

Discussion

Overall, the data support the orientation hypothesis – respondents in approach-oriented affective states (elated and bored) engaged in more associative thought than those in avoidance-oriented affective states (distressed, relaxed). However, the study design was unusual in that respondents could attempt a problem multiple times and this persistence positively predicted performance. Thus, affect altered associative thought only when the total number of attempts was taken into account. Therefore, in Study 2, we extended these results by using a different measure of associative thought. Following the work of Isen and Daubman (1984), De Dreu et al. (2008), and Friedman and Förster (2002), respondents completed a categorization task. Respondents saw a category (e.g., vehicles) and rated the extent to which an item (e.g., cars) did or did not belong to that category. People high in associative thought should be more inclusive and rate weaker exemplars (e.g. camels) as belonging in the category more so than those low in associative thought. We also enhanced our power by increasing the sample size.

In addition to examining generalizability and enhancing power, we examined whether these results are explained by the somatic or cognitive aspects of affective experience. Friedman and Förster (2008) argue that the effect of approach/avoidance states on associative thought is

independent of emotional experience, with the effects stemming from the cognitive focus that orientation engenders, rather than from the somatic experiences that it creates. Friedman and Förster (2005) argue that these two possibilities produce different patterns of hemispheric activation. If the effects are due to the somatic aspects, affective states that instill approach-oriented somatic arousal should produce greater relative left than right hemispheric activation than those that produce avoidance-oriented arousal. However, if the effect is due to affective states activating different cognitive components, then approach-related cues should produce greater right than left hemispheric activation than avoidance-related cues. To examine whether somatic or cognitive aspects of affect best account for the effects, we measured relative differences in hemispheric activation.

Study 2

Method

Participants. Respondents (96 women, 81 men) completed the study in exchange for course credit at a university in the United States. A man and a woman were dropped because of suspicious responding (providing the same rating for all the category exemplars) leaving 175 participants.

Materials and Procedure. Respondents participated in a study examining the imagination and how it influences thinking style. After completing the same affect manipulations used in Study 1, respondents completed Milner's line bisection task (see Friedman & Förster, 2005). Respondents saw a series of 54 lines that were bisected with vertical marks 10 mm long. Respondents indicated which side of the bisected line was the longest. Eighteen trials were bisected so that the longest line was on the right, 18 so that it was on the left, and 18 were centrally bisected. To calculate a score, we subtracted the number of times respondents selected

the right line as longest from the number of times they select the left line as the longest on the centrally bisected trials. Higher numbers reflect greater increased relative right and decreased relative left hemispheric activation.

Afterwards, respondents completed a categorization task. They saw a category, such as fruit, and rated to what extent 14 exemplars (e.g. watermelon, coconut, and pickle) belonged in that category. The three categories (fruit, vehicle, and sport) and the exemplars came from Rosch's (1975) ratings. Respondents rated category fit using a 10-point scale, with 1 = definitely does not belong, 5 = does not belong, but similar to members of the category, 6 = belongs, but not good example, and 10 = definitely does belong. Associative thought should promote category inclusion, especially for the weakest exemplars.[7] To create a set of weak exemplars, we used the four lowest rated exemplars from each category – these exemplars were the only ones to always have median ratings of 5 or under.

Results

Affect Manipulation Check. A 2 (Orientation: Approach, Avoidance) x 2 (Valence: Positive, Negative) ANOVA with whether respondents saw the affect manipulation clip as a covariate was conducted on self-reports of valence and arousal. The analysis revealed that the affect manipulations were effective. On the valence ratings, there was a main effect of valence, $F(1, 170) = 67.80$, $p < .001$, $\eta^2_{partial} = .29$, and orientation, $F(1, 170) = 9.88$, $p = .002$, $\eta^2_{partial} = .06$, and an interaction between them, $F(1, 170) = 22.35$, $p < .001$, $\eta^2_{partial} = .12$. Respondents in the relaxation condition reported more positive affect than those in the elation condition, *Ms* = 7.74, 4.92, *SEs* = .35, .36, $p < .001$, those in the elation condition reported more positive affect than those in the boredom and distress conditions, *Ms* = 3.66, 3.11, *SEs* = .35, .36, *p's* < .001.

[7] As in Study 1, respondents completed a second mood-check at the end of the study. These supplemental analyses (http://www.personal.psu.edu/kxg20/Supplemental_Data_AAA.docx), replicate those found in Study 1.

The fact that the relaxation clip was more positive than the elation clip is not problematic, for it results in an even stronger test of the valence and orientation hypotheses. If the valence hypothesis is correct, then relaxation, the most positive clip, should promote associative thought. In contrast, if the orientation hypothesis is correct, it predicts that relaxation, despite being the most positive clip, should hinder associative thought. Lastly, respondents who saw the clips before had more positive reactions, $F(1, 170) = 5.96$, $p = .02$, $\eta^2_{partial} = .03$.

In terms of activation, people in the avoidance condition reported more arousal than those in the approach condition, $M = 4.83, 4.03$, $SE = .29, .28$, $F(1, 170) = 3.88$, $p = .05$, $\eta^2_{partial} = .02$, which was qualified by an interaction with valence, $F(1, 170) = 11.72$, $p = .001$, $\eta^2_{partial} = .06$. The interaction indicates that people in an activated-affect condition were more aroused ($M_{elation} = 4.54$, $SE = .40$; $M_{distress} = 5.70$, $SE = .41$) than those in a deactivated affect condition ($M_{relaxation} = 3.96$, $SE = .40$; $M_{boredom} = 3.52$, $SE = .39$).

Associative Thought. A 2 (Orientation: Approach, Avoidance) x 2 (Valence: Positive, Negative) ANOVA with having seen the affect manipulation clip as a covariate was conducted on the weak exemplars. Consistent with the orientation hypothesis, there was a main effect of orientation on the weak category ratings, $F(1, 170) = 5.82$, $p = .02$, $\eta^2_{partial} = .03$. Respondents in the approach affect conditions (i.e., elation and boredom) demonstrated more associative thought by having higher inclusiveness ratings than those in the avoidance (i.e., distress and relaxation) conditions, $M = 3.94$ vs. 3.53, SE's $= .12$, Cohen's $d = .37$. Having seen the clip was a significant covariate $F(1, 170) = 4.95$, $p = .03$, $\eta^2_{partial} = .03$, indicating that if respondents saw the clip before, then they engaged in less associative thought.[8] There were no other significant effects: valence, $F < 1$, $p = .36$; interaction, $F(1, 170) = 3.50$, $p = .12$, see Table 2.

[8] When only people who had not seen the clip were included, the date replicated these analyses, main effect of orientation: $F(1, 158) = 5.80$, $p = .02$, $\eta^2_{partial} = .04$.

Hemispheric Activation. A 2 (Orientation: Approach, Avoidance) x 2 (Valence: Positive, Negative) ANOVA with having seen the affect manipulation clip as a covariate was conducted on the hemispheric activation scores. If respondents had seen the clip, they showed greater right, relative to left, hemispheric action, $F(1, 170) = 4.10$, $p = .04$, $\eta^2_{partial} = .02$, $r(175) = 0.16$, $p = .03$. There were no other significant effects, all p's > .31, and hemispheric activation did not correlate with associative thought, $r(175) = -.09$, $p = .26$.

Discussion

The data once again support the orientation hypothesis, rather than the valence or activated-orientation hypotheses. Specifically, respondents who experienced approach states, elation and boredom, engaged in more associative thought than those who experienced avoidance states, distress and relaxation. There was no effect of valence on associative thought.

One potential issue with Studies 1 and 2 is that the affect manipulations may not be ideal. Even though the pilot data and the affect manipulation-check data indicate that the affect manipulations altered elation, boredom, distress, and relaxation in the hypothesized directions, other researchers conceptualize these manipulations differently. Specifically, Gross and Levenson (1995) conceptualized the clip we used to induce elation as amusement, the clip we and Storbeck (2012) used to induce distress/withdrawal as sadness, and the boredom clip and the relaxation clip we used as neutral affect manipulations (despite the fact that their data indicates that these latter two clips induce a lack of interest and calmness, respectively). Because of these ambiguities, in Study 3, we replicated the results using self-reported affect.

In Study 2, we explored whether differences in hemispheric activation underlie the effect of motivational orientation on thought. Unfortunately, none of the affect manipulations altered hemispheric activation, nor did hemispheric activation predict associate thought. Consequently,

it is unclear whether affect was having these effects on associative thought due to changes in somatic or cognitive aspects linked to these different affective states. One possibility is that if both somatic and cognitive aspects are operating, then they might be influencing the line bisection task in opposite ways, thus producing a null effect. A more sensitive measure that can detect hemispheric activation in terms of location (where in the right and left hemisphere), pattern, and strength may be needed to fully understand whether these effects are due to the cognitive or somatic aspects associated with affect.

Given these findings, in Study 3, we sought a different means to assess orientation, in particular an approach orientation. Approach is a multifaceted construct (Carver & White, 1994). We hypothesize that approach-oriented affects promote associative thought because these states encourage a desire to explore and try new things. To assess this propensity, we asked respondents to complete a measure of sensation seeking. People high on sensation seeking seek novel, complex, and intense sensations and experiences (Zuckerman, 1994). Elation may promote sensation seeking, for the broaden and build theory of positive emotions (Fredrickson, 1998) postulates that positive affect is associated with expanding one's repertoire. Boredom also encourages sensation seeking (Zuckerman, 1994) as a means of finding something of interest to do. Lastly, sensation seeking is associated with engaging in divergent thinking (McCrae, 1987) and making inclusive category ratings (Zuckerman, 1994). Thus, in Study 3, we examine whether sensation seeking mediates the effect of these two approach-related affects on associative thought.

Study 3

Method

Participants. Two hundred and eighty five participants (142 men, 142 women, 1 missing, M_{age} = 36.66, *SD* = 13.20, range: 18 to 75) completed the study, which was posted on Mechanical Turk, for $0.30. Participants were from the United States, and they were asked to only participate in the study if they were native speakers of English. Eight participants were dropped for either failing the attention check (a question in which they were asked to mark the answer D, 1 person) or providing suspicious responses (e.g. the same answer for all the category ratings), leaving 277 participants (135 men, 141 women, 1 no information).

Materials and Procedure. Participants first rated to what extent they felt 12 affective states "right now, at this moment," on a 1 (not at all) to 10 (extremely) scale. The randomly presented states assessed: elation (α = .84 elated, joyous, and excited), boredom (α = .82, bored, disinterested, and dull), distress (α = .88, distressed, upset, and anxious), and relaxation (α = .84, relaxed, calm, and tranquil). Then participants completed a modified measure of Zuckerman's (1994) sensation seeking scale (SSS V), that included the thrill and adventure seeking, experience seeking, and boredom susceptibly subscales. For the experience seeking subscale, we dropped the items about drugs and homosexuality due to our concern that those items could lead to reactance in participants, and changed the question about wanting to meet far-out groups like artists or punks to wanting to meet "unusual people." Following Gray and Wilson's (2007) method, respondents rated the extent to which they currently agreed with each item on a 1 (Disagree very much) to 7 (Agree very much) scale. The SSS V is typically used as a trait measure, but we used it as a state measure. Indeed, sensation seeking was associated with respondents' in-the-moment affective experiences. The subscales were highly correlated and combined to form an overall measure of sensation seeking (α = .90). Afterwards, respondents completed the categorization task used in Study 2.

Results

We used Hayes' Process (2013) macro to analyze the data. We computed an orientation score, in which higher numbers reflected a greater approach than avoidance orientation. This orientation score was computed by averaging the two approach states (elation and boredom) and subtracting from it the average of the two avoidance states (distress and relaxation). We also computed a valence score, in which higher numbers reflect greater positive than negative affect. This score was computed by averaging the two positive states (elation and relaxation) and subtracting from it the average of the two negative states (boredom and distress). In all analyses we used mean-centered variables, heteroscedasticity-consistent SEs were employed, bias corrected confidence intervals were estimated using 5000 bootstrap samples, and *b* refers to the unstandardized betas.

First, using Process (2013), we examined whether orientation, valence, and their interaction predicted associative thought (i.e., ratings for the weak exemplars). Analyses revealed only one significant effect. As predicted, being more approach than avoidance oriented positively predicted associative thought, orientation: $b = .14$, se = .05, $t(273) = 2.62$, $p = .009$, valence: $b = -.03$, se = .03, $t(273) = -1.31$, $p = .19$, interaction, $b = .001$, se = .02, $t(273) = .09$, $p = .93$.

Then, we examined whether sensation seeking mediated the effect of orientation on associative thought. We used Process Model 5, in which orientation predicted sensation seeking, and orientation, valence, and their interaction predicted associative thought. As predicted, sensation seeking mediated the effect of orientation on associative thought. First, approach orientation predicted greater sensation seeking, $b = .11$, se = .05, $t(275) = 2.47$, $p = .01$, and sensation seeking predicted more associative thought, $b = .24$, se = .08, $t(272) = 2.89$, $p = .004$.

When sensation seeking was taken into account, orientation still predicted associative thought, *b* = .11, se = .06, *t*(272) = .04, and the effect of valence and the interaction still were not significant, *p*'s > .17. However, as predicted, sensation seeking mediated the effect of orientation on associative thought, for the indirect effect = .03, se = .01, 95% CI [.01, .07] was significant.

Because we did not manipulate affect in this study, we examined whether a model in which orientation, valence, and their interaction mediated the effect of sensation seeking on associative thought. The three variables did not mediate the effect of sensation seeking on associative thought; all CI's for the indirect effects included zero. Thus, it is not the case that increased sensation seeking alters affect, which in turn alters associative thought.

General Discussion

These three studies shed light on how the affective qualities of valence, orientation, and activation influence associative thought. All studies support the orientation hypothesis: approach-, rather than avoidance-, oriented states promoted associative thought. Moreover, because sensation seeking operated as a mediator, the data confirm that these effects are due to approach-oriented states promoting a desire to explore one's environment. The finding that elation promoted more associative thought confirms a range of prior work indicating that elation promotes elements of creativity (see Bass, et al., 2008); whereas the boredom finding is more novel and thus we discuss it in greater depth.

The finding that boredom promotes associative thought is consistent with many peoples' theorizing that boredom encourages the quest for meaning and exploration (Carroll et al., 2010; Eastwood, et al., 2012; Rule, 1998; Van Tilburg & Igou, 2012, Vodanovich, 2003), which could promote creative associations. Others, however, have classified boredom as an avoidance-

oriented state, in that it promotes escaping/avoiding punishing stimuli (Pekrun, et al., 2010). We certainly believe that if a person is bored by a task, that this boredom will probably promote a desire to avoid that task. Just as sadness, which others view as an approach state (see Carver, 2006; Higgins, 1999), would probably promote a desire to avoid the thing that makes one sad. These studies, however, examined whether general feelings of boredom can also spark approaching new and potentially rewarding stimuli. If boredom is solely about escaping, and not seeking new meaningful experiences, then there is no reason to expect that boredom would promote associative thought. Presumably, merely doing any new task, and not necessarily doing it creatively, would be enough to escape the situation. It is only when one considers boredom as signaling approach and exploration do these findings make sense. Thus, these data suggest that the outcomes of feeling bored may be complex. For boredom may spark approaching rewarding activities in a broad and explorative manner, rather than merely avoiding tedious activities.

Another issue is whether other low PA states like feeling sleepy, drowsy, or sluggish would promote associative thought. Unlike boredom, it is unclear to what extent these states are affective, as they can arise from a physical need. Feeling sleepy could be due to the body's physical need for sleep, just like feeling hungry reflects physical need for food. If so, then sleepiness may merely promote the quest for rest. However, it may be possible for feelings of sleepiness to spark associative thought. For instance, Weith and Zacks (2011) found that people performed better on insight problems during the time of day that was non-optimal for them. Healey and Runco (2006) also found that insomnia and creative potential were positively correlated and suggested that a lack of sleep could enhance creativity or vice a versa. Thus, the effects of sleepiness on creativity are unknown, but it is plausible that feeling a bit tired could promote associative thought.

In these studies, we can only make relative statements about approach versus avoidance orientations. Without a neutral control group, it is impossible to determine whether the effects of orientation on associative thought are due to approach increasing it, avoidance deceasing it, or both. However, the problem with many neutral control groups is that the process of trying to create a neutral state may actually create a deactivated state, like boredom or relaxation. Three recent reviews that examine using videos as affect manipulations (Gross & Levenson, 1995; Hewig, Hagemann, Seifert, Gollwitzer, Naumann, Bartuseek, 2005; Schaefer, Nils, Sanchez, & Philippot, 2010), all recommended neutral manipulation clips that elevated either boredom or relaxation. Given the confounding of many neutral conditions with boredom and relaxation, an appropriate control condition becomes harder to identify. Thus, in these studies we limited ourselves to making relative comparisons.

Overall, the data cast doubt on the valence hypothesis and the activated-orientation hypothesis. The data indicate that valence alone could not account for any of the data. Thus, it is too simplistic to argue that positive affect helps creativity and negative affect hurts creativity. These studies also indicate that, in contrast to the activated-orientation hypothesis, deactivated affective states can and do alter associative thought. These data are thus discordant with Baas et al.'s, (2011) and De Dreu et al.'s, (2008) dual pathway to creativity model. In this model, they propose that (a) positive activated states promote creativity by activating cognitive flexibility (b) negative activated states promote creativity by activating persistence, but not cognitive flexibility and (c) deactivated states have no effect. Our data are consistent with their hypotheses concerning positive and negative activated states, in that we too found that positive, but not negative, activated states promoted associative thought, a type of cognitive flexibility. Our data part company with their hypothesis concerning deactivated states, for we found that two

deactivated states, relaxation and boredom, influenced associative thought in opposite directions. Thus, it may be a mistake to assume that deactivated states exert little influence on associative thought and that all deactivated states operate in a similar fashion.

In sum, these data move beyond traditional research on affect and associative thought by examining how two deactivated states, relaxation and boredom, may alter this process. The data indicate that approach states, elation and boredom, promote more associative thought than avoidance states, distress and relaxation. Thus, in contrast to the valence and activated-orientation hypothesis, boredom can spark associative thought and relaxation can hinder it. We are not suggesting that organizations embrace boredom or hinder relaxation as a means to spark creativity, but rather that they may want to carefully consider their assumptions about how these states operate. Our main message is that researchers should test their theories about affect by including deactivated states, because these states provide critical information concerning whether valence, activation, orientation, or some combination underlies an effect.

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Table 1

Main Effect of Orientation on the Number of Correct Problems on the RAT in Study 1

	Orientation	
	Approach	Avoidance
Valence	*M (SE)*	*M (SE)*
Positive	Elated = 5.70 (.45)	Relaxed = 5.09 (.43)
Negative	Bored = 5.67 (.42)	Distressed = 4.54 (.42)
Total	Approach = 5.69 (.30)	Avoidance = 4.81 (.30)

Note. Higher numbers indicate more associative thought, data controls for number of attempts and prior exposure to the affect manipulation. N per cell ranges from 25 to 27.

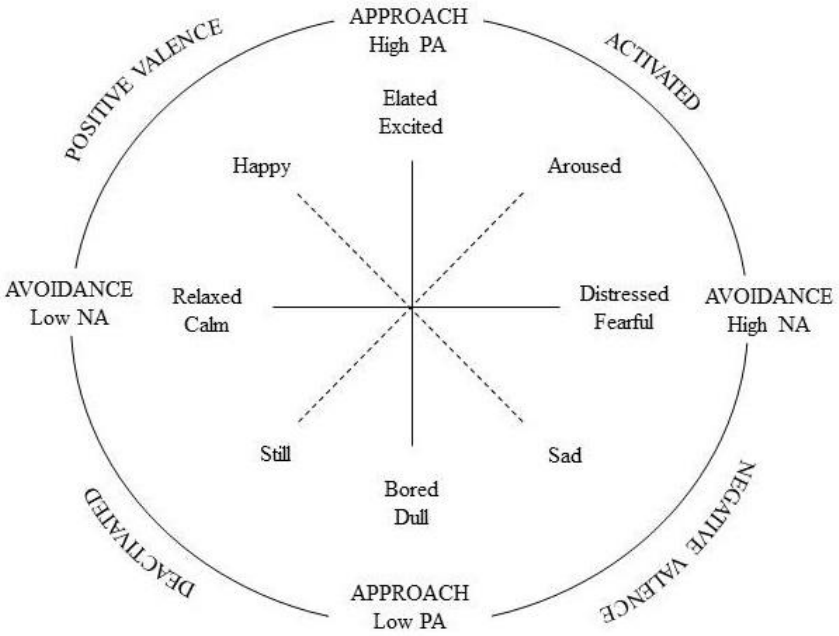
Table 2

Main Effect of Orientation on Category Fit for the Weakest Exemplars in Study 2.

	Orientation	
	Approach	Avoidance
Valence	*M (SE)*	*M (SE)*
Positive	Elated = 4.15 (.17)	Relaxed = 3.48 (.17)
Negative	Bored = 3.73 (.16)	Distressed = 3.59 (.17)
Total	Approach = 3.94 (.12)	Avoidance = 3.53 (.12)

Note. Higher numbers indicate more associative thought. N per cell ranges from 41 to 47.

Figure 1. Three Affective Dimensions: Valence, Orientation, and Activation



Highlights

- Approach orientated states (elation and boredom) promote creative associations more than avoidance orientated state (distress and relaxation).
- The valence of the affective state alone is insufficient to account for the role of affect on the process of making creative associations.
- Activated states need not always have a greater effect on creative thought than deactivated states.
- Deactivated affective states can have differential effects on thinking depending or in their approach/avoidance orientation.